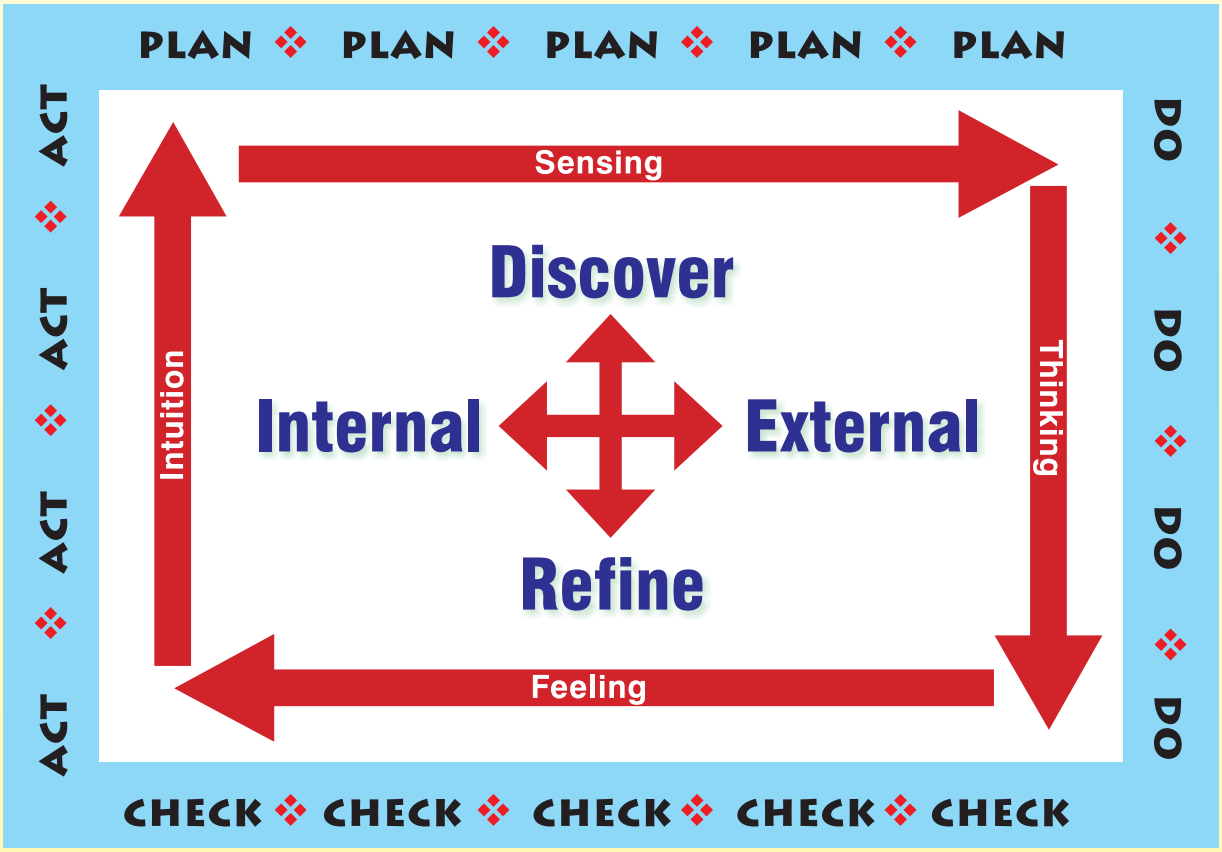
Knowledge Enabling Organon

knowledge executive officer



All the information provided in this book is presented using the following pattern format:

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"With everything else dropping out of the competitive equation, knowledge has become the only source of long-run sustainable competitive advantage." *- Lester Thurow*

"Knowledge Management
Do I Know What I Know?
Should I Care?

IDC (International Data Corporation) estimates that Fortune 500 companies spent $12.1B in 1999 to acquire knowledge that they already possessed. These companies either didn't know they had it, or they didn't know where to find it. This figure, termed the "Knowledge Deficit", is projected to grow to over $31.5B by 2003. How much of that amount will your company contribute? Companies of all sizes are beginning to take stock of what they already know, and they're doing it through knowledge management solutions. These solutions seek to inventory knowledge and make it accessible across the organization. In this fashion, these companies hope to re-use knowledge, leverage knowledge to generate new knowledge, and realize a greater return on the investments made in acquiring the knowledge in the first place.

Knowledge management solutions focus primarily on two types of knowledge. Explicit knowledge is the knowledge that is easily recorded, and resides in reports, analyses, archived e-mail and other documents. Tacit knowledge, by contrast, is the experiential, subjective and personal knowledge that is accumulated in the process of doing one's job. IDC, The Delphi Group, and most observers of the knowledge management industry now consider an organization's tacit knowledge as the repository of its most strategically valuable knowledge, and one of its greatest sources of competitive enhancement."

– Computerworld.com

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Foreward

The optimal knowledge-sharing process continues to add value to the individual as well as the enterprise knowledge base.

In this book we will study the different ways to approach the concept of knowledge management and what it means in the context of a large commercial organization. The concept of knowledge as an asset that should be managed as explicitly as any other key asset is central. KM is based on the premise that knowledge is power—power to manage innovation and to improve decision making through out the enterprise. Some of the more technical contributions in KM are about the variety of technological support tools which can assist in the flow, utilization and renewal of knowledge within an organization; these include, but are not limited to, group ware, hypermedia, expert systems, data mining, information filtering, adaptive work flow systems etc. The major technical KM concept focuses on codification of knowledge. On the other hand, the major human KM concept focuses on personalization of knowledge without increasing the natural tendency for knowledge-hoarding. The optimal knowledge-sharing process continues to add value to the individual as well as the enterprise knowledge base.

The content of this book describes frameworks for managing knowledge. A key requirement is, not surprisingly, the development of a knowledge management strategy which integrates human and organizational factors with technological solutions. Such factors include culture, incentives, information access, empowerment, knowledge sharing, information standards, control etc.

The University community is defined as an "open information" environment—one where knowledge is open to the public. Our business is to discover knowledge, to learn from our knowledge breakthroughs, to rationalize and share knowledge by teaching it to our students, and to transfer mature knowledge to the public domain. Therefore, if KM is the key managerial issue of the next few decades in the work place, does it stand to reason that a successful KM strategy at the University level may well be the necessary and sufficient strategy for all?

The full nature of our book is directed to answer the above question. The mission of the research university is three fold: Research, Teaching, and Public Service. The four fundamental knowledge patterns of our book address each of the missions from various directions:

The Maker — Research ➠ to discover

The Sharer — Teaching ➠ to learn, to rationalize

The Finder — Public Service ➠ to transfer

The Framer — Knowledge Is Our Business ➠ to manage

– Dr. Thomas L Honeycutt

Introduction

The knowledgeable can create an illusion of magic to the eye and/or understanding of the non-knowledgeable. If the latter can "crack the code", break down the combination of knowledge nuggets needed to create and understand the illusion, the magic aspect disappears.

Knowledge management provides the vehicle to link various knowledge nuggets necessary to create the magic illusion. Thus, effective knowledge management can lead to results that appear magical.

Pattern: Magic Illusion

Inspirational Quotes:

"That a frequent goal (of magic) was the creation of some illusion must not be taken to indicate magic's falsity or impotence, for illusions operated as a very real and powerful part of human life." – *Bert Hansen, 1986*

"Thomas Aquinas, writing in the 13th century, held that demons were capable of much but they could not effect transformations such as raising the dead, turning people into toads, or spinning straw into gold; they could, however, cause the appearance of such things by skillful use of their extensive scientific knowledge of the natural properties of things." – *Hopkin, 1940 (from Hansen, 1986)*

"Everything done by skilled men in imitating nature or helping it by unknown art is called magical work, not only by vulgar crowds but by all men in general.. […] Since the art was not understood, all this was called magic. Later all this became ordinary knowledge." – *Tommaso Campanella, 17th century (from Hansen, 1986)*

Pattern Name:

Magic Illusion

Aliases:

Pattern magic
Pattern generated illusions, illusion generating patterns

Context:

The world that surrounds us is made up of numerous and diverse components that co-exist and interact creating processes and systems. The dynamics, chaos and complexity of this world are so overwhelming that the outcomes often appear magical.

Problem:

To the ordinary observer, creativity generating innovations and/or solutions to complex problems seem to come about as a result of magic. How can the illusion behind this magic be understood and "tamed"?

Forces:

- In his book on "questioning the essence of mind and pattern", scientist Hofstadter (1985) shares his experience of analyzing the pattern, poetry and power of Chopin's music, which he considers magical. According to him, the only possible source of that magic is some kind of complexity, a patterned complexity, which can be looked at two ways. One way involves human perception and its capacity to "integrate a huge set of independent elements and 'hear' only a single quality". The other way focuses on "the incredible skill of a pianist who can play so many notes so quickly that they all blur into one shimmering mass, a 'co-hear-ent' totality". Therefore, the illusion depends on the spectators limited capacity/perception and/or the performers extraordinary skills/talents.

- DeBono claims patterning systems are at the root of the way the mind works to understand things. "The mind functions because it is a pattern creating and pattern using system" (DeBono, 1982). "The mind works to make sense out of confusion and uncertainty. The mind works to recognize familiar patterns in the outside world" (DeBono, 1994). A pattern involves items of information that "hang together", are recognizable and repeatable, and so give expectancy. DeBono concludes that, consequently, if the patterning system of the mind is acknowledged and understood, "creativity changes from mysterious magic to predictable process" (DeBono, 1982).

Solution:

Patterns are the solution to understanding the illusion behind magic.

"Phenomena perceived to be magical are always the outcome of complex patterns of non-magical activities taking place at a level below perception. More succinctly: the magic behind magic is pattern. The magic of life itself is a perfect example, emerging as it does out of patterned but lifeless activities at the molecular level. The magic of music emerges from complex non-magical … patterns of notes". (Hofstadter, 1985)

The illusion behind magic depends on the audience's lack of understanding or knowledge. This knowledge is encrypted in a multitude of finite nuggets, which can be combined in an infinite manner to create outcomes with various degrees of complexity and thus magical appearance.

In order to tame this illusion, patterns of knowledge nuggets have to be identified, recorded, archived and distributed to the appropriate audience. Knowledge management can capture and/or facilitate the "magic" behind creative or problem-solving processes by managing knowledge nuggets, encapsulated in pattern format, required to understand these processes and break the illusion.

Metaphors:

1. An athlete in action "makes it look easy" (as if by magic)—but it's not easy; it's incredibly difficult and complex. The average untrained spectator will see only the beauty and poser of the final performance. The coach and other professionals athletes will decompose the movement, understand and analyze each fragment, and evaluate the final performance by the value of each fragment and their overall coordination. They will know the amount of training and effort that goes in every single fragment and the mastering of the complete combination of these fragments.
2. The way a modern-day computer works—without making mistakes—seems to be "magic" to the uninitiated. However, to a computer science engineer or programmer who is aware of all the hardware and software components that go into building and running a computer, it is just a complex system at work.
3. How a big, heavy 747 can fly is a magical mystery even to some engineers. Those who grasp the laws of nature, physics, dynamics, statics, mechanics, etc. can put

together all the different knowledge nuggets that help understand how this phenomenon is possible.

Examples:

Biology, chemistry and physics

Grady Booch (1996), an object-oriented software expert, confirms the study of patterns is not unique to architecture. Indeed, the importance of patterns has long been recognized in other technical disciplines such as biology, chemistry and physics. "For example, Herbert Simon, in his study of complexity, observed that 'hierarchic systems are usually composed of only a few different kinds of subsystems in various combinations and arrangements.' In other words, complex systems have common patterns. These patterns may involve the reuse of small components, such as the cells found in both plants and animals, or of larger structures, such as vascular systems, also found in both plants and animals. In his classic work, *The Sciences of the Artificial*, Simon went on to illustrate how these patterns manifest themselves in social and biological systems, and how the existence of such patterns help to simplify their inherent complexity" (Booch, 1996).

Geometry and art

Roger Penrose, a professor of mathematics at the University of Oxford in England, pursues an active interest in recreational math, which he shared with his father. He is fascinated with a field of geometry known as tessellation, the covering of a surface with tiles of prescribed shapes.

Penrose received his Ph.D. at Cambridge in algebraic geometry. While there, he began playing around with what appears to be a somewhat frivolous geometrical puzzle. He wanted to cover a flat surface with tiles so that there were no gaps and no overlaps. There are several shapes that will do the job, regular triangles, rectangles, hexagons, and so forth. Or it can be done with combinations of shapes, resulting in a pattern that repeats regularly. Penrose began to work on the problem of whether a set of shapes could be found which would tile a surface but without generating a repeating pattern (known as quasi-symmetry). It turned out this was a problem that couldn't be solved computationally. So, armed with only a notebook and pencil, Penrose set about developing sets of tiles that produce 'quasi-periodic' patterns; at first glance the pattern seems to repeat regularly, but on closer examination you find it is not quite so.

Roger and his father are the creators of the famous Penrose staircase and the impossible triangle known as the tribar. Both of these impossible figures were used in the work of Dutch graphic artist Maurits Cornelis Escher to create structures such as a waterfall, which is preented at the end of this pattern. In this figure, the water appears to flow uphill and a building with an impossible staircase which rises or falls endlessly yet returns to the same level. The basis of the illusion is the inclusion of the impossible triangle or tri-bar, developed by Roger Penrose and his father. The triangle is placed into the picture three times. As you look at each part of the construction in the print cannot find any mistakes, but when the print is viewed as a whole you see the problem of water traveling up a flat plane, yet the water is falling and spinning a miller's wheel. How do the two towers appear

relatively the same height yet the left side rises three stories and the right two? Why did Escher choose to use underwater plant life, greatly magnified, as his choice for above watergarden? The illusion in this print, when viewed by most people, is not seen on the first look. This is the example of why Escher's work deserves that second look.

