# Knowledge Management Models

A compilation of various Knowledge Management Models in practice.

### CSC 546 : Management & Decision Control Systems

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## Purpose

The Knowledge Insight Model and the PDCA cycle are the most significant parts of the curriculum for our Management & Decision Control Systems course. Both these are extremely useful tools to analyze and understand a given problem and arrive at a definite solution.

The PDCA cycle discusses how to get from a “problem faced” situation to a “problem solved” situation. The Knowledge Insight Model(KIM) is a model to manage knowledge as efficiently and effectively as possible.

This paper explores other popular knowledge management models, their structure and format. The paper presents brief descriptions of the 10 models stated above to initiate familiarity with knowledge models apart from the KIM.
**SECI Model**

The SECI Model is a model of the knowledge creating process to understand the dynamic nature of knowledge creation, and to manage such a process effectively.

The SECI Model consists of 3 elements:

1. **SECI**
2. **Ba**
3. **Knowledge Assets**

These three elements interact with each other organically and dynamically. The Knowledge assets of an organization are mobilized and shared in ‘Ba’ and the tacit knowledge held by individuals is converted and amplified by the spiral knowledge through SECI. [1][2]

This model mainly focuses on the fact that knowledge creation is a spiraling process of interactions between explicit and tacit knowledge. [3]

**Tacit knowledge** is something that falls into the category of insights, intuitions and hunches. It is deeply connected to the emotions and feelings of a person and his/her experiences and actions. Because of this personal quality, it is hard to formalize tacit knowledge.

**Explicit knowledge** can be thought of as a form of codified knowledge that can be formalized as discrete or ‘digital’. This kind of knowledge can be captured in record and expressed in words and numbers, it can be formulated or presented as scientific data. It is easy to transmit explicit knowledge.

As per the SECI knowledge model there are 4 kinds of knowledge creating processes.

- **Socialization**
  This process focuses on TACIT to TACIT knowledge linking. Tacit knowledge goes beyond the boundary and new knowledge is created by using the process of interactions, observing, discussing, analyzing, and spending time in the same environment.

- **Externalization**
  Developing concepts which embed the combined tacit knowledge. This process focuses on tacit to explicit knowledge linking and we can say that the knowledge is crystallized at this point.

- **Combination**
  Combination of various elements of explicit knowledge to build a prototype.

- **Internalization**
  Here the explicit knowledge created using the tacit knowledge is shared across the organization. When knowledge is shared, the organization can innovate and learn.

**BA** is a concept where the knowledge is created, utilized and shared through interaction.

**Knowledge Assets** are the company specific resources that are indispensable to create values for the firm. They are inputs, outputs and moderating factors of the knowledge-creating process.

To effectively manage knowledge creation and exploitation, a company has to map its inventory of knowledge assets. Cataloguing is however not enough: knowledge assets are dynamic; new knowledge assets can be created from existing knowledge assets.
The Capability Maturity Model

An organizational model that describes 5 evolutionary stages (levels) in which processes in an organization are managed.

This model was originally developed for software development and talks about an organization being able to absorb and carry its software applications and the steps and activities for an organization to progress from one level to another.[4] The model was initially funded through military research to create an abstract model for the military to use an objective evaluation of software subcontractors.

There are 5 levels defined in the CMM and, according to the SEI: "Predictability, effectiveness, and control of an organization's software processes are believed to improve as the organization moves up these five levels.[5]"

- **Level 1 - Initial/Ad hoc (Chaotic)** Processes at this stage are typically undocumented stage and dynamic in mature. This could correspond to information in the tacit form. They are uncontrolled and reactive and create an unstable environment.

- **Level 2 - Repeatable** Processes in this state are repeatable with consistent results. Processes now have a level of discipline to stick to.

- **Level 3 - Defined** All processes at this level are well documented, defined, standardized, and integrated into each other. At this level process performance consistency can be established in an organization.

- **Level 4 - Managed** Processes at this level are managed by collecting detailed data on the processes and their quality. In particular, management can identify ways to adjust and adapt the process to particular projects without measurable losses of quality or deviations from specifications. Process Capability is established from this level.

- **Level 5 - Optimizing** This is a continuous process of improvement and is made in place by quantitative feedback and from piloting new ideas and technologies.

Though this model refers to management of processes in an organization, it can be easily adopted to manage knowledge. The 5 levels stated above are analogous to knowledge too as we can think of knowledge evolving from a dynamic unstable version to a more well defined structure. Further, this knowledge can be refined and optimized by bringing in new ideas and technologies.
Business Intelligence Model

Aims at making better business decisions through the use of a broad category of Management Information Systems to manage data.

