Knowledge Assets and Knowledge Conversion: Addressing issues of practical application

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Abstract: There is a broad consensus regarding what constitute "knowledge assets" in an organisation and the mechanisms by which they are created and maintained via the Knowledge Management Cycle (Evans 2014). Their characterisation at the highest level as "tacit" or "explicit" (Nonaka and Takeuchi 1995) establishes a widely-accepted conceptual basis for their understanding. It is argued that particular knowledge assets lie on a spectrum between tacit and explicit extremes and that they move along this spectrum under the impetus of the process of "knowledge conversion" (Nonaka and van Krogh 2009). Knowledge conversion is seen as a fundamental dynamic that interplays between tacit and explicit knowledge in a non-linear way that leads to the enhancement of both. At the explicit end of the spectrum is "codified knowledge", that is, knowledge that has been converted into "accessible and applicable formats" (Grover and Davenport 2001) and can be communicated independently of the knower. This type of knowledge asset is identified as having the advantage that it is easier to distribute and reuse, but there are practical difficulties associated with it, in that its efficacy is dependent on how it is packaged as a "knowledge unit" and presented and controlled within an overall "knowledge architecture" (Zack 1999). Within this context, codified knowledge is examined to determine if approaches can be identified that optimise the knowledge conversion process, thereby enhancing the value of the resultant knowledge assets. This is done by exploring what may constitute a viable knowledge unit within the business environment, in conjunction with a complementary schema for constructing a knowledge architecture that optimises its application to business improvement and innovation. A cross-disciplinary approach is taken that draws on developments in technical communication (specifically DITA*), metadata standards, and continuous improvement practices (Kaizen, Lean, etc.). The proposed approaches to the management of codified knowledge assets, and the knowledge conversion process, are evaluated and discussed using a case study carried out in a knowledge-intensive mutual insurance company.
*Darwin Information Typing Architecture
Keywords: knowledge management, knowledge architecture, knowledge conversion, business improvement, knowledge unit, continuous improvement, metadata, DITA, topic, DCMI

1. Introduction

While there is much debate around what precisely constitutes 'knowledge' in organisations (Evans 2014) the concept that it falls into the two broad categories of 'tacit' and 'explicit' (Nonaka 1994) is generally accepted as a practical means of analysing its nature, its relationship to an organisation, and the means by which it may be managed.

'Tacit' knowledge is knowledge retained internally by individuals and expressed by them through their actions (the tasks they perform, decisions they make, and the products or services that they help design and produce), while 'explicit' knowledge is knowledge retained externally to the individual in some symbolic or representational form. The two categories are intuitively appealing in that they factor in the two ways in which one can learn, which is through experience and thought, and by listening to, observing, copying, or being guided by others (to acquire tacit knowledge), or by reading, following written instructions, or observing the operation of machines or other artefacts (explicit knowledge).

This internal /external dichotomy is critical to the tacit /explicit categorisation because it is seen as the basis on which the two interact to the betterment of both; "tacit and explicit forms of knowledge interact to create new knowledge ... (they) are not separate but 'mutually complementary' in that they dynamically interact with each other in creative activities by individuals and groups" (Nonaka and von Krogh 2009 p 638). This is referred to as 'knowledge conversion'.

Once this view is accepted, it opens up a practical challenge for organisations to find the means to pursue this 'dynamic interaction' in the most effective way. Two issues have been identified as practical barriers to this pursuit. The first is that the context in which organisational knowledge is retained and exchanged, both conceptually and physically, is often not clearly articulated and consciously designed for optimal benefit. In other words, how is effective 'knowledge conversion' actually achieved? And second, the important role played by explicit, codified knowledge is limited by a lack of clarity and consistency in the way it is formatted and presented.

These issues were identified some time ago by Zack (1999). He pointed out that “Many organizations have become so complex that their knowledge is fragmented, difficult to locate and share, and therefore redundant, inconsistent or not used at all.”, and also that, “A shared, explicit understanding of concepts, categories and descriptors lays the foundation for effective communication and knowledge sharing in organizations.” ; the latter he characterised as a ‘Knowledge Architecture’.