Resulting Context:

The current use of the term "pattern language" was first introduced in the field of architecture by Alexander who has written several books (1964; 1975; 1977; 1979) on the topic as it relates to urban planning, building architecture and construction. Although these books are about architecture and urban planning, they are applicable to many other disciplines, including software development. Because the structure of pattern languages is "based on general invariants, pattern languages help to understand the complexity of a wide variety of systems ranging from buildings and cities, to software and organizations" (Salingaros, 1998).

Rationale:

"Pattern languages encapsulate human experience. A creative civilization places great value on its pattern languages, which are often synonymous with its heritage — both technical and cultural.… Almost every discipline possesses a history of solutions obtained under different conditions. An invariant solution shows up under slightly different formats, while remaining basically the same pattern. A repository of these patterns forms the groundwork for any discipline. Many patterns of human relations are codified into religions, myths, or literary epics. Pattern languages are essential tools for human beings to function in, and control a complex world" (Salingaros, 1998).

Related Patterns:

KM Link
Pattern
Pattern Language

Known Uses:

Existing pattern languages have been developed to help understand the various fundamental components and dynamics of complex systems by using a series of related generic problem-solving patterns empirically proven to be successful. Patterns record existing knowledge to make it rapidly and easily accessible and communicated between different users in various fields and disciplines. Pattern languages can greatly contribute to knowledge sharing and management across organizations, industries and even countries.

In the past decade, the software community has been developing a number of patterns to define the virtual spaces it is trying to construct (Erickson et al., 1997). Patterns help think about complex problems in an "intuitive shorthand" (Booch et al., 1998) and provide a growing toolkit for solving architectural problems regardless of the nature of the space involved, whether it is real or virtual, 2D or 3D.

Figure:

Escher's Waterfall

M.C. Escher was a Dutch graphic artist, most recognized for spatial illusions, impossible buildings, repeating geometric patterns (tessellations).

M.C. Escher was born June 1898 and died March 1972. His work continues to fascinate both young and across a broad spectrum of interests. M.C.

Escher was a man studied and greatly appreciated by respected mathematicians, scientists and crystallographers yet he had no formal training in math or science. He was a humble man who considered himself neither an artist or mathematician.

Intricate repeating patterns, mathematically complex structures, spatial perspectives all require a "second look". In Escher's work what you see the first time is most certainly not all there is to see.

References:

Hansen, B. (1986, March-April).
Hopkin, (1940) - quote taken from Hansen (1986)
Hofstadter (1985)
DeBono (1982; 1994)
Booch (1996)
Alexander (1964; 1975; 1977; 1979)
Salingaros (1998)
Erickson et al. (1997)
Booch et al. (1998)

Pattern: Knowledge Management Link

Inspirational Quotes:

"Knowledge Management is the engine that transforms ideas into business value. It is the systematic process for acquiring, creating, synthesizing, sharing and using information, insights and experiences to achieve organizational goals." Andersen Consulting

Pattern Name:

Knowledge Management Link

Aliases:

Knowledge Management Grasp

Context:

In today's world, all developed countries and most developing countries must learn to evolve in a global economy that is becoming entirely knowledge based.

Problem:

To survive in this knowledge based economy, organizations need to take full advantage of all their potential knowledge assets enabling them to maximize their creativity, solve their problems and reach their goals.

Forces:

In any organization, a process involves gathering and analyzing information both internal and external to the organization, and editing ideas for successful combinations of the knowledge available and acquired. These ideas are the result of creativity.

The role of creativity is crucial in today's highly developed economies that are entering a new stage of development.

- For centuries this growth was based on increases in productivity. However, "this expansion trajectory is now perceived as unsustainable" (Andersson, 1997). Quantitative growth must be replaced by improvements in quality.
- "Wealth creating innovations ultimately substitute knowledge for energy or materials. […] Knowledge accumulates exponentially, with every innovation creating the opportunity for a greater number of innovations" (Petzinger, 2000).
- As products are becoming more varied and complex, creativity rather than productivity is becoming the key to business success and survival. In the new knowledge-based economy, Petzinger (2000) concludes that "creativity is overtaking capital as the principal elixir of growth".

Solution:

Knowledge is key to understanding the magic illusion behind creativity. Knowledge management makes use of this key to unlock the mechanism of creativity, and thus solve problems and achieve goals.

The greatest amount of research done on creativity and its quantitative assessment has been done in the field of social psychological disciplines (Kidd & Workman, 1999). Most models describe the creative process as a problem-solving system. Alexander (1977) recognized that in the architectural design process some problems occur over and over again, in a given environment with a core (generic) solution. From that observation, he was the first to develop a pattern language for a design process, where each pattern describes a problem/solution combination related to a specific context. The patterns are formulated in such a way that they can be used in different sequences and numbers, many times over without ever doing it the same way twice. Therefore the output can always be unique and new, thus defined as creative.

Existing pattern languages have been developed to help understand the various fundamental components and dynamics of complex systems by using a series of related generic problem-solving patterns empirically proven to be successful. Patterns record existing knowledge to make it rapidly and easily accessible and communicated between different users in various fields and disciplines. Pattern languages can greatly contribute to knowledge sharing and management across organizations, industries and even countries.

Knowledge management (KM) can be defined as the ongoing "process" of delivering knowledge presently available in a pattern format easily comprehended. The patterns must be open-ended to encourage creativity and innovation. By adding new knowledge nuggets and ideas, the initial knowledge may grow and change, and return to the "process" in an upgraded version. Being a continuing process, knowledge management should always be growing and improving, as in a "perfect circle/spiral, never-ending, for eternity" (Patty O'Neil, 1999).

The purpose of knowledge management should be to link and articulate knowledge nuggets to provide the pertinent knowledge required to analyze and understand a specific need, and to create at least one appropriate response or solution.

Metaphors:

1. Languages are formed by a multitude of words, which can be combined in an infinite number of sentences following grammar and syntax rules. Given the context (culture, environment, situation), different languages will be spoken. When knowledge nuggets are captured in pattern format, each pattern represents a word in a pattern language representing the entire knowledge pool available. Clusters of knowledge nuggets forming sentences can be used to address specific needs. The pattern language will follow rules specific to its use context.
2. Patterns, knowledge and creativity are inter-related, inter-dependent, forming the basic/generic assets any organization needs to survive. Like in an interwoven fabric, the tighter the weave, the stronger the fabric.

Examples:

The apparel design process involves gathering and analyzing information on fashion trends, markets, past line sales and editing ideas for successful combinations of fabric, style and price.

The research objective of my dissertation was to develop a pattern language describing the initial creative phase of the apparel design process. The patterns define the links between marketing and design knowledge, activities, constraints and resources throughout the process, in order to optimize its efficiency and effectiveness and the market success of its end-product.

Developing a pattern language specifically for textile apparel design seemed appropriate and valuable for several reasons.

- Pattern languages have primarily been developed to help guide the crucial initial creative process in the fields of architecture and software design, where an optimum end product must be developed without having the possibility of previously testing it with real scale prototypes.
- Patterns encapsulate knowledge of problem/context/solution combinations proven to be successful through time. They could help optimize the creative design process, which is difficult to control and often associated with poor rates of efficiency and effectiveness.
- A common language could be provided for the various professionals contributing to the design process, making it possible for the process to be conducted using a systematic, visible and analytical "glass box" approach as prescribed by Jones (1981).

Resulting Context:

A pattern language for any process can channel creative efforts and enhance communication between organization/team members by providing them a common language to work with.

Pattern languages today are increasingly used in the design of software and user-interface programs (Booch, 1996; Gamma et al., 1994). Setting the ground to develop a comprehensive pattern language could save time and resources to improve the quality of future customized information technology (IT) tools for the processes and organizations involved.

Industry and academic experts should continuously contribute to the necessary ongoing developments of pattern languages relevant to their specific fields, businesses and/or industries.

Rationale:

If a process is viewed as a combination of interrelated problem solving activities, a pattern language as defined by architect Christopher Alexander (1977) may prove to be

quite adequate and beneficial for modeling the dynamic structure of any process in a given system (business, organizational, operational, design & development, etc.). Encapsulating knowledge acquired through time, patterns can ensure efficient and effective transfer of this knowledge for on-going development through piecemeal growth. Since "knowledge accumulates exponentially, with every innovation creating the opportunity for a greater number of innovations" (Petzinger, 2000), use of pattern languages to manage knowledge could optimize the quality, speed and innovation potential of any system.

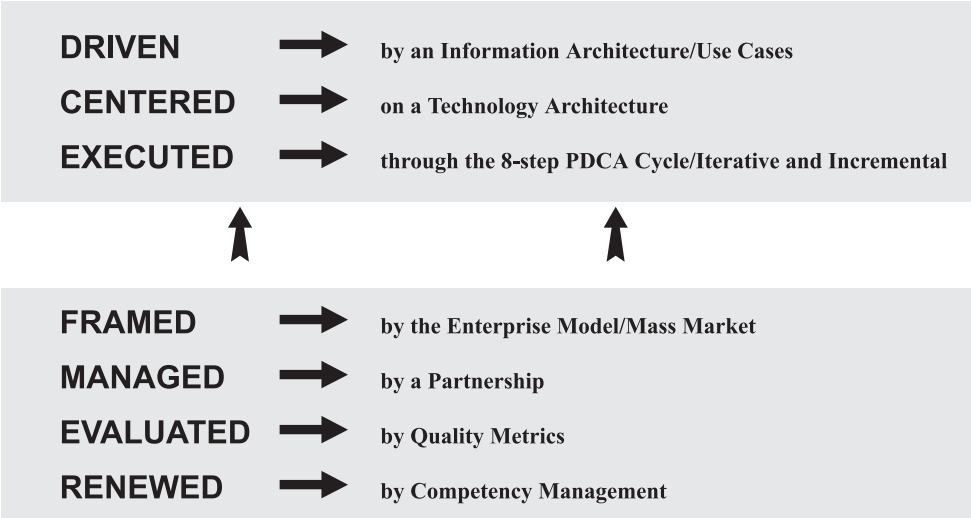
Related Patterns:

Magic Illusion
Pattern
Pattern Language

Known Uses:

Architect Christopher Alexander (1977) and four of his colleagues developed the first complete Pattern Language over a ten year period. The 253 inter-related patterns allow professionals in the field to manage knowledge from urban planing all the way down to construction passing by the various phases of building architecture and design.

Figure: Generic Process



References:

Andersson (1997)
Petzinger (2000)
Kidd & Workman (1999)
Alexander (1977)
Jones (1981)
Booch (1996)
Gamma et al., a.k.a. Gang of Four or GoF (1994)
Patty O'Neil (1999)

Pattern: KM Magic

Inspirational Quotes:

"Successful KM projects are X% technology, Y% people, and Z% magic!" –*Lisa Taylor*

"In the 13th century, Roger Bacon and Albertus Magnus, among others, began to explore a new philosophical vision of magic as applied knowledge, a view that emphasized the value of magic to humanity, de-emphasized its dependence on demons, and made magical phenomena a subject of active scientific investigation." – *Thorndike, 1923 (from Hansen, 1986)*

"This new […] approach was expressed pointedly in Albertus's remarks about the three Magi of the Christmas story: '[…] a magus is only a great man who, having knowledge of all necessary things … sometimes produces marvels or gives advance notice of them.' (1893)." – *Hansen, 1986*

Pattern Name:

KM Magic

Aliases:

The Art of Illusion

Context:

Any KM environment where the catalyst is missing to help combine elements of the KIM pattern.

Problem:

You are faced with the need to start a KM initiative or stimulate a stalled KM initiative.

Forces:

- Our technocratic profession has learned to distrust magic.
- A main component of learning is subsumption where new material is related to relevant ideas in our existing schema on a general level.
- To connect what is known and unknown.
- The need for rhythm.
- Magic simplicity works better than the laborious method.

Solution:

Knowledge Management and the Illusion of it's Inner Mechanism Knowledge

Knowledge Management(KM) is about the illusions of managing the creation and distribution of knowledge among people within a common organization with the intent of

improving the economics or survivalism of the organization. Colonies of ants or bees accomplish this task with little or no fanfare—we say it's in their nature or it's because of their primitive and instinctive programming. However, when it comes to KM, little or nothing of human nature kicks in to support the KM idea. Why? Our tendency is to horde not share knowledge among ourselves—especially in a competitive situation. The artificial life movement has shown that the simple rules of such insect colonies can lead to simulated chaos; however, the reverse of applying simple rules to chaos will not necessarily bring order or control. But with a human organization, the chances for success should be greater because we have a higher level of communication and the unique ability to learn and change. With this idea in mind a Game of KM has been developed with simple rules for types of knowledge workers to follow. The Game becomes an educational and learning tool much like an advance organizer—an instrument for acquiring and sharing knowledge called an organon. Each of the four fundamental patterns in the Game are based on the same primitive PDCA cycle.