Business intelligence (BI) refers to skills, technologies, applications and practices used to help a business acquire a better understanding of its commercial context. Business intelligence may also refer to the collected information itself. Business intelligence often aims to support better business decision-making. Thus a BI system can be called decision support system (DSS).[6] BI uses timely and accurate information to make decisions.

With a business intelligence system, a company can expect to find improved turnaround times on data collection, ideas for new business initiatives, a much more precise picture of customer needs and desires, and a strong understanding of how best to compete with top competitors. The improvement in business agility that comes with business intelligence is substantial in most cases, and allows a company to take better advantage of constantly evolving market conditions.[7]

BI applications mainly consist of systems for monitoring, gathering information, reporting, analysis and profiling. BI plays a very strategic role in the planning process of an organization. Key characteristics of Business Intelligence systems include:

- Interdepartmental focus and their general overview towards business performance
- Advanced technology to mine data
- Data discovery in an optimal manner
- Various forms of business improvement are tied together to facilitate quick and easy communication between different different departments.

Businesses that are run on the BI model consider covert information gathering as a healthy part of the business intelligence program.

Atos Origin, an international information technology services company precisely describes the importance and necessity of information and its management for any company as “Information is the lifeblood that fuels that creativity. Information on the outside world, information on the competition and information on the current performance of your own organization. A strategy needs to be defined, deployed and translated into mid term plans and executable actions. These plans need to be confirmed and adjusted by rolling forecasts. The actual performance needs to be measured and compared to the progress of plans. The organization need to learn from what is happening in order improve the quality, speed and reliability of the next planning cycle.”[8]

The figure to the left depicts the business intelligence model for the flow of information in a knowledge creating company. If we closely look, the Bi model is an unrolled version of the PDCA cycle. Collect Data corresponds to Plan, Present and Interpret Data correspond to Do, Verify Data corresponds to Check and Distribute Data and Act correspond to the Act stage of the PDCA cycle. In this context the PDCA cycle can be thought of as a better model as the loopback brings in opportunities of refinement of knowledge. This depicts the advantages of spiral models over waterfall type models.
**Johari Window**

Helps us understand how we are giving and receiving information.

The Johari Window can help improve and illustrate self awareness between an individual and a team.[10] It can also be used to change group dynamics within a business context. The Johari Window is commonly used in corporate settings as a corporate exercise. Communication plays a vital role in the success of any organization. Every Leader/Manager must create an environment that engenders trust and mutual sharing of information[9]. The Johari Window is an information processing model that can be represented in a 2 by 2 matrix form. This models employs the interactions between two sources of information, the Self and the others. The 2 by 2 matrix represents the interpersonal space and each region in the matrix corresponds to a particular information processing element.

This model represents information in the form of feelings, feedback, experience, views, attitudes, skills, motivations etc. within or about a person in the relation to their group. The four quadrants are described as follows:

- **Arena**: The Arena quadrant refers to the space that is devoted to mutual understanding or shared information. This known by the self - known by others facet of the relationship is thought to control interpersonal productivity. The assumption is that productivity and interpersonal effectiveness are directly related to the amount of mutually-held information. Therefore, the larger the arena becomes, the more rewarding, effective, and productive the relationship is apt to be.[9]

- **Blindspot**: This quadrant depicts information that is unknown to self but known by others. We can view this information as similar to Explicit knowledge of the SECI Model. Another way of putting it would be external information that is internally unknown.

- **Facade**: The facade quadrant refers to information is known to the self but externally unknown. This is analogous to a company’s personal information store like trade secrets etc. that are unknown to the external. In knowledge management we can also view information in the “facade” quadrant to information related to innovation and discovery in the company.

- **Unknown**: The unknown quadrant refers to undefined information. This information has unknown potential to effect the rest of the information in the Johari Window. Information from the unknown quadrant can flow to facade, arena or blindspot depending on the location and context of discovery and its flow to each quadrant can have different effects on the model.

A client-company interpretation of the Johari Window[11] can be summed up as:

- **Public information** is available and commonly understood by both parties.
- **Private information** is known by the client but not communicated to the design team.
- **Blind information** is known by the design team and not communicated to or understood by the client.
- **Unknown information** is not available to any of the parties.
Bridging Epistemologies

This model shows that most of the organizational knowledge is based on the understanding of the nature of that knowledge.

The authors of this model believe that most of the work on organizational knowledge and knowledge-creating organizations, is based on a single traditional understanding of the nature of knowledge. The knowledge that people possess is treated like the “epistemology of possession”. Knowing as action calls for an “epistemology of practice”. Here we can draw parallels with Tacit and Explicit knowledge and Individual and Group knowledge. The authors identify 4 types of knowledge, tacit and explicit at the individual and collective levels and consider their bridging by the active process of knowing[12].