On the second issue, Zack (1999) identified the need to develop the concept of a ‘knowledge unit’; this being a format that can package knowledge in a way that allows it to operate effectively within a (technologically supported) knowledge architecture. “The basic structural element is the knowledge unit, a formally defined, atomic packet of knowledge content that can be labelled, indexed, stored, retrieved and manipulated. The format, size and content of knowledge units may vary depending on the type of explicit knowledge being stored and the context of their use.”

2. Knowledge Architecture and the Knowledge Management Cycle

The idea of an overall knowledge architecture that supports effective development and application of organisational knowledge has been examined extensively in the context of knowledge management life cycle models and frameworks. Evans et al (2014) provide a comprehensive historical review of the development of these models and frameworks, which they synthesize into a model containing the inter-related activities of *Identify/Create*, *Store*, *Share*, *Use*, *Learn*, and *Improve*.

Inputs to the model are tacit knowledge, and outputs are explicit knowledge assets, and the improvement, enhancement, or maintenance, of existing explicit knowledge assets. These outputs (that is, new or improved explicit knowledge), in turn, become inputs to individuals as they draw on them to enhance their tacit knowledge. In this way, the Knowledge Management Cycle, if it operates effectively, continuously facilitates ‘knowledge conversion’. (To complicate things a little, it is also argued that there is an additional factor at work in that tacit knowledge is enhanced during the process of translation into explicit form via the pressure for clarity, precision, and logical consistency.)

In order to explore the practical application of these concepts further, it is necessary to put forward some propositions about what this picture tells us and to pick a logical starting point from which to seek greater understanding. These propositions are:

- Tacit knowledge (internal to individuals) and explicit knowledge (external) feed and support each other.
- Creation of explicit knowledge, since it is accessed by individuals to enhance tacit knowledge, and takes an objective /tangible form, may be taken as a starting point to clarify what is meant by a ‘knowledge unit’.
- Tacit/explicit interaction is best explained/applied using a Knowledge Architecture and Knowledge Management Life Cycle model or framework.
- For the purpose of this analysis, a ‘knowledge unit’ is synonymous with a ‘knowledge asset’ that is both explicit and codified.
- Knowledge is more effectively managed by applying an appropriate Knowledge Architecture and Knowledge Management Cycle to the development of clearly defined ‘knowledge units’.

To put it succinctly, this paper examines how a ‘knowledge unit’ may be defined such that it constitutes the ‘currency’ used as a store of knowledge wealth that is applied, developed, and sustained, by a knowledge management life cycle model and an appropriate organisation-specific knowledge architecture.

3. ‘Knowledge units’ as codified explicit knowledge assets

Explicit knowledge is not an entirely straightforward categorisation to deal with. It is usually represented as comprised of three sub-categories: intellectual property, encapsulated knowledge, and codified knowledge. Intellectual property is most easily identified as a separate set of knowledge assets, being those that can be protected by law against copying. These include patents, brands, and trade-marks, which may be seen as the outputs of other knowledge-based processes rather than as ‘facilitative knowledge’ in its own right.

The same can be said for encapsulated knowledge, which is knowledge expressed or evident in machinery, hardware, software, or physical structures. While highly beneficial to organisational activity, these forms of explicit knowledge are the outputs of other knowledge processes, which themselves may be expressed in other explicit forms, such as operating manuals, parts descriptions, material specifications, manufacturing methods, and so on. And in the case of software, the code itself, code-embedded explanations, technical manuals, data dictionaries, operating manuals, help systems, and so on.

All of the latter items are examples of codified explicit knowledge. They capture and communicate knowledge that is valuable not just to support contemporary activity, but also to provide a basis for creative development and improvement.

The potential coverage of codified explicit knowledge extends beyond the above examples to encompass the knowledge processes that generate them. These are the meta-activities such as research, development, design, production, marketing, customer support, financial management, and so on. All of these, and their myriad sub-activities, potentially benefit from the creative and innovative effects of systematic knowledge management.