Metaphors:

The Knowledge Game: In this game there are two knowledge generators: The Maker and The Finder. The Finder acts like a Matcher. In this game there are two knowledge facilitators: The Framer and The Sharer The Maker is a Level One player who can discover new ideas. The Finder is a Level Two player who can find an external use of an innovated idea. A Finder can become a Reverser by jumping the knowledge seam to Level One by invoking the Sharer. A Maker can become an Accelerator by jumping the knowledge seam to Level Two by invoking the Sharer. Both the Maker and the Finder are oriented by the Framer. Full Knowledge Unity can occur through various relationships:

The Ideal KM Laws:

1. Framer <—> Maker <—> Sharer —> Finder
2. Framer <—> Finder <—> Sharer —> Maker
3. Maker <—> Finder —> Sharer and Framer
4. Sharer and Framer —> (Maker <—> Finder) or (Finder <—> Maker)

Examples:

Using an Advance Organizer

Previously, we have learned that there are various components in developing the instructional strategy. There are several cognitive strategies that an instructional designer could draw upon when developing the various components of the instructional episode. We have already learned that Metaphors are bridging cognitive strategies useful in information assimilation. Advance Organizers are another form of bridging strategies. Remember that in designing the instructional episode, recall of prior knowledge relevant to the new knowledge is important. This is done before you begin presentation of the new material. Well, Advance Organizers like Metaphors could be used to make a strong connection and

transition from the prior learned material into the new material to be presented. In this unit, we will define the characteristics of the Advance Organizer.

Using the Keyword Method

ASSURE is an acronym utilizing the keyword method to aid recall of the various components of a classroom oriented instructional design model developed by Heinich, Molenda & Russel (1989) .

A Analyze Learners
S State Objectives
S Select Media and Materials
U Utilize Materials
E Evaluation /Review

Resulting Context:

KMAOs are introduced in advance of learning itself, and are also presented at a higher level of abstraction, generality, and inclusiveness. Since the substantive content of a given organizer or series of organizers is selected on the basis of its suitability for explaining, integrating, and interrelating the material they precede, this strategy simultaneously satisfies the substantive as well as the programming criteria for enhancing the organization's strength of cognitive structure.

Rationale:

Related Patterns:

Magic Illusion
KM Link
PDCA Cycle
KMI
Framer
Maker
Sharer
Finder
KMAO

Known Uses:

Figure:

References:

Ausubel, D. (1968)
Ausubel, D.P. and Fitzgerald, D. (1962)

Fundamental Concepts and Models

Patterns provide a format to record knowledge nuggets. This format invites the reader and writer to fundamentally understand, define, and reflect upon the knowledge described. Because patterns relate to one another through common contexts and forces, they can be grouped into knowledge clusters that can address larger issues. These groupings of patterns into "sentences" provide a language that can communicate knowledge from writer to user and reader.

Just as any action/task/decision/problem solving requires relevant necessary knowledge, it's efficient and effective outcome depends on the completion of a full and successful Plan-Do-Check-Act (PDCA) cycle. If PDCA becomes an inherent model of thinking and acting, knowledge can be managed to its fullest potential to address any issue/situation.

Pattern: Pattern

Inspirational Quotes:

"Each pattern describes a problem, which occurs over and over again, in a given environment, with a core, generic solution, in such a way that it can be used a million times over without ever doing it the same way twice. Each solution is stated in a way that it gives the essential field of relationships needed to solve the problem, but in a very general and abstract way - so that you can solve the problem for yourself, in your own way, by adapting it to your preferences, and the local conditions at the place where you are making it." *–Alexander, 1977*

"Patterns help bring order out of chaos by identifying what is constant and recognizable in the midst of […] incessant change. […] Patterns represent distilled experience, which, through their assimilation, convey expert insight and knowledge […]." *–Appleton, 1997*

Pattern Name:

Pattern

Aliases:

Problem solving tool
Reuse of expertise
Reusable knowledge
Codified knowledge

Context:

You are an experienced practitioner in your field. You have noticed that you keep using a certain solution to a commonly occurring problem. You would like to share your experience with others.

Problem:

How do you share a recurring solution to a problem with others so that it may be reused?

Forces:

- Keeping the solution to yourself doesn't require any effort.
- Sharing the solution verbally helps a few others but won't make a big impact in your field.
- Writing down your understanding of the solution is hard work and requires much reflection on how you solve the problem.
- Transforming your specific solution into a more widely applicable solution is difficult.
- People are unlikely to use a solution if you don't explain the reasons for using it.

- Writing down the solution may compromise your competitive advantage (either personal or corporate.)

Solution:

Write down the solution using the pattern form shown in the Figure section of this pattern.

Each pattern is a three-part rule expressing a relation between "a certain context, a certain system of forces which occurs repeatedly in that context giving rise to a certain problem, and a solution which allows these forces to resolve themselves." (Alexander, 1979)

Therefore, you should capture not only the problem and the solution, but also the context in which the problem occurs and the forces appearing in this context, as well as the context resulting from applying the solution and the reasons why the solution is applicable.

Patterns are living things. They change as more is learned about the problem, the context, the forces and the solution. They evolve with the environment. Distribute the resulting pattern to the largest audience you feel it could help that does not compromise your competitive advantage.

Metaphors:

Wallpaper

Wallpaper is generally designed and constructed as a repeated pattern, with a small, sometimes intricate design to start off with, but then repeated. So that upon initial examination of the wallpaper, the design appears complex. But upon further, more detailed examination it can be seen that the whole thing is made up of just one basic design, repeated over and over. For example, consider a wallpaper that has four individual flowers of varying shapes, connected by a curvy stem running through each of them. But then that same group of four flowers is repeated and connected to the first set of four flowers, and the pattern repeats—the overall effect is one of seeming complexity until you break it down and see the pattern—then you understand the design.

Dressmaker

"Just as a dressmaker tailors a pattern to an individual customer, and perhaps to a specific event where the dress is to be worn, so designers must be creative when using patterns. Patterns channel creativity; they neither replace nor constrain it." (Appleton, 1997)

Examples:

The 15 patterns included in this book.

Resulting Context:

Patterns **relate** to one another; they can be used in combination forming a language.

Pattern: Pattern

Rationale:

A pattern "is both a process and a thing" (Alexander). The pattern foreshadows the product: it is the rule for making the thing, and in many respects it is the thing itself (Coplien). Apparel patterns are a good example: they guide the user in making the product and if stitched together they could actually give an idea of the final product, even though some of the characteristics such as color, feel and drape of the fabric would not appear.

Related Patterns:

Magic Illusion
KM Link
Pattern Language
PDCA Cycle
KIM
Framer
Sharer
Finder
Maker

Known Uses:

GoF Design patterns

The constraints imposed on software development teams include a full understanding of the complexities of both the customer and end-user requirements. These complexities can stem from a variety of sources such as the nature of the applications, the distributed and heterogeneous environments, the size of programs, the organization of teams, and the end-users expectations, which all have to be taken into consideration and combined most efficiently and effectively. To overcome these challenges, they must not only learn their job, but also be able to explain their work to others as well as to understand others' work. "Glass-box" design as defined by Jones (1981) is imperative in the field of software design.

For this reason, Alexander's pattern language has triggered an increasing amount of interest in the software field since the 1980s. "The concept of the design pattern in software provides a key to helping developers leverage the expertise of other skilled architects" (Gamma et al., 1994). The goal of patterns within the software community is to provide a body of literature that helps software developers resolve common difficult problems encountered throughout all of software engineering and development. Software developers have a strong tendency to reuse designs that have worked well for them in the past. As they gain more experience, their repertoire of design experience grows and they become more proficient. Unfortunately, this design reuse is usually restricted to personal experience and there is usually little sharing of design knowledge among developers.

Patterns help create a shared language to communicate insight and experience about these problems and their solutions. Formally codifying these solutions and their relationships lets software developers capture the body of knowledge proven to provide an under-

standing of good architectures that meet the needs of their users. Furthermore, the construction of a common pattern language for conveying the structures and mechanisms of developed architectures allows the whole software community to intelligibly reason about them. "The primary focus is not so much on technology as it is on creating a culture to document and support sound engineering architecture and design" (Appleton, 1997). The availability of a catalog of design patterns can help both the experienced and the novice designer recognize situations in which design reuse could or should occur. "Such a collection is time-consuming to create, but it is our experience that the invested effort pays off.… The patterns community is sufficiently enthused about the prospective advantages to be gained by making this design knowledge explicit in the form of patterns, that hundreds of patterns have been written, discussed and distributed" (Beck et al., 1996).

This so-called "patterns community" met and intensified discussions on patterns at a series of annual Object-Oriented Programming, Systems, Languages and Applications (OOPSLA) workshops starting in 1991. In 1993, a small group of pattern enthusiasts formed the "Hillside Generative Patterns Group" and subsequently organized the first conference on patterns called the "Pattern Languages of Programming" (PLoP) in 1994. The success this conference and the unveiling of the "Gang-of-Four" (GoF) book (Gamma et al., 1994), which presented the first catalog of design patterns, created a surge of interest in the topic of design patterns (Beck et al., 1996). From that point on, software patterns really became popular and widely accepted (Appleton, 1997).

Due to the overwhelming acceptance of the GoF's book (Gamma et al., 1994), much of the initial pattern focus in the software community has been on design patterns. However, there are many other kinds of patterns. Patterns submitted to previous PLoP conferences have encompassed all aspects of software engineering including: user interface development, system re-engineering, reverse engineering, software process, process improvement, risk management, project planning, requirements engineering, concurrent programming, etc.

Pattern: Pattern

Figure:

Pattern Format

Required components:

Pattern Name:	meaningful, for easy referencing
Context:	pre-conditions in which problem and solution recur
Problem:	"context-free" problem definition
Forces:	often contradictory, priority set by context
Solution:	based on problem, context and forces described above
Examples:	concrete applications of the pattern
Resulting Context:	post-conditions and side-effects
Rational:	explanation of why and solution applies
Related Patterns:	common forces, compatible contexts
Known Uses:	instructional examples of application

Optional components:

Inspirational Quotes, Aliases, Metaphors, Figures and **References** are optional, however we have found that these allow the patterns to communicate to a larger number of people who may be more receptive to the pattern contents if this additional mean of communication or information is provided.

References:

Appleton (1997).
Alexander (1977)
Coplien
Jones (1981)
Gamma et al., a.k.a. Gang of Four or GoF (1994)
Beck et al. (1996)

Pattern: Pattern Language

Inspirational Quotes

"All 253 patterns form a language. They create a coherent picture of an entire region, with the power to generate such regions in a million forms, with infinite variety in all the details.… Any small sequence of patterns from this language is itself a language for a smaller part of the environment; and this small list of patterns is then capable of generating a million parks, paths, houses, workshops, or gardens" *–Alexander, 1977*

"Many of the patterns here are archetypal—so deeply rooted in the nature of things, that it seems likely that they will be part of human nature, and human action, as much in five hundred years, as they are today.… In this sense, at least part of the language we have presented here, is the archetypal core of all possible patterns languages" *–Alexander, 1977*

Pattern Name:

Pattern Language

Aliases:

Problem solving system
Reuse of expertise bank
Reusable knowledge clusters
Codified knowledge clusters

Context:

You are trying to use the "pattern form" to describe a procedure with many steps or a complex solution to a complex problem. Some of the steps may only apply in particular circumstances. There may be alternate solutions to parts of the problem depending on the circumstances. A single pattern is insufficient to deal with the complexity at hand.

Problem:

How do you describe the solution such that it is easy to digest and easy to use parts of the solution in different circumstances?

Forces:

- A single large solution may be too specific to the circumstance and impossible to reuse in other circumstances.
- A complex solution may be hard to describe in a single pattern. A "divide and conquer" approach may be necessary to make the solution tractable.
- Factoring the solution into a set of reusable steps can be very difficult. Once factored, the resulting pieces may depend on one another to make any sense.
- Other pattern languages may want to refer to parts of the solution; they require some sort of "handle" for each of the parts to be referenced.

Solution:

Factor the overall problem and its complex solution or procedure into a number of related problems with their respective solutions. Capture each problem/solution pair as a pattern within a larger pattern language. Each pattern should solve a specific problem within the shared context of the language. Strive to ensure that each pattern could conceivably be used alone or with a limited number of patterns from the language.

To give the pattern language an identity of it's own, give it an Evocative Name by which it can be known and referenced. Describe the overall problem and how the patterns work together to solve it in a Pattern Language Summary. Relate the patterns to each other using Readable References to Patterns within the pattern description, especially in the Context and Related Patterns elements.

Metaphors:

"The factoring process in mathematics operations".

Breaking a problem down into smaller parts, which can then be solved more readily, reminds one of factoring in math. For example, by using the distributive property, (ab + ac) = a(b + c). And depending on the context or circumstances, the factored form may be easier to consider or solve.

Patterns for garments

Every garment is constructed using different sets of patterns. Every pattern is graded so it can be adapted to fit the end user's dimensions.

Different combinations of patterns are used to construct different garments.

A same pattern or set of patterns used over and over again with different fabrics, details and trims will lead to different garments.

Patterns provide a standard structure. Different users should arrive at the same result if applying the patterns in the same conditions.

If an element of the pattern is modified, it may impact other elements of the pattern. These elements may also need adjustments, which in turn can effect other elements. Thus several iterations of change and adjustments may be necessary to reestablish a good pattern.

Furthermore, when constructing a garment with a set of patterns, if one pattern is altered it will impact the relations it has with the other patterns and the overall structure of the garment.

Examples:

1. KEO book
2. The pattern language written by Meszaros & Doble (1996) is itself an example of tackling the complex problem of writing patterns and pattern languages. It presents

the solution as a number of patterns each of which describe the solution to a specific smaller problem.

Resulting Context:

Each pattern follows the same **format** for easy referencing and use.

All patterns are **connected** to other patterns.

Patterns follow a general **order** within the language. Generally this order goes "from large to small patterns" across **3 embedded scales.** Examples of these scales follow**:**

- Architecture: urban planning, building architecture and construction.
- SW systems: architecture, design, and code.

Patterns record knowledge that has been acquired, refined and validated through time and experience. They represent a generic, archetypal input. However, the output of using a pattern language is individual. **Creativity** stems from the application and combination of selected patterns.