The process by which different knowledge types are used in practice are referred to as “generative dance” and knowledge creation does not just mean maintaining an inventory of these knowledge elements(possession) but also how knowledge can be used as a tool(action).

Let us consider a simple bakery example to illustrate true knowledge creation.

- Knowledge of concepts - Knowing the recipe to make bread.
- Skills - Ability to make the bread(execute).
- Stories - How things were built up. Past records of the method to make bread.
- Genre - the context of “bakery”. A context of a railway station wouldn’t fit!

It is clear from this simple example that all the 4 qualities are needed to successfully make bread. Here we see that, knowledge as action is knowledge in the true sense. A new employee, for example would not be able to make bread if the company(bakery) does not provide him knowledge in all these forms. Hence we can look at a scenario that management of knowledge is critical to a company’s success.

An excerpt from the abstract of “Bridging Epistemologies: The Generative Dance between Organizational Knowledge and Organizational Knowing” by Scott DN Cook and John S Brown is presented below

Organizations are better understood if explicit, tacit, individual and group knowledge are treated as four distinct and coequal forms of knowledge (each doing work the others cannot), and if knowledge and knowing are seen as mutually enabling (not competing). We hold that knowledge is a tool of knowing, that knowing is an aspect of our interaction with the social and physical world, and that the interplay of knowledge and knowing can generate new knowledge and new ways of knowing. We believe this generative dance between knowledge and knowing is a powerful source of organizational innovation. Harnessing this innovation calls for organizational and technological infrastructures that support the interplay of knowledge and knowing. Ultimately, these concepts make possible a more robust framing of such epistemologically-centered concerns as core competencies, the management of intellectual capital, etc. We explore these views through three brief case studies drawn from recent research.[13]
The Three Worlds of Knowledge

Karl Popper introduced a concept called Objective Knowledge and in it he defined the ideas of three ontological worlds or domains.

1. The world of material objects, processes and events including physical and biological entities (W1)
2. The world of mental objects, events and processes or a psychological world of beliefs (W2)
3. The world of the products of the human mind (W3)

This model was developed by Popper to help him solve the mind-body problem and also understand the interactions between the physical, the mental and the manifestations of the human mind. For this, he clearly distinguished between subjective (tacit) and objective (explicit) knowledge. Mark Elroy and Joe Firestone have interpreted Karl Popper’s work in the world of Knowledge Management. Their work makes explicit that:

Knowledge is a tested, evaluated and surviving structure of information (e.g., DNA instructions, synaptic structures, beliefs, or claims) that is developed by a living system to help itself solve problems and which may help it to adapt. [14]

The interpretation of the three worlds now follows as:

1. **W1**: tested, evaluated, and surviving structures of information in physical systems that may allow them to adapt to their environment (e.g., genetic and synaptic knowledge composed of biological structures used in developmental and learning processes)

2. **W2**: tested, evaluated, and surviving beliefs and belief predispositions (in minds) about the world (subjective, or non-sharable, mental knowledge composed of mental structures used in learning, thinking, and acting)

3. **W3**: tested, evaluated, and surviving, sharable (objective), linguistic formulations about the world (i.e., claims and meta-claims that are speech- or artifact-based or cultural knowledge used in learning, thinking, and acting).[14]

With this model, knowledge managers can identify 3 types of knowledge and can easily sort out conflicts between people who think that knowledge is exclusively biological, exclusively psychological or exclusively cultural. In order to understand the significance of Popper’s three worlds on knowledge in Knowledge Management, we need to first understand a set of assumptions that underlie KM. The assumptions can be stated as:

- A higher quality of Knowledge Management will lead to a higher quality of knowledge making and knowledge sharing.
- A higher quality of knowledge making and knowledge sharing will automatically translate to high quality knowledge being available to make individual decisions.
- High quality individual decisions are always beneficial and produce better results.

The interrelations between the 3 worlds can be defined as:

- World 1 drives and enables world 2 to exist, while world 2 tries to control and regulate world 1.
- World 2 produces world 3, while world 3 helps in the recall and the training/education/development/learning of world 2.
- World 3 describes and predicts world 1, while world 1 is the inferred logic of world 3.[15]
Pyramid to Wisdom & the DIKW Model

Zeleny[16] talks about knowledge and states that “To manage wisely implies knowing why to do something; to manage effectively implies knowing what to do; to manage efficiently implies knowing how to do it (and to ‘muddle through’ implies nothing and having ‘lots of data’ around)”. Ackoff also talks about knowledge in a similar manner. To him, the most important attribute of knowledge is the know-how. Information can always be represented in the form of an answer or a description to very basic questions like who, what, where, when and how many. He says – “The difference between data and information is their usefulness – functional, not structural”[17].