A search for 'knowledge assets' in knowledge management literature supports this view. For example:

- Schiuma and Carlucci (2010) investigated a new product development activity from a knowledge management perspective and, in addition to the tacit knowledge of designers and the encapsulated knowledge contained in their design and prototyping software, they identified as critical the codified explicit knowledge covering "working practices in terms of team-working", and "codified knowledge about the product design and prototyping with particular attention to the routines and procedures". They go on to say, "…the company is updating continuously its own manual which collects and makes easily available codified rules and procedures on the design and prototype solutions. Moreover, it codifies knowledge about the features of company's product portfolio. This is proving to be particularly useful for the identification of the best practices and solutions which support continuous improvement as well as for stimulating learning organisation mechanisms by moving the knowledge from individual to groups and from groups to the entire organisation."
- Scarso and Bolisano (2010) refer to "Organisational (such as: structured documentation processes, taxonomies, knowledge maps, etc.) and technical arrangements (e.g. knowledge repositories, knowledge retrieval systems, etc.) can be adopted to ensure the efficient use of knowledge assets."
- Zack (1999) states "Imagine an organization without procedure manuals, product literature, or computer software."
- Grover and Davenport (2001) refer to "'Best practices' knowledge within a quality or business process management function."

One thing that is evident in the codified knowledge referred to above is that there is a lack of any consistent way of naming the artefacts involved. There are references to 'manuals', 'best practices', 'structured documentation', 'codified rules', 'procedures', 'solutions', and so on. This points to the fact that within organisations, there is only a very loose taxonomy covering these types of knowledge assets. This taxonomy is based on a long tradition of paper-based documentation as the means of codification. It lacks rigour, includes many duplications, and is ill-adapted for online electronic use. It is a long way from the idealised 'knowledge unit' posited by Zack (1999).

If we were to catalogue the terms commonly used to label these knowledge assets, it would look something like this, with most being derived from 'document types': Policy, Procedure, Standard Operating Procedure, Policy and Procedure, Work Instruction, Guideline, Guide, Policy Manual, Procedure Manual, Operating Manual, Instruction Manual, Technical Manual, Process (Descriptive and/or Flowchart and/or Process Map). These are most commonly published in the form of Word or PDF electronic formats, other 'Office' type file formats (spreadsheet, presentation application, flowcharting, and so on) but may also be in the form of web files (html/xml/asp), and retained in file servers, content management systems, electronic document management systems, or online collaboration systems.

The things that all these knowledge assets have in common is that they:

- all relate to organisational activity in some aspect or level
- are predominantly unique to the organisation (or if not unique, then consciously adopted and/or adapted to the organisation)
- cover both behavioural and technical knowledge to a high level of detail

The challenge facing knowledge management from the point of view of practical application, is to find some way to rationalise this legacy of varied 'knowledge asset descriptors', for want of a better term, in a way that optimally supports the knowledge management life cycle and the role that codified knowledge plays in it.

4. Adapting metadata standards

Since the problem is one of description and classification, the logical path to a solution is to look to standards on metadata. The most widely used standard is the Dublin Core Metadata Initiative (DCMI). The DCMI contains 15 core elements (in effect classification categories) to be used for all physical and digital resources, one of which is 'Type', which the standard describes as "the nature or genre of a resource".

The 'Type' element is divided into a further set of vocabulary terms, which are: Collection, Dataset, Event, Image, Interactive Resource, Service, Software, Sound, Text, Physical Object, Still Image, and Moving Image. It is easy to see how these standardised terms can be used to identify different types of explicit codified knowledge resources. The standard allows for further subdivisions, for example, 'Text' may be qualified using a fixed vocabulary. The Standard cites an example of a vocabulary for 'Text' that includes: Books, Letters, Poems, Dissertations, newspapers, and Articles. It is also easy to compose a similar list adapted for business, such as: manuals, forms, white papers, research papers, product specifications, etc.