Rationale:

Alexander, the founder of the first complete Pattern Language, justified the need and relevance of a Pattern Language to deal with a complex problem/project composed of multiple smaller problems/tasks with the following basic attributes a good pattern language should have:

- **Quality Without A Name** (QWAN): similar to the "total customer satisfaction" objective in TQM where the ultimate goal is to improve user comfort and quality of life.
- **Organic order**:
  - "all the patterns collaborate to solve a more fundamental problem that is not explicitly addressed by any individual pattern" (Alexander)
  - "planning and construction will be guided by a process which allows the whole to emerge gradually from local acts". (Alexander)
- "Pattern languages grow and evolve through a process of **piecemeal growth**." (Alexander)
  - "Knowledge accumulates exponentially, with every innovation creating the opportunity for a greater number of innovations" (Petzinger, 2000)

Use of pattern languages to manage knowledge could optimize the quality, speed and innovation potential of any process or system.

Related Patterns:

Patterns
Pattern Language
PDCA Cycle
KIM
Framer
Sharer
Finder
Maker

Known Uses:

In creating his pattern language for architecture, Alexander's main concern was to create structures that are good for people and have a positive influence on them by improving their comfort and their quality of life. He concluded that architects must constantly strive to produce work products that better fit and adapt to the needs of all their inhabitants and users and their respective communities. They must strive to achieve what he calls the **"Quality Without a Name",** abbreviated as the acronym QWAN (Alexander, 1979).

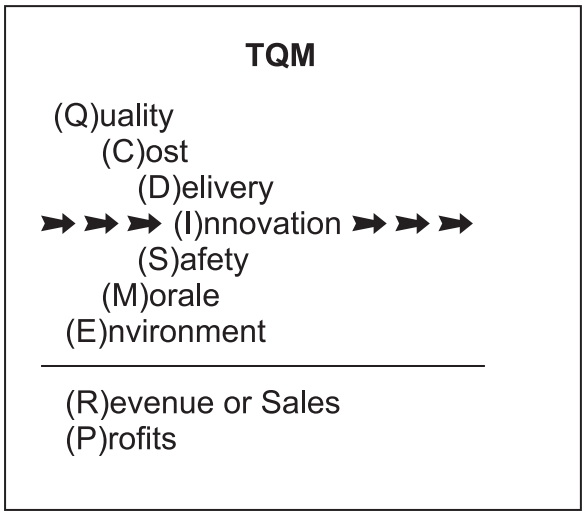
Pattern languages are intended to grow and evolve whole architectures through this process of **piecemeal growth** (Alexander, 1977). Patterns are living things that change as more is learned about the problem, the context, and the solution. Patterns evolve under the impact of new experience and observation. "As people exchange ideas about the environment, and exchange patterns, the overall inventory of patterns in the pattern pool keeps changing " (Alexander, 1979).

In a pattern language, all the patterns collaborate to solve a more fundamental problem that is not explicitly addressed by any individual pattern. This helps a pattern language to achieve an **organic order**, where "planning and construction will be guided by a process which allows the whole to emerge gradually from local acts" (Alexander, 1979) and therefore, pattern languages are evolutionary.

These interrelated patterns form **embedded networks**, which guide its users through a sequence that always moves from the largest patterns "which create structures, to the ones which embellish those structures, and then to those which embellish the embellishments.… Each pattern can exist only to the extent that it is supported by other patterns: the larger patterns in which it is embedded, the patterns of same size which surround it, and the smaller patterns which are embedded in it" (Alexander, 1977).

Alexander's list of patterns follows an order, beginning with the very largest patterns, those for regions and towns, then working down through neighborhoods, clusters of buildings, buildings, rooms and alcoves, ending finally with details of construction. Alexander's language is divided in **three different scales of patterns**: towns, buildings and construction. The current research has shown that the design process can similarly be described in three different scales: marketing data analysis, line and garment designs presented as storyboard concepts, and product details.

Figure:



Milliken's TQM Pattern Language Map: "QCD IS ME"

References:

Meszaros, G., & Doble, J. (1996)
Alexander (1977; 1979)
Petzinger (2000)

Pattern: PDCA Cycle

Inspirational Quotes:

"If you don't have a method, you were goofing off. […] A system must be managed and must have an aim." *–W. Edwards Deming, General Motors Technical Center in Warren, Michigan, October 2000*

"Statistical calculations and predictions based on warped figures may lead to confusion, frustration, and wrong decisions." *–W. Edwards Deming*

"What this method does is simply free us from all method. […] It is not an external method, which can be imposed on things. It is instead a process which lies deep in us and only needs to be released." *–Alexander, 1979*

Pattern Name:

PDCA Cycle

Aliases:

Shewhart Cycle
Deming Wheel

Context:

A problem has been identified and needs to be solved.

Problem:

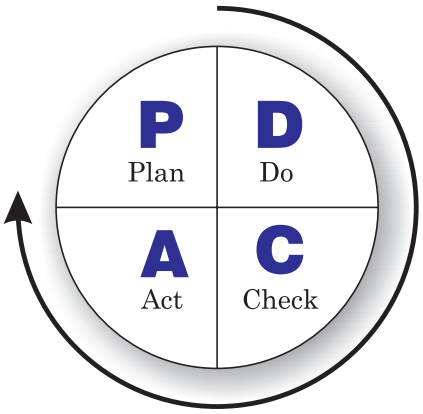
How do you get from a "problem faced" situation to a "problem solved" situation?

Forces:

- There is no unique solution to one problem.
- Each potential solution may have both positive and negative side effects.
- The best solution must be determined by testing and controlling its potential outcomes.
- Several solutions can be tested.
- Selecting the best solution depends on the priority given to related factors such as cost and time efficiency, or, user satisfaction and tolerance.
- If the test results of one solution are overall negative, another solution must be developed, tested and assessed. This procedure should be repeated until an overall satisfying positive assessment is reached and a final solution approved.
- While focusing on developing a solution for the identified problem, attention should also be kept in identifying other underlying problems or new problems that may suddenly emerge.

Solution:

The PDCA Cycle is a checklist of the four stages, which you must go through to get from 'problem-faced' to 'problem solved'. The four stages are Plan-Do-Check-Act, and they are carried out in the cycle illustrated below.



Here is what you do for each stage of the Cycle:

- **Plan** to improve your operations first by finding out what things are going wrong (that is identify the problems faced), and come up with ideas for solving these problems.
- **Do** changes designed to solve the problems on a small or experimental scale first. This minimizes disruption to routine activity while testing whether the changes will work or not.
- **Check** whether the small scale or experimental changes are achieving the desired result or not. Also, continuously Check nominated key activities (regardless of any experimentation going on) to ensure that you know what the quality of the output is at all times to identify any new problems when they crop up.
- **Act** to implement changes on a larger scale if the experiment is successful. This means making the changes a routine part of your activity. Also Act to involve other persons (other departments, suppliers, or customers) affected by the changes and whose cooperation you need to implement them on a larger scale, or those who may simply benefit from what you have learned (you may, of course, already have involved these people in the Do or trial stage).

Metaphors:

- Constant regeneration cycle of any organism/system that evolves.
- For generations, certain Native American tribes built a kind of canoe, called a dugout, made of a hollowed-out log. The canoe builders began by looking for a tree that was several feet in diameter that had already toppled over near the water. Near it, they lit a fire and spread the hot coals on the top of the log. The charred wood

was much easier to hollow out with stone tools. After several days of carving, the canoe would appear to be complete, and the builders would push and pull it into shallow water. More than likely, the first rough effort simply rolled over. It was not balanced. More work with those dull stone tools followed, until they had a boat that did not capsize when someone bent over to pull a fish out of the water. Only then did they call it finished. This knowledge had been passed from generation to generation and had made its way to the builders' very backbones. (Jacobson, Booch, & Rumbaugh, 1999)

Examples:

Garment Pattern:

When developing a garment pattern, the planning stage consists in sketching the design of the garment desired and determining the dimensions and the outlines of the pattern. In the "do" stage, a prototype is developed. In the "check" stage the prototype is tested for aesthetics and fit. If the prototype is approved, the pattern can move on into the production line initiating the "act" stage.

Launching a New Product:

After having developed the new product, manufacturers plan a marketing and advertisement campaign for it (Plan stage). Then they launch the product with the campaigns on a small market segment (Do stage). They test the results (Check stage). If the product and the campaigns are both successful, they launch them on the wider market (Act stage).

Writing a Paper:

After having collected all the necessary data and information required to write a paper on a specific topic, the author will start by writing an outline of the paper (Plan stage). Then he or she will review the information collected and place it in the appropriate segments of the outline (Do stage). The author will then assess the overall balance of this first draft: if enough information is available for each segment or if more research is necessary to fill in some gaps, if some segments are repetitive and should be grouped, or if on the contrary, some are too wide and could be divided into separate segments, etc. (Check stage). The author will certainly need to iterate these first three stages several times!!! Once the author is finally satisfied with the draft, he or she can develop the paper more in depth according to the final approved outline (Act stage). (Note that the author will probably apply a PDCA Cycle in developing each segment of the final paper more in depth!!).

Resulting Context:

You have now completed the cycle to arrive at "problem solved". The outcome of each PDCA cycle feeds as input into the Plan stage of the another related PDCA cycle.

- If the experiment was not successful, skip the Act stage and go back to the Plan stage to come up with some new ideas for solving the problem and go through the cycle again.

- If the cycle was successful, go back to the Plan stage to identify the next "problem faced". The next problem faced may involve refining the solution to the problem that has just been addressed, or it may involve discovering the solution to a new related problem.

Rationale:

Use the PDCA Cycle to coordinate your continuous improvement efforts. It both emphasizes and demonstrates that improvement programs must start with careful planning, must result in effective action, and must move on again to careful planning in a continuous cycle.

Also use the PDCA Cycle diagram in team meetings to take stock of what stage improvement initiatives are at, and to choose the appropriate tools to see each stage through to successful completion.

Related Patterns:

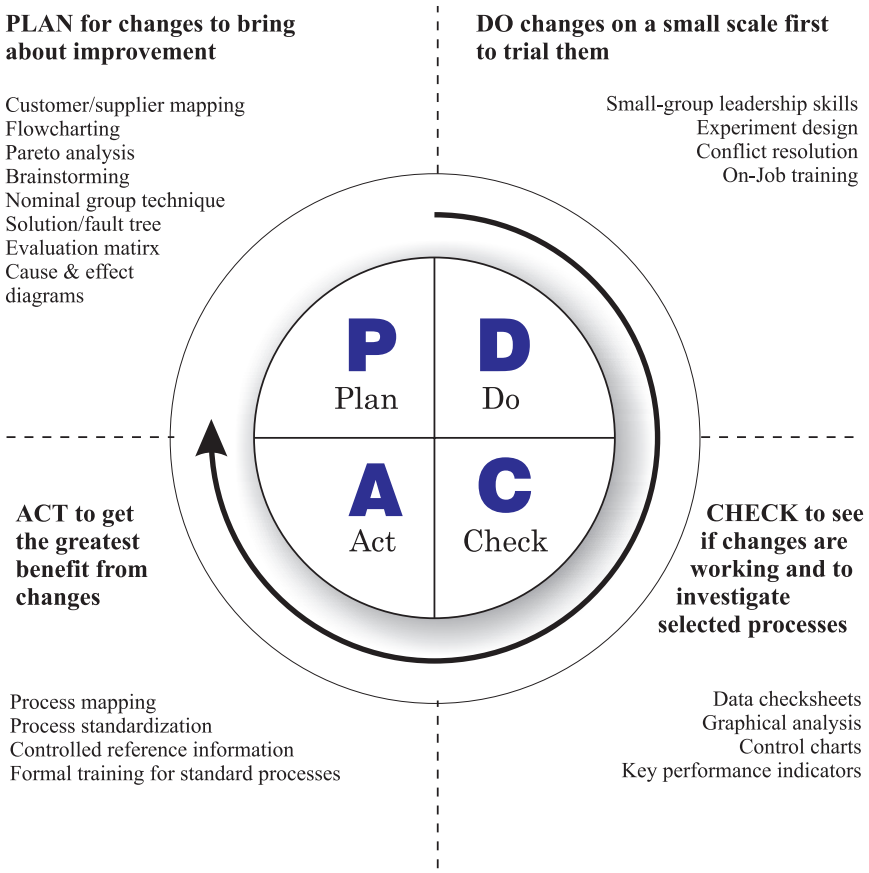
KEO Book
KIM
Framer
Sharer
Maker
Finder
KIM cube

Known Uses:

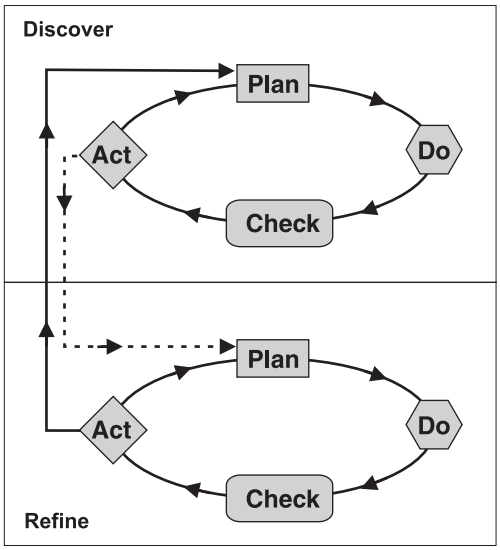
The concept of the PDCA Cycle was originally developed by Walter Shewhart, the pioneering statistician who developed statistical process control in the Bell Laboratories in the US during the 1930s. It is often referred to as 'the Shewhart Cycle'. It was taken up and promoted very effectively from the 1950s on by the famous Quality Management authority, W. Edwards Deming, and is consequently known by many as 'the Deming Wheel'.