The pyramid model has been very useful as it has been able to clearly define the relationship between data, information, knowledge and understanding. Using this model managements can decide a strategy on which part of the model must be emphasized.

The knowledge pyramid has led to the foundations of one the most powerful knowledge management models known as the DIKW Model. Well known companies like BMC Software have adopted this model and treat it as a “best practices”[18] model. The DIKW model stands for Data, Knowledge, Information and Wisdom model of decision making. The DIKW Model consists of 4 levels[18].

• **Data:** This is the most basic level of the model. It consists of factual information. we can view this as raw and unprocessed or just a set of observations and measurements.

• **Information:** Some of our basic questions can be answered at this level. These questions would include what, when, where, who. At this level, data is defined and structured. The structure provided makes it possible for us to analyze the relationships and connections across the data.

• **Knowledge:** The information that has been structured and given a form lacks a meaning. It is at this level that the information transforms into knowledge. It gains an interpretation based on context. This new structure gained by knowledge puts it in a position where it can be processed. This processing can help make important business decisions like effect on he market, effect on suppliers, the impact on growth of the company etc. These questions are of the nature “how”.

• **Wisdom:** At this level, we move to a somewhat tacit level. This level incurs a sort of personal interpretation of the knowledge and lets one answer the hardest type of questions... The ones with a “why”.

Anywhere the DIKW model is mentioned, Frank Zappa’s 1979 description of knowledge follows. Heres what Frank Zappa has to say

\[
\begin{align*}
\text{Information is not knowledge,} \\
\text{Knowledge is not wisdom,} \\
\text{Wisdom is not truth,} \\
\text{Truth is not beauty,} \\
\text{Beauty is not love,} \\
\text{Love is not music,} \\
\text{and Music is THE BEST.}
\end{align*}
\]

The extent and influence of the DIKW model shows not only in companies using it but in Frank Zappa’s songs and Eliot’s poetry too! The existence of the DIKW model has been shown in T.S. Eliot’s 1934 poem “The Rock”.

\[
\begin{align*}
\text{Where is the Life we have lost in living?} \\
\text{Where is the wisdom we have lost in knowledge?} \\
\text{Where is the knowledge we have lost in information?}
\end{align*}
\]

The DIKW model “is often quoted, or used implicitly, in definitions of data, information and knowledge in the information management, information systems and knowledge management literatures, but there has been limited direct discussion of the hierarchy”.[19]
The Knowledge Life Cycle Model

The Knowledge Life Cycle Model is a relatively new model for the 1990s which talks about a new focus in Knowledge Management, **Innovation**. Joseph M. Firestone defines innovation as **Innovation is a completed knowledge process life cycle event**, beginning with knowledge production and ending in incorporation of knowledge structures within business structures. Innovation acceleration then, involves continuous decrease in cycle time of the knowledge process cycle[20].

- **Knowledge Production** produces **Validated Knowledge Claims**, **Unvalidated Knowledge Claims**, **Invalidated Knowledge Claims**, and information about the status of these.
- **Organizational Knowledge** consists of all the results of this knowledge production. It is this that gets integrated into the organization in the Knowledge Integration phase.
- **The Knowledge Integration phase** now produces the **Distributed Organizational Knowledge Base (DOKB)**. DOKB has a big impact on organizational structures like business processes and information systems.

### Knowledge Production

A number of factors impact Knowledge Production and they include information acquisition and individual and group learnings. These set a foundation to “knowledge claims” that produce Codified Knowledge Claims (CKCs). Not presented in the above figure, these CKCs are tested and validated in validation subprocesses. The result of the validation is the production of Organizational Knowledge (OK). Individual and group learning involves knowledge production from the perspectives of individuals and groups. However, the organization may not consider this as knowledge and it may be treated as sheer information. This information needs to be processed/validated before it can be termed a knowledge, or specifically Organizational Knowledge. Information may also be acquired from external sources or parties in additional to individuals and groups within the organization.

### Knowledge Integration

The organizational knowledge produced in the knowledge production phase needs to be integrated into the enterprise. The methods used for integration include broadcasting (through emails), searching/retrieving (company documents, wikis), teaching (training sessions, mentoring programs) and sharing (knowledge transfers) subprocesses. The subprocesses can all be done in parallel and have no dependency on one another. Also, from the examples it is clear that each of these subprocesses can be done electronically or non-electronically (for example, person interaction). The subprocesses are important from the perspective of Knowledge Management but any one of these are not critical. One or all of the subprocesses may be employed within an organization.
The Knowledge Management Method

A framework that can be used for learning, capturing, sharing and exploiting knowledge and experience.