5. "Formally defined, atomic packet of knowledge content"

Adopting standardised classification terms in line with the DCMI will go some way towards enabling consistent management and control of explicit codified knowledge, however, it does not solve the core problem of a lack of a clearly defined 'knowledge unit' or, in the words of Zack (1999) a "a formally defined, atomic packet of knowledge content that can be labelled, indexed, stored, retrieved and manipulated".

Using broad metadata specifications to identify knowledge assets at the 'artefact' level provides a certain degree of control (it can be labelled, indexed, stored, retrieved, and manipulated more effectively, particularly in conjunction with the other DCMI standard elements), but it is not 'fine-grained' enough to provide the search-ability, flexibility, and adaptability necessary to fully support a high level of knowledge conversion, particularly given the potential inherent in computing and networking capabilities.

The Technical Communication community, however, has addressed this problem for technical knowledge (principally concerned with software user manuals and help systems (CIDM 2017) by developing the DITA Standard (Darwin Information Typing Architecture), which coins a basic unit of technical information as a 'topic'. A topic is defined as "a unit of information with a title and content, short enough to be specific to a single subject or answer a single question, but long enough to make sense on its own and be authored as a unit". Each topic is stored with metadata that allows it to be "labelled, indexed, stored, retrieved and manipulated" (Zack 1999). Within this framework, topics of different types can be specified (typically Concept, Task, Reference, and Tutorial) and their relationships to one another are specified in a DITA Map. (DITA is managed by the OASIS* organisation as a public Standard.)

At the moment, the DITA approach is confined to a fairly narrow spectrum of codified explicit knowledge, and content is authored and managed, on the whole, by specialist Technical Writers and Information Architects. It is, however, possible to apply the same concepts to 'core' business knowledge currently deposited in documents designated as Policies, Procedures, Standard Operating Procedures, Work Instructions, Guidelines, Specifications, and so on. Although they sound like specialised units of information, in practice, the nature of the information contained in these documents invariably overlaps or is mixed together. Policy documents often combine both policy and procedural content, Standard Operating Procedures often contain instructions and specifications (as well as policy elements), and so distinctions between them are mostly spurious. This is because the knowledge 'needs' that they address, if they are to be effective, focus on assisting an individual to handle a specific circumstance and in that circumstance, to understand what they are faced with, make the best decisions, and complete any tasks required in the right way. In other words, knowledge is best packaged as a unit to address a discrete business activity.

This realisation, in combination with available networked computer applications, potentially enables organisations to apply the 'topic' principle (borrowed from DITA) to create 'atomic packets of knowledge' that fit the Zack (1999) criteria. By creating 'Business Information Topics' to cover policies, procedures, instructions, and specifications in one unit, as well as relevant concepts, values, and philosophies common to specific business activities, organisations can achieve the search-ability, flexibility, and adaptability necessary for explicit codified knowledge to support optimal knowledge conversion.

6. Jettisoning restrictive cultural baggage

The 'topic' approach also helps to begin to jettison some significant cultural baggage that comes with continuing to label documents with the terms 'Policy', and 'Procedure'. These terms reflect a command and control or mechanistic style of management that has now been largely abandoned due its rigidity and antipathy to open communication and creativity. Despite this, the terms have 'stuck' and continue to have a dampening effect on knowledge creation as indicated by Nonaka (1995), "Deeply ingrained in the traditions of Western management, from Frederick Taylor to Herbert Simon, is a view of the organisation as a machine for 'information processing.' According to this view, the only useful knowledge is formal and systematic – hard (read: quantifiable) data, codified procedures, universal principles."