Plan-Do-Check-Act describes the overall stages of improvement activity, but how is each stage carried out? This is where other specific quality management or continuous improvement, tools and techniques come into play. The diagram below lists the tools and techniques, which can be used to complete each stage of the PDCA Cycle.

Pattern: PDCA Cycle



Figures:



PDCA cycles to discover and refine solutions to related problems

References:

Walter Shewhart
W. Edwards Deming
Rumbaugh (1999)
Alexander (1979)

Knowledge Insight Model Overview

The Knowledge Insight Model provides a framework to manage knowledge. Four related models compose KIM and are called the Framer Maker Sharer and Finder. These focus respectively on the four basic functions (Plan, Do, Check, and Act) of the two PDCA cycles that support KIM.

The KIM Cube provides a 3-D representation of all four related models and the two supporting PDCA cycles to help visualize and reflect upon their links and dynamics.

Pattern: Knowledge Insight Model

Inspirational Quotes:

"Organon: from the Greek for "instrument", the name of Aristotle's treatise on logic, because logic is an instrument by which knowledge may be obtained. An Organon is a package designed to get you up and running quickly. The instructions deliberately concentrate on using the examples that come with Organon as a training tool. The instructions are also, by virtue of the depth and complexity of the subject matter in some areas, a big jigsaw. If you read all of this document, you will get all of the jigsaw pieces." – *James Solderitsch*

"The ancient library at Alexandria was known as an organon and during its zenith, this library served not only as a collection of books and manuscripts but also was the location where many of the ancient world's scholars lived and conducted their investigation." *–James Solderitsch*

Pattern name:

Knowledge Insight Model

Aliases:

KIM
KM Organon
KM Framework

Context:

Any organization (business, academic, government, etc.) is made up of people who pool their knowledge together to execute all the processes necessary to the organization's survival and growth. These processes depend directly on how the knowledge is managed: created, acquired, stimulated, shared, captured, synthesized, packaged, archived, transferred, and used.

Problem:

A model is needed to manage knowledge as efficiently and effectively as possible.

Forces:

Any process within an organization can be modeled as an evolutionary problem solving process dealing with complex chaotic systems.

The problems are solved with knowledge that either has to be created or, if it already exists, has to be made available wherever, whenever and in whatever form it is needed.

The complexity of the chaotic systems involved can stem from a variety of sources:

- the presence of multiple symbiotic/intervening components (such as functions, disciplines, cultures, people), interacting both with the system and among themselves, creating an internal base of influences, resources and constraints.

- not all these components may have obvious, visible, direct links to the system, which can limit the access to potentially useful existing available knowledge.
- each component may be dependent on other complex systems and have its own chaotic unpredictable behavior.
- the system is submitted to a wide variety of external factors (influences, resources, constraints), ranging from its immediate surroundings to a wider general environment.
- the internal components, their links to the system and to each other, as well as the external factors are not static entities; they evolve and change through time, as does knowledge.

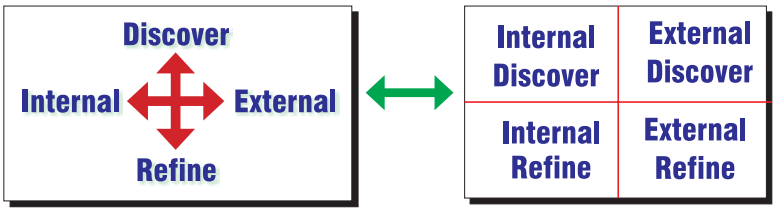
Teamwork increases the complexity of the system and its dynamic structure, but it can ease the flow, propagation and creation of knowledge

Solution:

Construct an Organon, which is defined as "an instrument for acquiring knowledge", "a body of methodological doctrine comprising principles for scientific or philosophic procedure or investigation" (Webster unabridged dictionary). Use this organon to develop an efficient and effective KM methodology and its inherent pattern language.

The Knowledge Insight Model represents the generic organon or KM framework that provides its users with a set of related models (Framer, Sharer, Finder, Maker) that can help any organization manage its knowledge.

Processes depend on systems evolving in the organization's internal environment as well as its external environments. Processes start off from a discover stage, move on to a refinement stage and iterate back and forth between these two stages to gradually advance, solve problems and achieve results. By crossing the external/internal dimensions of the organization's processes with their discover/refine dimensions, the Organon can be articulated around a four-quadrant matrix presented below



Four Quandrant matrix graphic here

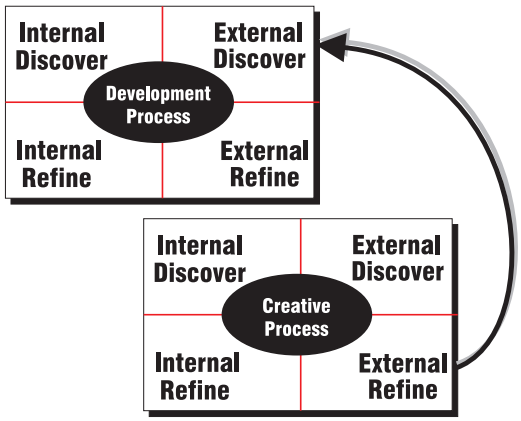
In this matrix, the transition from one stage to the next involves iterations and cyclical movements, which guide the users into altered states of awareness and knowledge within each quadrant involved.

- The transitions from discover to refinement represent solution increments, while the transitions back to the discover stage involve the consolidation and synthesis of what has been learned and refined in order to move forward in the creative

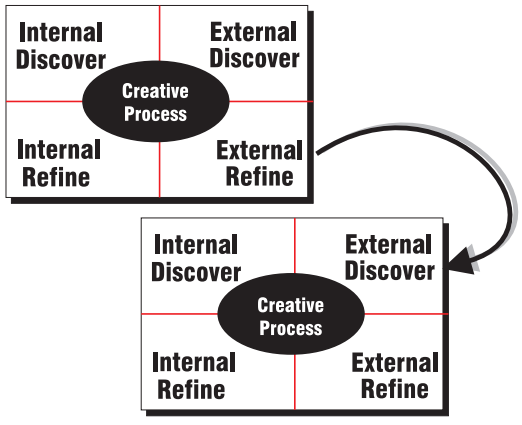
process. These transitions can be iterated until the desired level of refinement has been achieved.

- The transitions from external to internal and back depend on the level of creative achievement that has been reached. The process starts off by using external input to generate innovations internally. The creative achievements developed internally will help learn more about the external output required. Integrating this external information will allow to further refine and rationalize the creative achievement internally to finally offer a mature output to the external environment. Here too iterations can take place until a desirable level of maturity has been reached.

This mature output will be consolidated and fed back as input for the next development phases of the mature output concerned (Refinement Evolution), or for the creative phase of a new creative achievement (Creative Evolution).



Refinement Evolution: From creative phase to development phase of an on-going design process



Creative Evolution: From creative phase of an ongoing design process to creative phase of a new design process

Two basic levels of knowledge are actually reached in every quadrant, leading to the complete 8-step framework of KIM. The boundaries between these 8 steps are not perfectly defined, and the flow across these boundaries is continuous. Delving deeper into the structure of this generic organon framework, problem-solving Plan-Do-Check-Act (PDCA) cycles can be applied to ensure the efficient and effective management of knowledge.

KIM is the source of a holistic dynamic model that can be used not only to capture existing knowledge but also to plan what new knowledge is needed, how to create it, share it and ensure its best possible deployment. KIM can be applied to any scale within the organization to satisfy its diverse levels of process and knowledge management needs.

Metaphor:

The Knowledge Painter's Palette

Inspired by Hermann Hesse's "Glass Bead Game "

These patterns(Framer, Maker, Share, and Finder), the sign language and grammar of the KIM Game, constitute a kind of highly developed secret language drawing upon several sciences and arts, but especially mathematics and music (and musicology), and capable of expressing and establishing interrelationships between the content and conclusions of nearly all scholarly disciplines. The KIM Game is thus a mode of playing with the total contents and values of our culture; it plays with them as, say, in the great age of the arts a painter might have played with the colors on his palette.

The Knowledge Burglar

Inspired by E.H. Gombrich's "Art and Illusion"

The use of KIM, as we have interpreted it so far, is like the forging of master keys for opening the mysterious locks of our senses to which only nature herself originally held the key. They are complex locks which respond only when various screws are first set in readiness and when a number of bolts are shafted at the same time. Like the burglar who tries to break a safe, the knowledge worker has no direct access to the inner mechanism (Sharer). He can only feel his way with sensitive fingers (Framer), probing (Maker) and adjusting (Finder) his hook or wire (KIM) when something gives way (Sharer). Of course, once the door springs open (Green PDCA), once the key is shaped (KM Pattern), it is easy to repeat the performance. The next person needs no special insight—no more, that is, than is needed to copy (Imitator) his predecessor's master key.

The Special Sauce

Set your Framer and start your Maker which excites your Finder who then gives you feedback on taste. Mix and stir with care and you get this Very Nice Green Sauce called from the Shaker (Sharer).

Pattern: Knowledge Insight Model

Examples:

The Knowledge Insight Model can be used for managing Information Technology investments and provide a framework for measuring the return on these investments within an organization or "Enterprise". As a matter of fact KIM grew out of the Information Technology Management Model, or ITMM, presented in the appendices of this book. ITMM is a comprehensive model that allows an organization to analyze its current position and then work toward improvement through a continuous cycle. The model gives an organized path to follow through the transition process.

ITMM requires a total Enterprise commitment to the Quality Philosophy starting at the very top levels(CEO) and moving throughout the organization to its lowest level, thus revealing the different scales of the organization's necessary inherent pattern language to articulate KIM.

ITMM's basic philosophy is centered around two activities: Hoshin Planning(Hij) and Kaizen Planning(Kij). Hoshin is a Japanese term interpreted for our purpose to mean innovation or breakthrough processes. Kaizen is a more familiar Japanese term meaning continuous improvement processes.

The development and implementation of these processes are accomplished in the PDCA cycle. By utilizing the PDCA cycle related to the four KIM related models (**Framer**, **Sharer**, **Finder**, **Maker**) the Enterprise is constantly monitoring itself as we will explain the examples of the patterns associated with each of these related models.

Resulting Context:

KIM can be used to guide its users into altered states of knowledge within each related model (Framer, Sharer, Finder, and Maker) through Plan-Do-Check-Act problem solving cycles. (Each individual PDCA cycle will be described in its respective model's **pattern**.) These related models work in tandem to fully complete the necessary PDCA cycles: Framer/Sharer, Maker/Finder. In any case, if three of the related models are "followed", the fourth will automatically be followed as well.

Specific patterns can be developed to form a language articulating KIM and its related models for specific organization's process and knowledge management needs, leading to the progressive development of that organization's inherent **pattern language**.

Rationale:

The KIM pattern represents the highest abstraction level possible in order to capture knowledge in its purest form, i.e. for any process. At a lower level of abstraction, related models (Framer, Sharer, Finder, Maker) can help users determine their current knowledge management situation and thus realize necessary changes or improvements. At the most concrete level, patterns will describe specific strategies, techniques, processes, activities, tasks that will consequently need to be carried out.

Related Patterns:

KM Link
Patterns
Pattern Language
PDCA Cycle
Framer
Sharer
Finder
Maker
KIM cube
ITMM

Known Uses:

Glaxo Wellcome / Smithkline Beecham

By applying KIM, two graduate students in the spring 2000 IE546 "Management Decision and Control Systems" class were able to tackle the challenge of analyzing the development process of pharmaceutical products in the context of the Glaxo Wellcome/ Smithkline Beecham merger. Though these students had no prior knowledge of the pharmaceutical industry, after three months of research they were able to present a detailed description of the drug development process, pointing out existing bottle necks and inefficiencies, and suggesting potential solutions to increase process efficiency through knowledge management improvements. The students' in-depth understanding of the industry and the product development process impressed the executives from the Glaxo Wellcome/Smithkline Beecham group. The depth of the study and suggestions was especially impressive since their knowledge had been acquired in just three months. The students explained that they applied KIM to develop their personal research process, as well as to analyze the drug development process, highlight bottlenecks/problems and suggest improvement measures.

Creative phase of the Apparel Design process – NCSU School of Design and College of Textiles

KIM was applied to describe the initial creative phase of the apparel design process. A pattern language was then developed around this applied KIM to describe its different stages, components and their interactions. Design professionals reviewed the pattern language and evaluated projects developed by students who applied it. Feedback from these participants indicates the pattern language offers a tool that can be used by all team members to improve design efficiency and effectiveness, i.e. higher success rates of new products in a timely manner.