Chris Collison and Geoff Parcell state that knowledge management is an oxymoron. According to them knowledge is something that resides in the minds of individuals and is not something that can be controlled or managed. Instead, the environment in which this knowledge exists can be managed. The environment can be defined as a setting where the knowledge is created, discovered, captured, shared, distilled, validated, transferred, adopted, adapted and applied[21]. The key prerequisites to a solid environment for knowledge creation must have:

1. A reliable infrastructure and an entrepreneurial company (the right **Conditions**).
2. A common model and efficient tools to process the knowledge (the right **Means**).
3. An active group of knowledge sharers and knowledge users (the right **Actions**).
4. Role models to inspire learning and sharing (the right **Leadership**).

- Individuals and groups or teams agree on a set of goals that need to be achieved. Then they work towards the target and create value.
- Using knowledge is very important. Individual and groups must be inspired to use the knowledge before, after and during any target activity. Using can be defined in post project retrospection, ongoing usage and pre project knowledge transfers. This helps create new knowledge that would otherwise have only remained in the minds of individuals.
- All the knowledge that is gathered needs to be present in some form of knowledge bank. Before a task, knowledge can be retrieved and after the task new knowledge can be added. The interaction with this knowledge bank is continual.
- However, the knowledge in this bank needs to be captured and distilled. People must be encouraged to continuously add to the knowledge bank so that their insights and experiences can serve others beneficially.
- The Environment of Culture within the organization surrounds the model. The environment plays a key role in sustaining knowledge sharing. This translates into good leadership in the organization so that the process of knowledge sharing becomes somewhat unconscious and not explicit.
Six Knows Knowledge Model

This is one of the simplest knowledge management model. This model finds similarities in the DIKW model and the questions it tries to answer. The model is quite self expressive as shown below.

- **Know What**

  Know what knowledge is the knowledge about how to find data that is relevant enough to produce information. This is very crucial to a knowledge manager as the wealth of information available today makes it hard to find the right information that can be beneficial to the company. hence this dimension represents a real challenge because discovering where new knowledge resides, internal to and external to the enterprise, is very crucial to success.

- **Know How**

  The “know how” knowledge is more tacit in nature. By tacit, it means that know how generally depends on the skills of an individual and is more person to an individual. Know how knowledge provides an insight and allows an individual to interpret and give meaning to emerging complexity and predict certain outcomes. Know how knowledge is present in the social interaction of members of a team and without it teams cannot operate effectively. The very nature of know how knowledge being tacit and not codified presents an challenge to the knowledge manager for its discovery.

- **Know why**

  Know why knowledge can be both tacit and explicit. It defines knowledge that is used to explain natural and social phenomena. This form of knowledge is more explanatory and deals with principles. [22]

- **Know who**

  Know who knowledge is a form of individual and social knowledge that is largely tacit. It involves information about the gatekeepers to ‘know what’, the owners of ‘know how’ knowledge, and the possessors of ‘know why’ knowledge. Know who knowledge also deals with the ability to cooperate effectively with different types of people and experts, and is a fundamental precondition for the learning organization. It is learnt in both formal and informal social practice, in specialized education environments, and with day-to-day dealings with colleagues, customers, and competitors. It follows therefore that for a knowledge management initiative to succeed it is essential that ‘know who’ knowledge is tapped[22].

- **Know when and Know where**

  Know when and know where knowledge are more important from the economic perspective. They provide information about the market.
References

- [17] Is the Pyramid to Wisdom Model Useful? http://www.durantlaw.info/Pyramid+to+Wisdom
- [22] The Six Knows Knowledge Model http://www.durantlaw.info/Six+Knows
Acknowledgements

This paper is a compilation of 10 knowledge management models that I found interesting. This is a part of my portfolio for the “Management & Decision Control Systems” class that I am taking under Dr. Thomas L. Honeycutt. This document is merely a compilation to facilitate familiarity with popular models of knowledge management and done to fulfill the requirements of my course, in addition to my curiosity of course! Thanks to Dr. Honeycutt for allowing me go ahead with the idea and guiding me through with suggestions and encouragement. Some resources that I have heavily relied on for this work are:

- Graham Durant Law’s “Knowledge Matters” (http://www.durantlaw.info)
- Knowledge and Intangibles Management. Methods, Models and Theories(http://www.12manage.com/i_ki.html)

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