7. Creating an holistic view of the organisation and linking knowledge management to continuous improvement

If an organisation can break with the past and coin a 'knowledge unit' in the form of a 'Business Information Topic' that combines policy, procedure, instruction, 'best practice', etc. information into a single useful unit for each discrete organisational knowledge need (that conforms to the DITA definition of a topic), it will be able to produce much more useful, flexible, and adaptable codified knowledge assets for these types of information. 'Knowledge units' defined in this way also fit more logically into a knowledge architecture with a taxonomical structure that aligns with a value-chain, or process-orientated, view of an organisation. This is the path implied when a practical classification framework is recommended to manage knowledge assets. For instance,

- Zack (1999), when describing the role of Knowledge Repositories in his knowledge architecture, emphasises the importance of structure, "Knowledge structures provide the context for interpreting accumulated content."
- Structure and 'map' are often used as synonyms for the means by which knowledge assets are classified in order to manage them in such a way that they operate both as effective resources and guiding frameworks for expanding and improving knowledge, for example, Schiuma and Carlucci (2010, p337), conducting research into the knowledge management aspects of new product development (NPD) refer to "how to identify and map the knowledge assets to be managed in order to improve NPD process performance".
- Fine (2002), makes a connection with knowledge assets from the other direction. Beginning with a value-chain analysis, he identifies knowledge assets as key components of the process, "The model we developed … identifies two broad categories of assets: knowledge assets and supply assets."
- Garvin (1998) observes that "organizations accomplish their work through linked chains of activities … These chains are called processes and can be conveniently grouped into two categories: (1) processes that create, produce, and deliver products and services that customers want, and (2) processes that do not produce outputs that customers want, but that are still necessary for running the business."

If organisational activity as a whole is structured or classified according value-chain or process relationships, then it makes sense that the knowledge that relates to it is similarly classified. This supports both the effective use of knowledge assets and their development. Users of knowledge assets employ them within the context of operational and administrative activity (to support decision-making, planning, and task completion), so a clear alignment with processes makes these assets more readily identifiable and accessible.

The development of knowledge assets also benefits from this alignment because it allows the effectiveness of the assets to be measured and assessed in terms of process outputs, along with other assets and input factors. This approach also aligns with metadata standards that allow standardisation of classification methods for knowledge resources across organisations and (subject to competitive restraints) across industries.

For example, the AGLS metadata standard, which conforms to the DCMI, includes an element called 'Function'. This is "Used to indicate the business role of the resource in terms of business functions and activities. Functions are the major units of activity which organisations pursue in order to meet the mission and goals of the organisation."

This element is typically implemented as a controlled vocabulary containing multiple levels, that is, activities are grouped and labelled at a high level, and then divided into subsidiary groupings. It is not difficult to see that functions, activities, and processes, are effectively synonymous when applied in this context. A generic, two-level, vocabulary for 'Function' for a business enterprise would look something like Table 1.

Table 1 Function /Process metadata element controlled vocabulary

Function/Process	Sub-Function/Sub-Process
Design & Development	Research and analysis Design development Production integration and handover
Production & Logistics	Managing supplier relationships Controlling production Storing and distributing products
Marketing & Sales	Managing customer relationships Planning and implementing marketing programmes Processing sales
Service & Support	Providing technical advice and support Maintenance and servicing

Systems Development & IT	Developing and maintaining IT infrastructure Software applications development User help and support
Human Resource Management	Managing work environment and behaviour Recruitment and induction Employee development Employee administration

Such a classification provides not only a firm basis for a comprehensive and consistent knowledge architecture, but connects the organisation with recognised society-wide standards for managing knowledge resources. Another example of this approach is that taken by the APQC* to support cross-industry benchmarking and knowledge development. Called the Process Control Framework* (PCF), it is a very detailed vocabulary, jointly developed by participating companies, that contains 13 high-level groupings and over 1600 other terms in sub-groupings up to four levels deep. Table 2 lists the 13 high-level groupings, which are designated as 'categories'.

Table 2 APQC PCF Categories (top level)

Develop Vision and Strategy
Develop and Manage Products and Services
Market and Sell Products and Services
Deliver Physical Products
Deliver Services
Manage Customer Service
Develop and Manage Human Capital
Manage Information Technology (IT)
Manage Financial Resources
Acquire, Construct, and Manage Assets
Manage Enterprise Risk, Compliance, Remediation, and Resiliency
Manage External Relationships
Develop and Manage Business Capabilities

The use of function /process classifications as the main structural component of a knowledge architecture also ties it in to continuous improvement programs. It makes sense that activity aimed at improving organisational activity and outcomes should be allied with activity aimed at applying and developing knowledge assets. In fact, the collaborative, team-based, group approach inherent in continuous improvement (aka Quality Management, Kaizen, Lean, Six-Sigma, etc.) is ideally suited to encouraging the conversion of tacit to explicit knowledge.