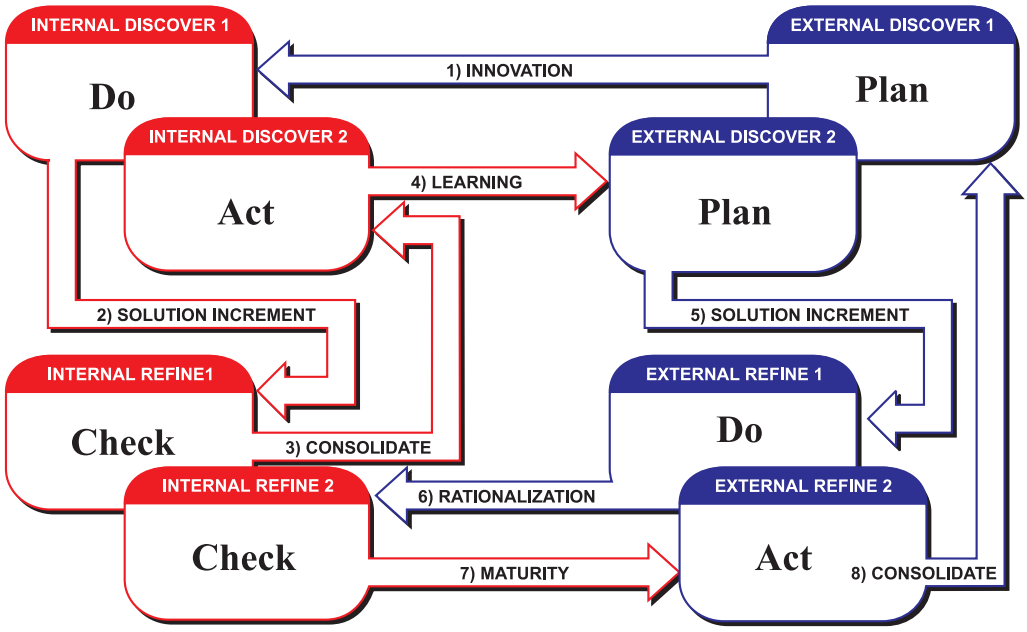
The design professionals who reviewed the pattern language and the students who used it to develop product concepts and storyboards, found it a very useful tool covering the

multi-disciplinary facets of design and serving many functions that contribute to optimize process efficiency:

- teaching the apparel design process
- providing a checklist of components and activities to be iterated in the process
- channeling knowledge and creative input to focus on a common goal
- supporting ongoing communication and record keeping
- providing a structure to organize tasks, activities, skills, talents, knowledge and ideas
- promoting discussions and interaction of all those involved in the design process for constructive idea sharing and problem solving
- stimulating creativity and motivation through teamwork and a relaxed environment
- integrating all available marketing and design competencies

The results and comments of the panel of judges who evaluated the storyboard projects developed by the students indicate that the pattern language may also contribute to increasing the effectiveness of the design process. The judges found that the group of students who used the pattern language developed product designs that made better use of market information, particularly target consumer's needs and use situation.

Figures:



KIM Model

References:

James Solderitsch (1994)
Le Pechoux, 2000
Hermann Hesse
E.H. Gombrich
Thomas L. Honeycutt, ITMM, Consortium for Information Technology Management Research

Pattern: Framer

Inspirational Quotes

"All representations are grounded on schemata which the artist learns to use." – *E. H.Gombrich*

"Where we have no matrix, no keyboard, we cannot assess the meaning of an individual feature." – *E. H.Gombrich*

"Worse than being blind would be to be able to see but have no vision." – *Helen Keller*

"Success occurs when opportunity meets preparation"

Pattern Name:

Framer

Aliases:

KM Organon Superstructure
KM Superstructure
The Schemata

Context:

Knowledge management requires a superstructure to plan out how the knowledge is created, shared and applied.

Problem:

How can an organization figure out what knowledge is needed for its survival and growth?

Forces:

Existing knowledge can be:

- explicit or tacit (transparency)
- local or global (applicability, recipient)
- programmable or unique, codified or personalized (transferability)
- minefield or nugget (richness)
- expensive or cheap (currency)
- reliable or doubtful (trustworthiness)

These different types of knowledge require different management techniques and strategies.

Strategic Alliances can be formed to ensure that all these forms of knowledge are captured, created, shared and deployed.

Solution:

Construct an Organon Superstructure or Framer model illustrating the Plan-Do Check-Act cycle that can help determine the necessary KM techniques and strategies required to carry out processes and achieve set objectives within an organization.

The framer focuses on the Plan phase of the PDCA cycle. Higher management generally focuses on the Framer model to develop short to long term plans.

The KM plan (P) is developed based on processes to be carried out and objectives to be achieved within an organization and its environment. This information will be processed (D) internally to see how it matches with existing internal knowledge. The internal knowledge will be evaluated (C) and goals of creation and refinement will be set (A).

The three other related Organon models will ensure the creation of non-existing necessary knowledge (Maker), the deployment of both the existing and new knowledge (Finder), and the sharing/flow of all this knowledge (Sharer).

Metaphors:

The Framer allows its users to "zoom out" and "see the big picture" in order to make the necessary plans to correctly frame the Knowledge Insight Model and its other three related models (Sharer, Maker, Finder).

Puzzle Game

When starting off a puzzle, one usually starts by putting together the frame first. The pieces representing the edges and the four corners of the final picture are the easiest to find. They represent a relatively small number of pieces making it easier to figure out how they fit together. Once the frame (KM plan) is set up, the player has a better sense of direction of how the other pieces (knowledge nuggets) can fit together. He or she can start building clusters of pieces (knowledge nuggets) and gradually relate them to the frame until the puzzle is complete.

House Building

Building a house is a large project that involves professionals with diverse expertise and combines different materials. To figure out how those materials will come together to form the house requires a blueprint which is the tangible representation of the house plan. Construction will always start by building the frame of the house, thus providing the foundation on which all the rest (materials, development ideas,…etc.) will have to depend on and/or grow from.

Examples:

ITMM

Since the Framer focuses on the planning phase of the PDCA cycle, when applied to the ITMM it involves all the elements of IT planning:

- IT architecture

- Change Management and organizational learning
- IT spending
- Measures to assess the impact
- Create partnerships among business units

The Framer PDCA cycle can be defined as follows.

- Plan:
  - understand the environment
  - identify base parameters
- Do:
  - develop a plan
  - establish measurements
  - partnership measurements
- Check:
  - analyze the plan
  - verify that it reflects the fundamental objectives
- Act:
  - execute the plan
  - keep track of results through progress reports

The outcomes of the Framer applied to ITMM will include:

- Company objectives & issues
- IT Mission/Enterprise Mission
- IT vision/Enterprise Vision
- Cornerstone plans
- Information Model/Enterprise Model
- Primary Hoshin / Kaizen Plans (use cases)
- Partnerships /Enterprise Information Architecture
- Competencies Change Plans
- Mission critical / IT competencies à Enterprise competencies
- Secondary/Tertiary use cases
- Internal quality vs. external quality

Top 10 critical issues to be considered in the Framer model applied to ITMM:

1. Aligning IS & corporate goals
2. Instituting cross-functional IS
3. Organizing & utilizing data
4. Reengineering business process through IT

5. Improving the IS human resources
6. Enabling change
7. Connecting to customers & suppliers
8. Creating information architecture
9. Updating obsolete systems
10. Improving the systems development process

Resulting Context:

The Framer or Organon Superstructure developed can be used to define KM strategies, techniques, processes, activities, and tasks that will need to be carried out to achieve the organizations goals.

Rationale:

KM must be aligned with an organization's mission, vision and strategic plans.

Related Patterns:

PDCA Cycle
KIM
Sharer
Finder
Maker
KIM cube
ITMM

Known Uses:

ITMM

The enterprise model with cornerstone plans.

Cornerstones: key factors (quions) that form an indispensable and fundamental basis for the enterprise to achieve its objectives.

Cornerstones: markets & distribution, customers, competitors, suppliers, products, technology, economic & political issues, ourselves.

Software Engineering—The Water Fall Model

Frame of Reference

- requirements
- specifications
- implementation
- integrate/test
- maintain

Six Sigma - TQM STANDARDS:

Cp = PROCESS CAPABILITY INDEX

Cp = (HIGH-LOW)/6s , WHERE

Cp = 2 IS 6-SIGMA

Cp = 5/3 IS 5-SIGMA

Cp = 4/3 IS 4-SIGMA

Cp = 1 IS 3-SIGMA

Notes on PDCA for programming General outline for Framer

I. Plan phase (design)
- A. Recognize the environmental system
- B. Define problem domain
- C. Develop the environmental context diagram(ecd)
  1. Define external entities
     - a. Input data
     - b. Required output information
     - c. Constraints
  2. View the ecd as a 'free body diagram'
- D. Write a 'good' definition of problem in english
  1. Recognize the 'nouns' as objects(object model)
  2. Recognize the 'adjectives' as data attributes(data model)
  3. Recognize the 'verbs' as processes or procedures(process model)
- E. Develop algorithm
  1. Divide problem into subproblems
  2. Math models
  3. Engineering models
  4. Use established design patterns
- F. Draw a structured flowchart
  1. Sequential construct
  2. Selection construct
  3. Repetition construct
- G. Draw control diagram for program modules
  1. Main program
  2. Functions
  3. Subroutines

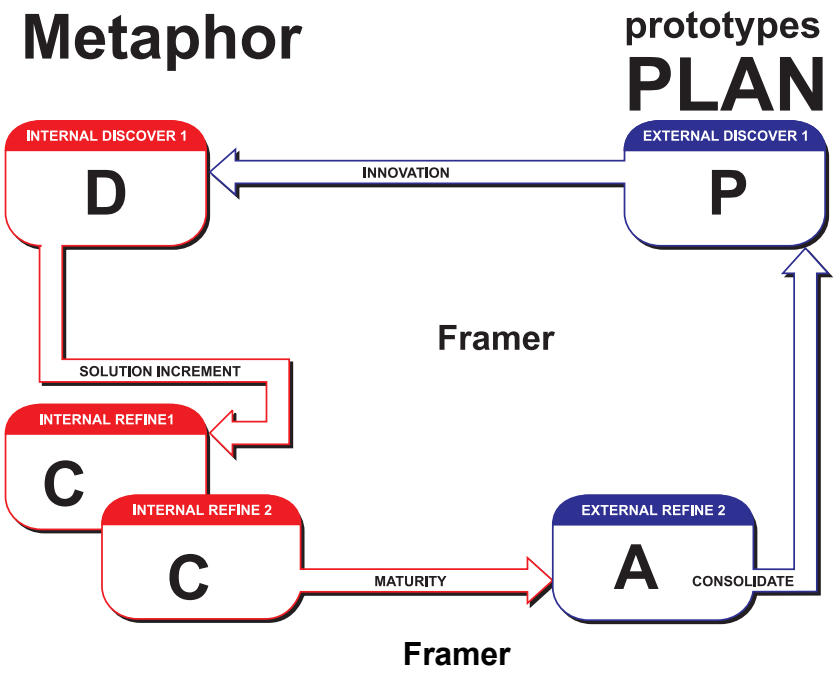
II. Do phase(programming)
- A. Write source code by module
  1. Program parts:heading, specification, execution
  2. Know syntax and grammar of fortran
  3. Programming constructs:assignment, if, do loop, do while
- B. Add nagf95 compiler

C. Compile program
1. Remove syntax errors
2. Object program created by compiler

III. Check phase (testing)
A. Code verification (does it do what was specified?)
1. Test cases designed
a. Initial and ending conditions
b. Known solutions
c. Exercise every program path
B. Execute object program
C. Remove logical and run time errors
D. Execute code with actual real world data

IV. Act phase (system implementation)
A. Code validation (does it solve the right problem right?)
B. Present decision support software (dss) to decision maker
C. Perform sensitivity tests on dss
1. Establish valid range for dss solutions to meet constraints
2. Determine adaptability of dss (can it adapt to problem change?)
D. Make final system recommendations
E Make final decisions to solve problem

Figure:



References:

Thomas L. Honeycutt, ITMM, Consortium for Information Technology Management Research

Pattern: Sharer

Inspirational Quotes:

"What we know of the beginnings of image making confirms the continuous link between finding and making." – *E. H. Gombrich*

Pattern Name:

Sharer

Aliases:

Organon Infrastructure
KM infrastructure
Inner Mechanism

Context:

Knowledge management requires an infrastructure to track, monitor and deliver knowledge according to process and organizational needs.

Problem:

How can an organization ensure that the knowledge needed for its survival and growth always be made available?

Forces:

- In every organization, a vast pool of knowledge is available across its internal competencies and external sources.
- To keep track of existing knowledge, it must be defined, verified and recorded.
- Some knowledge is very difficult to track (ex: tacit or unique personal knowledge).
- To be made available wherever, whenever and in whatever form needed, knowledge has to be packaged and delivered adequately.
- If knowledge is missing, new knowledge must be gained from external sources or created internally.
- Newly acquired knowledge must be recorded and integrated to ensure that the "existing knowledge" resources are always updated.
- Knowledge accumulates exponentially: knowledge builds on knowledge. The better knowledge is shared, the greater knowledge is created.
- Knowledge flow should follow the "information architecture" determined by the Organon Superstructure or Framer.

Solution:

Construct an Organon Infrastructure or Sharer function model illustrating the Plan-Do Check-Act cycle that can help keep track of existing knowledge, integrate new knowledge, and deliver adequate knowledge as needed.

The Sharer model focuses on the Check phase of the PDCA cycle, and is distinguishes itself from the three other KIM related models (Framer, Maker, Finder) because it actually starts off at the Check point and is the only of the four to go in a clockwise direction. Internal auditors or external consulting firms are often hired to carry out this sharer function to ensure that Maker and Finder functions are well integrated within the Framer model.

This Sharer function starts off by tracking, verifying and monitoring (C) existing knowledge. Existing knowledge is processed and packaged (A) according to specific needs as planed (P) in the Framer function. Based on this plan, missing knowledge will be acquired externally (D) if possible. If the required knowledge does not exist, it will be created based on existing knowledge internally (C) and added to the existing "knowledge pool".

The Sharer function should ensure that the Maker and Finder functions work in tandem within the KM superstructure defined by the Framer.

Metaphors:

The Sharer allows its users to share between Maker and Finder within the Framer.

Puzzle Game

Throughout the process of putting together a puzzle, the players constantly re-evaluate the individual pieces (knowledge nuggets) and clusters (knowledge clusters) they have already put together to figure out how they can fit together. They always keep an eye on the frame (KM plan) to possibly link the pieces and/or available clusters to the frame as soon as possible. Whenever they have an idea where one of these entities would fit in the overall picture, they place in that imaginary spot within the frame to help them visualize and assemble the missing entities.

House Building

When building a house, a general contractor is indispensable to coordinate the multitude of activities generated by all the parties (architects, sub-contractors, civil engineers, material suppliers, etc.) involved, and solve all the problems that may surface building evolves. This contractor plays a crucial role in the quality and timing of the building process.

Examples:

ITMM

The purpose of the Sharer function in the ITMM is to study measures of IT investments for business process refinements using pre-defined control items. Assess impact and identify effects and problems.

- The inputs of the Sharer function applied to ITMM
- Control Items for measurements
- Change management spending
- Improved business quality results
- Systems and infrastructure spending

The Sharer PDCA cycle can be defined as follows.

Plan:

- Review plans for control measurements
- Develop tools to implement measures

Do:

- Perform measurements
- Monitor results to identify potential problems

Check:

- Assure the right measurements are taken at the right times
- Determine effectiveness of the tools

Act:

- Document ratios and impacts
- Document IT product investments
- Document change management investments

ITMM Sharer components:

Total planned IT investments

- Discretionary funds
- Non-discretionary funds
- IT product investments
- Infrastructure investments

Total change management investments

- Mission critical competencies
- IT distinctive competencies

IT ratios

- Total IT / Total Revenue
- Total change management / Total IT
- Total non-discretionary / Total IT
- Total discretionary / Total IT

Business goal impact

- Quadrant total / Total IT
- System type investments (transactional, informational, decision support)
- Hoshin ($ increase in revenue from process capability change divided by IT system investment multiplied by IT's contribution to whole process change)
- Kaizen ($ increase in revenue from process variance reduction divided by IT system investment multiplied by IT's contribution to process variance reduction)

Outputs of Sharer function applied to ITMM

- IT strategic impact analysis
- IT tactical analysis, cornerstone plans

Resulting Context:

The Sharer model or Organon Infrastructure developed can be used to define how knowledge can be tracked, created and delivered to align KM and organizational objectives.

Rationale:

Alignment of an organization's KM with its mission, vision and strategic plans can only be ensured through careful monitoring and coordination of al knowledge flow.

Related Patterns:

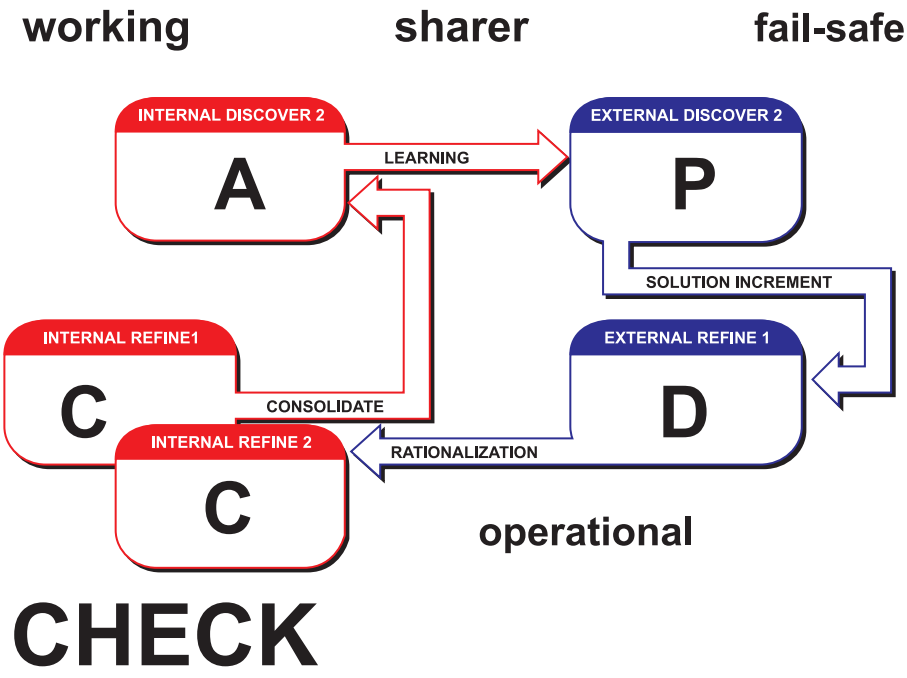
PDCA Cycle
KIM
Framer
Finder
Maker
KIM cube
ITMM

Known Uses:

Software Engineering—The Iterative Life Cycle

The shortcomings of the Waterfall Model's approach are recognized in both the Spiral Model and Object Oriented Design (OOD) practices. The Spiral Model and OOD both use iterative development. This type of development is intended to provide opportunity for user feedback and accommodate changing requirements.

Figure:



Sharer Model

References:

Thomas L. Honeycutt, ITMM, Consortium for Information Technology Management Research

Pattern: Maker

Inspirational Quotes:

"Without making there can be no matching." – *E. H. Gombrich*

Pattern Name:

Maker

Aliases:

Organon Hoshin
Knowledge creation

Context:

Knowledge management involves both stimulating knowledge growth and ensuring that all available knowledge be deployed according to process and organizational needs.

Problem:

How can an organization ensure that the knowledge is created as needed for its survival and growth?

Forces:

- In every organization, a vast pool of knowledge is available across its internal competencies and external sources.
- If knowledge is missing, new knowledge must be gained from external sources or created internally.
- Newly acquired knowledge must be recorded and integrated to ensure that the "existing knowledge" resources are always updated.
- Knowledge accumulates exponentially (Petzinger, 2000): knowledge builds on knowledge.
- "New knowledge" is created by combining existing knowledge nuggets in a way that has never been done before.

Solution:

Construct Maker model illustrating the Plan-Do Check-Act cycle to stimulate knowledge creation based on process and organizational needs.

The Maker model focuses on the Do phase of the PDCA cycle. Designers and researchers generally focus on the Maker function to create new products, concepts, processes, etc.

This Maker function can be associated with Hoshin, which "is a Japanese term interpreted […] to mean innovation or breakthrough processes" (Honeycutt, 1998). Corporate strategic issues include Hoshin planning to achieve breakthrough, i.e. "a dramatic change in level of performance heretofore not achievable" (Honeycutt, 1998).

Based on the KM plan defined (P), the internal knowledge pool will be scanned for existing required knowledge nuggets (D). After evaluation of the overall knowledge available and compatibility between the format and content of the nuggets selected (C), knowledge nuggets will be aggregated to form/customize the knowledge clusters needed (A).

The Maker should work in tandem with the Finder, thanks to the Sharer function within the KM superstructure defined by the Framer.

Metaphors:

The Maker allows its users to make/do what the Framer planned.

Puzzle Game

Once the frame (KM plan) of the puzzle has been put in place, the players can analyze the remaining pieces (knowledge nuggets). Pieces that fit together will be assembled into clusters (knowledge clusters) forming little groups that gradually represent different pieces of the picture to come together.

House Building

Once the frame of the house has been built according to the blueprint, the workers can start filling in the gaps of the structure as planned. As they are building, they will probably run into some ideas, problems, constraints they had initially overlooked in the "wide-angle view" blueprint plan. They may re-adjust their blueprint/requirements based on this new knowledge/ awareness, but they will still have to base it on the foundation that was initially set up according to the blueprint.

Examples:

ITMM

The purpose of the Maker function in the ITMM is to implement plans to change or improve business/operational processes. This is accomplished by investing in system areas and resources to facilitate process changes.

The inputs of the Maker function applied to ITMM :

- Business issues and objectives
- Cornerstone plans
- Primary Hoshin and Kaizen plans, use cases
- Competencies change plans
- Secondary/Tertiary use cases

The terms/issues involved are:

- Internal vs. External Quality

- Internal (Programmers/Software Mgmt) vs. External (End user/functionality) customer

- Hoshin changes
  - Improving capability of process (changing the mean)
- Kaizen changes
  - Reducing variance (increasing predictability & reducing standard deviation)

Components of Maker function applied to ITMM

- Hoshin/Kaizen contract deployment
- Investment in application areas and infrastructure
- Hoshin changes = new capability
- Kaizen changes = reduced variance
- Resource allocation
  - Discretionary Investing (special variation)
  - Non-discretionary investing (common variation)

Outputs of Maker function applied to ITMM:

- Business process impact
  - Capability improvement
  - Reduced variation
- IT product measures
  - Investment measures in IT (Applications areas and competencies)
  - Measures of capability changes to business processes
  - Measures of reduction in variation to business processes
- Mission critical / IT distinctive competency changes

Resulting Context:

The Maker model or Hoshin Organon developed can be used to define how existing knowledge nuggets can be combined, to create the knowledge needed to meet objectives set in the External Discover 1 Plan phase, as well as determine new objectives in the External Discover 2 Plan phase.

Rationale:

Alignment of an organization's KM with its mission, vision and strategic plans requires that the adequate knowledge needed be generated.

Pattern: Maker

Related Patterns:

PDCA Cycle
KIM
Framer
Sharer
Finder
KIM cube
ITMM

Known Uses:

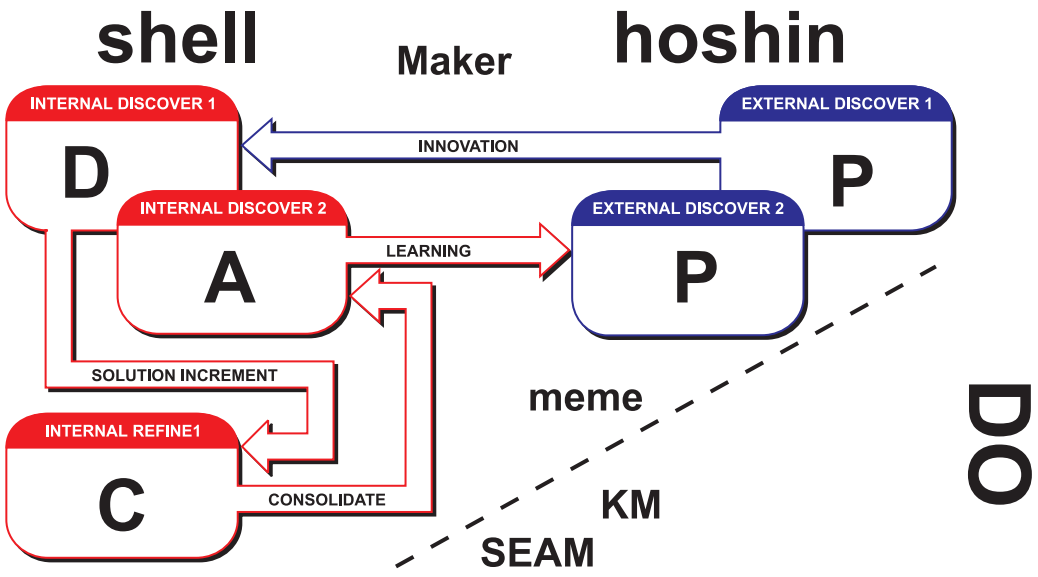
- Software Engineering—The Orb Web Model

The Embryonic Prototype + The Shell Prototype + The Working Prototype = The Maker

- Rational Software Model

The Logical View + The Development View + The Physical View = The Maker

Figure:



Maker Model

References:

Petzinger (2000)
Honeycutt, T.L.

Pattern: Finder

Inspirational Quotes:

"Finding, indeed, even precedes making, but it is only in making things and trying to make them like something else that man can extend his awareness of the visible world." – *E. H. Gombrich*

Pattern Name:

Finder

Aliases:

Organon Kaizen
Knowledge deployment
Matcher

Context:

Knowledge management involves both stimulating knowledge growth and ensuring that all available knowledge be deployed according to process and organizational needs.

Problem:

How can an organization ensure that the knowledge available is deployed as needed for its survival and growth?

Forces:

- In every organization, a vast pool of knowledge is available across its internal competencies and external sources.
- Some knowledge is very difficult to track (ex: tacit or unique personal knowledge).
- To be made available wherever, whenever and in whatever form needed, knowledge has to be packaged and delivered adequately.
- If knowledge is missing internally, new knowledge must be gained from external sources.
- "New knowledge" is created by combining existing knowledge nuggets in a way that has never been done before.

Solution:

Construct Finder model illustrating the Plan-Do Check-Act cycle to ensure optimal knowledge deployment based on process and organizational needs.

The Finder model focuses on the Act phase of the PDCA cycle. Marketers and sale representatives generally focus on the Finder function to deploy the new products, concepts, processes, etc. created in the Maker function, or identify needs for the creation of new ones.

This Finder function can be associated with Kaizen, a "Japanese term meaning continuous improvement processes" (Honeycutt). Kaizen plans are developed to update and establish relevant continuous improvements (Honeycutt).

Based on the KM plan defined, available knowledge clusters have been created internally through he Maker function. Based on this knowledge, the KM plan is refined and extended to include finding the knowledge nuggets missing internally but required to carry out the KM plan (P). The internal knowledge available will be deployed and the missing knowledge nuggets will be sought out (D). The deployment results will be evaluated and the new knowledge nuggets will be checked for compatibility between the format and content of other new nuggets as well as nuggets existing internally, thus integrating the existing internal knowledge base (C). Based on this increased knowledge base, knowledge nuggets will be aggregated to form/customize the knowledge clusters needed to improve deployment (A).

The Finder should work in tandem with the Maker, thanks to the Sharer function within the KM superstructure defined by the Framer.

Metaphors:

The Finder allows its users to find/match external needs with internal Maker creations and Framer plans.