Rees and Protheroe (2009) make the point that "The essential overlap between total quality improvement and kaizen methods (Masaaki Imai 1986) and knowledge management, arising from measurement tools, process mapping, and business process development, are well understood (O'Neill-Cooper 2001)", and "Proliferation of good practice and leveraging of knowledge offers a practical route to high performance culture."

8. Developing knowledge assets and a knowledge architecture that supports knowledge conversion

An Australian specialty insurer provides an example of how knowledge assets and a knowledge architecture can be developed to support effective knowledge conversion. In 2015 a decision was taken by a mutual insurance company to in-source all its operations. Established in 2001 by a group of over 100 municipal bodies, and mutually owned by them, the company provides workers compensation insurance coverage to their approximately 31,000 employees.

When it started, the company outsourced all its operations to a large, international insurer and paid a management fee to them to run the business. In 2015, rather than renew the outsourcing contract (due to expire in 2016), it decided to run the business itself to lower the overall cost to members.

The transition began early in 2016. A tranche of employees was hired from the previous operator, which provided a good proportion of the base tacit knowledge required to run the business competently. Computer

systems and records were migrated or copied to new platforms, and these included the codified knowledge assets developed by the previous operator.
In mid-2016 these knowledge assets were thoroughly catalogued and reviewed. They consisted of around 400 documents, 100 of which were forms, 2 of which were manuals (containing multiple policies and procedures), and the remainder were separate stand-alone documents designated as ‘policy’, ‘procedure’, or ‘policy and procedure’, or ‘training’. The documents were in multiple formats, mostly Microsoft Word and PDF, but also some Excel, PowerPoint, and Visio files. They were stored on a shared network drive and grouped using folders nested up to four levels deep.
The folder names represented the categorisation of the documents and these were a mixture of various types, including ‘areas of responsibility’ (team names), generic functions (for example, ‘Administration’), information types (‘Procedures’, ‘Forms’), and job roles. These categorisations had been applied on an ad-hoc basis, with no obvious overall structure or documented overall management process.
Analysis of the quality of the content revealed that over 50% of the documents could be discarded immediately because their content was obsolete, redundant, or duplicated. In the case of the forms, the discard ratio was 80%. Of the remaining documents, layout and presentation varied significantly, and while the content was still relevant it was subject-based rather than user-orientated and therefore not easy for knowledge users to apply. There was also no electronic version control. A proportion of the documents contained paper-style ‘document control’ panels on a cover sheet identifying an authoriser and update notes.
Finding codified knowledge assets in this sort of state is not unusual, even in large, international organisations such as the one from which these were inherited.
The strategy adopted to recover and improve the quality of these knowledge assets was to:

- Select Microsoft SharePoint as the platform to retain codified knowledge in place of the shared network drive.
- Define a standardised ‘knowledge unit’ designated a ‘topic’ to cover all internal information relating to policy, values, philosophy, procedure, instruction, and specification. Each topic addresses an identified ‘knowledge need’ and is tagged with standard metadata to identify its context and ownership, assist retrieval, and control its currency and authority.
- Scope the organisation’s overall knowledge needs by creating a taxonomy based on a value-chain analysis of its operations.
- Create a SharePoint library, shared by all staff, as a reliable and accessible knowledge repository.
- Rework the content from inherited documents into new topics and develop new content based on knowledge needs identified by the new taxonomy.
- Engage knowledge users and knowledge contributors in a systematic and facilitated knowledge conversion process.
- Implement continuous improvement in parallel with the development of codified knowledge assets through knowledge conversion.

The strategy was implemented over a period of 18 months and is ongoing. Staff are actively engaged with the codified knowledge assets, either as users or contributors. Data collected on the number of unique daily users of the repository indicate that, on average, 15 % to 20% of staff members interact with these codified knowledge assets on a daily basis.

9. Conclusion

There is a general view that tacit and explicit knowledge complement each other, in a way that enhances both, through the action of knowledge conversion. There is also a general view that knowledge conversion is enabled by the application of an effective knowledge management life cycle model in conjunction with a clearly defined knowledge architecture. Building on this, knowledge architectures based on value-chain or process-oriented views of an organisation have the advantages that they:

- are focussed on the needs of knowledge users and contributors
- scope knowledge coverage in a relevant and logically-structured way
- comply and connect with society and industry metadata standards (DCMI, AGLS, PCF)
- align with, and complement and support, continuous improvement activity (Quality Management, Kaizen, Lean, Six-Sigma, etc.)

Within this context, the lack of clearly defined ‘knowledge units’ for codified knowledge assets represents a serious impediment to knowledge conversion, particularly for knowledge assets made available and managed via computer networks. This impediment can be overcome by packaging organisational knowledge in ‘topics’ in a similar way to that applied to technical knowledge using the DITA* philosophy and approach. This also has the advantage that it creates a 'knowledge currency' that can be exchanged in an open and creative way, contrary to the restrictive 'machine' mentality (Nonaka 1995) that often still persists.

References:

Evans M. Dalkir K. and Bidian C. "A Holistic View of the Knowledge Life Cycle: The Knowledge Management Cycle (KMC) Model" The Electronic Journal of Knowledge Management Volume 12 Issue 2 2014 pp 85-97

Nonaka I. and Takeuchi H. "The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation" Oxford University Press 1995

Nonaka I. and von Krogh G. "Tacit Knowledge and Knowledge Conversion: Controversy and Advancement in Organizational Knowledge Theory" Organization Science Vol 20 No 3 May – Jun 2009 pp 635-652

Zack, Michael H. "Managing Codified Knowledge" Sloan Management Review Summer 1999

Schiuma G. and Carlucci D. "The Knowledge-Based Foundations of Organisational Performance Improvements: an Action Research Approach" Electronic Journal of Knowledge Management Volume 8 Issue 3 2010 pp 333 - 344

Scarso E. and Bolisani E. "Knowledge-Based Strategies for Knowledge Intensive Business Services: a Multiple Case-study of Computer Service Companies" Electronic Journal of Knowledge Management Volume 8 Issue 1 2010 pp 151 – 160

Grover V. and Davenport T. "General Perspectives on Knowledge Management: Fostering a Research Agenda" Journal of Management Information Systems Vol. 18 No. 1 Summer 2001) pp 5-21

CIDM eNews 07 17, 2017 Publishing Trends (Comtech and DCL fifth annual publishing trends survey)

Fine, Charles H. "Rapid-Response Capability in Value-Chain Design" Sloan Management Review Winter 2002

Garvin, David A. "The Processes of Organization and Management" Sloan Management Review Summer 1998

Rees, S. J. and Protheroe, H. "Value, Kaizen and Knowledge Management: Developing a Knowledge Management Strategy for Southampton Solent University" The Electronic Journal of Knowledge Management Volume 7 Issue 1 2009, pp. 135 - 144

Imai, M "Kaizen: The Key to Japan's Competitive Success" McGraw-Hill 1986

O'Neill-Cooper L. "The Principal Synergist: Combating Confusion in Knowledge Management" 'Information Systems Development: Theory, Methods and Practice', Proceedings of the Tenth Annual Conference on Information Systems Development, Kluwer Academic, New York, August 16-19, 2001 pp619 – 631, 2001

*DITA topic definition https://docs.oasis-open.org/dita/v1.0/archspec/topicover.html

*DCMI (Dublin Core Metadata Initiative) http://www.dublincore.org

*AGLS (Australian Government Locator Service) http://www.agls.gov.au/agls

*APQC (American Productivity and Quality Council) http://www.apqc.org/

*PCF (Process Control Framework) https://www.apqc.org/pcf