Puzzle Game

When putting together a puzzle, after framing (Framer) and clustering (Maker), players seek to combine the remaining individual pieces (knowledge nuggets), clusters (knowledge clusters) they have already put together, and the frame (KM plan). They try to combine clusters between themselves, or individual pieces to existing clusters, or individual pieces amongst themselves to form new clusters, or any of these entities to the frame.

House Building

Builders merchants, building supply companies, real estate agents are in charge of finding materials and buyers for the house being built. Their duties involve purchasing, selling, delivery and logistics.

Note that once the house has been built and sold, the buyer will incorporate his or her own KEO process(es) to best finance, live in, maintain, and eventually sell the house.

Examples:

ITMM

The purpose of the Finder function in the ITMM is to examine the results achieved from process changes with the objective of either standardizing and stabilizing the process or maintaining, improving, or correcting the process.

The inputs of the Finder function applied to ITMM:

- Mission critical competencies investments
- IT distinctive competencies investments
- IT product investments
- Business process impact
    - Milestone analysis (current year)
    - IT ratios

The Finder PDCA cycle for ITMM can be defined as follows.

Plan:

- Understand strategic & operational plans based on contracts and competencies of the integrated partnerships.
- Review data collection process & performance measures for relevancy
- Develop assessment tools to analyze Sharer outputs

Do:

- Execute analysis of performance data
- Examine results to identify outcomes
- Identify differences between plan and results

Check:

- Review performance results
- Review strategic and operational plans
- Review performance measures and data collection for accuracy/precision
- Determine validity of results

Act:

- Document and report results
- Highlight opportunities for improvement
- State examples to validate data
- Recommend improvements for strategic and operational areas

ITMM Finder components:

- Competencies update
- Partnership values update
- Information model update
- Impact analysis

- Operational/Tactical
- Strategic

Outputs of Sharer function applied to ITMM

- Operational—Progress/Status reports (multi-year cornerstone plans)
- Strategic—Annual report
- Contents of these reports
  - Clear description of plan
  - Baseline description
  - Performance measurement criteria description
  - Results achieved with supporting data
  - Recommendations

Resulting Context:

The Finder model or Kaizen Organon developed can be used to define how existing internal knowledge can be completed with external knowledge nuggets to achieve optimal deployment of knowledge needed and meet objectives set in the External Discover 1 Plan phase. This additional knowledge will contribute to setting new objectives in the External Discover 2 Plan phase.

Rationale:

Alignment of an organization's KM with its mission, vision and strategic plans requires that the existing internal knowledge be completed with external knowledge nuggets.

Related Patterns:

PDCA Cycle
KIM
Framer
Sharer
Maker
KIM cube
ITMM

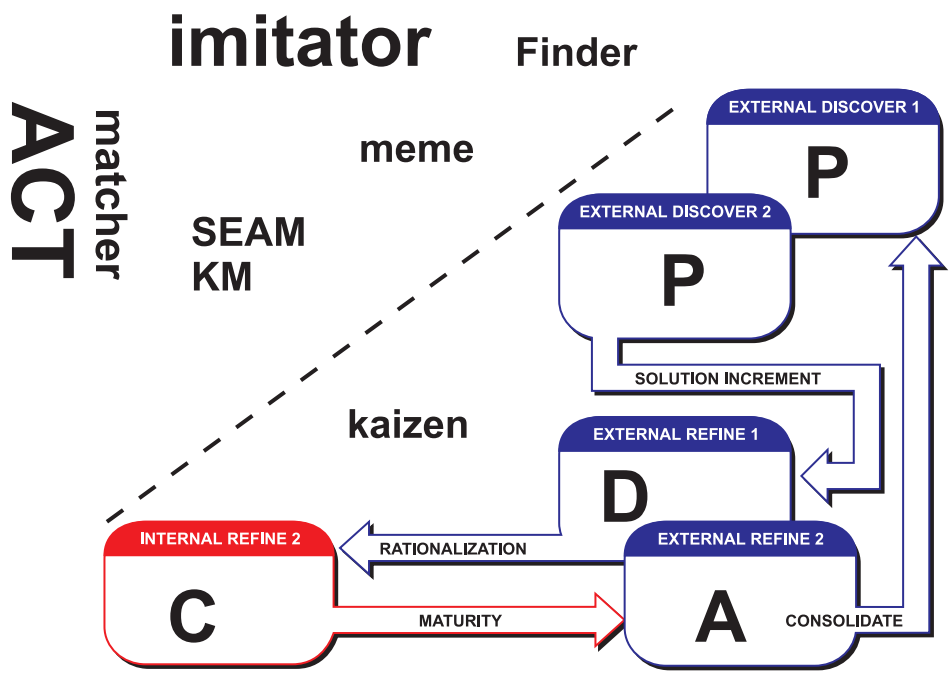
Known Uses:

Software Engineering—Extreme Programming

XP programmers communicate with their customers and fellow programmers. They keep their design simple and clean. They get feedback by testing their software starting on day one. They deliver the system to the customers as early as possible and implement changes

as suggested. With this foundation XP programmers are able to courageously respond to changing requirements and technology.

Figure:



Finder Model

References:

Honeycutt, T.L. (Fall 98), IE/CSC 546, "Consortium for Information Technology Management Research".

Honeycutt, T.L. (Fall 98), IE/CSC 546, "Information Technology and Quality Improvement: A Business Model for the next Millennium".

Pattern: KIM Cube

Inspirational Quotes:

Rubics cube!

"In short, the structure of a DNA molecule or combination of DNA molecules determines the shape, form, and function of the offspring." – *Encarta® Online Encyclopedia*

Pattern Name:

KIM Cube

Aliases:

3-D KIM,
Dynamics of KIM

Context:

The Knowledge Insight Model and its related models (Framer, Maker, Sharer, Finder) provide a framework to manage knowledge.

Problem:

A tool is needed to illustrate how these models fit together and interact.

Forces:

- The 8-step structure of KIM is derived from the four-quadrant matrix of the Abstract Mandala.
- These four quadrants are divided along two axes: external/internal and discover/refine.
- The discover/refine dimension is a continual process that repeats and builds on itself: discovery leads to refinement and refinement leads to new discovery and so on.
- The four quadrants are thus split into two levels of awareness: a first level of discovery, a second level of refinement.
- Overall KIM involves two PDCA cycles which interlace the two levels of awareness (i.e. they DO NOT correspond each respectively to one specific level of awareness).
- The Framer, Maker, Sharer and Finder interlace the various phases of these two PDCA cycles.
- All the inter-connections between the two levels of awareness and the two PDCA cycles modeled in KIM through the Framer, Maker, Sharer and Finder create a complex system.

Solution:

KIM cube presents the KIM model with all its related models in a 3-D format.

Each related model is presented in a different color.

The cube highlights many characteristics of KIM.

PDCA phases have specific functions/objectives/roles

Plan is only External Discover, both at levels 1&2. Plan is based on environmental analysis. Check is only in Internal Refine, at both levels. Check is based on internal monitoring. Do is both Internal Discover and External Refine, but only at level 1. Do is based on a plan. Act is both Internal Discover and External Refine, but only at level 2. Act is based on a "verified" do.

The fact Do is always at the first level and Act only at the second level confirms that Do always precedes Act.

Plan and Check are both levels highlighting the importance of Plan and Check iterations to coordinate discovery & refine and internal & external. The connection of levels ensures the progression of any process that follows KIM by securing its "double helix" or "DNA" structure.

Plan and Check are diametrically opposed? they balance the system?
Do & Act at level 1 are diametrically opposed to Do & Act at level 2? a different balance?

The KM seam splits the cube into two prisms.

The Framer and Sharer appear as "stitches" between the two prisms. The Finder and Maker are confined to each to a different prism. Plan and Check phases link the two prisms, while Act and Do phases are internal to each. (For Internal Discover 1, they are confined to the "Maker" prism, for External Refine 2, they are confined to the "Finder" prism).

While the Framer, Maker and Finder all can actively link to a new KIM 8-step process, the Sharer has purely an internal role.

Discovery and Refine seams:

The cube can be sliced horizontally to separate discovery and refine within one 8-step run. The cube can be sliced vertically to separate discover and refine between 4-step segments (levels 1&2)

(INSERT GRAPHIC HERE)

KIM Cube split into 2 prisms along the KM seam

Pattern: KIM Cube

Metaphors:

Prism light reflection

The KIM prism refracts the white light of knowledge into the constituent colors: internal tacit, internal explicit, external tacit, and external explicit. The KIM cube also acts as a lens by which to exclude extraneous information, and focus on detail for closer examination and clarification.

DNA / Double helix

"There are some universal structures that all bacteria have. The basic building blocks of life, DNA, RNA, and protein, are common to all organisms not just microbes." (Timothy Paustian)

Watson and Crick's three-dimensional model of the DNA molecule exhibits the two sides of a "flexible ladder" coiled around a common center to form a double helix. Each outside of the ladder, often called the backbone, is invariant throughout the molecule and merely repeats the phosphate-sugar bond over and over again. Attached to the inside of the backbone at the sugar is part of the ladder's rung. This variable part of the DNA molecule consists of one of the four bases: adenine, guanine, thymine or cytosine. It is the exact sequence of these bases along the inside of the ladder that determines the genetic message.

Bee hive

Inspired by William James

As the bees in swarming cling to one another in layers till the few are reached whose feet grapple the bough from which the swarm depends; so with objects of our thinking (Framer, Maker, Share, and Finder), they hang to each other by associated links, but the original source (PDCA) in all of them is the native interest which the earliest one once possessed.

Examples:

Summary/Evolution from concepts of all other examples in the KEO book.

Resulting Context:

KIM cube allows one to think about all the inter-connections and dynamics of its related models, levels of awareness and PDCA cycles. It is more a meditation tool than a "how to" tool.

Rationale:

The cube illustrates in one graphic representation all the complex connections and dynamics of KIM. The original source of KIM and all its inter-connections is the PDCA Cycle. The fundamental nature of the PDCA Cycle will be shown to tie knowledge management together as given in the cube. (See "Bee hive" metaphor below).

Related Patterns:

PDCA Cycle
KIM
Framer
Maker
Sharer
Finder
Abstract Mandala

Known Uses:

KIM cube is used to conceptualize and show the entire KEO structure and dynamics in one single diagram, so that the viewer can grasp and reflect on KEO as the holistic dynamic model it really is.

(INSERT GRAPHIC HERE)

Figure:

(INSERT GRAPHIC HERE)

KIM Cube

References:

Microsoft® Encarta® Online Encyclopedia (2000)

Crick [ref: to James Watson] (1989)

Timothy Paustian (2000)

William James

KEO Consulting Training and Support

We believe the concepts and models presented in this book, which are all part of the Knowledge Enabling Organon, can be used to manage knowledge in any organization. We can provide the consulting, training, and support services required to apply them to one's specific needs.

Pattern: Knowledge Enabling

Inspirational Quotes:

"KEI wants to be to knowledge management what Beethoven is to classical music." T.L. Honeycutt

Pattern Name:

Knowledge Enabling

Aliases:

Knowledge consulting, training and support
Knowledge Enabled LLP

Context:

Individuals that have been introduced to the models and concepts presented in Dr. Honeycutt's "Management Decision and Control Systems"/IE546 class have had the same enlightening experience as I did applying them to their specific needs. Two professionals from the IT sector, Jim Bender and John L. Baines, together with Dr. Honeycutt and myself decided to form a team called Knowledge Enabled International (KEI) that would actively pursue the progression of these concepts and their potential applications.

Problem:

How can the methodology built around the Knowledge Insight Model be applied to an organization's specific needs, enabling it to leverage its specific needs as rapidly, efficiently and effectively as possible?

Forces:

- Challenges and opportunities presented in the KEO Book pattern determine the survival of today's organizations that need to identify knowledge and technology driven opportunities as well as their critical timing.
- Often an outsider's view and analysis is very useful to see through the veneer of corporate culture or organization and identify the real value in the employee infrastructure and knowledge underneath.
- The team charged with this mission must cut through organizational fat, insulation, façade, tradition and inertia.
- The team must proactively assess knowledge assets in order to inventory, analyze, compare against benchmark models in other industries, conceptualize, and evaluate.
- They will need to ignore useless information deadwood, and to identify strong girders of knowledge hidden in the organizational structure that are not being used strategically.

Solution:

KEI will seek to leverage the organization's knowledge assets to improve competitiveness, through use of KEI methodologies. This will include both internal and external aspects to the organization being studied:

Internally:

- Organize and developing multi-disciplinary and multi-cultural teams
- Identify, at a corporate or product level:
  - Knowledge assets
  - Opportunities
  - Problems
  - Potential solutions
- Apply the KIM methodology to plan a draft process
- Develop a plan and distribute tasks according to this draft
- Record the following in pattern language format as a product model is developed and applied
  - Components
  - Stages
  - Interactions
- Apply continuous refinement through regular team meetings:
  - Assess latest developments in the product
  - Ask new questions from an outside perspective
  - Give critical feedback between members and groups
  - Suggest and evaluate new alternatives
  - Make iterative changes to the plan
- Identify the skills needed to develop and exploit the product plans, and develop a curriculum emphasizing the courses that will nurture these skills
- Develop Web-based tools to record knowledge in patterns and ensure the required ongoing communication and idea sharing within the customer organization.

Externally

- Benchmark models processes and results from local and global research and previous KEI experience:
  - Competitors

- Similar functions or tasks in related and even unrelated industries
- Research labs and universities
- Other organizations (governmental, standards, IT, ASP, etc.)

- Encourage customer employees to collect knowledge externally through conferences, work-shops, on-line forums, and other live seminar opportunities
- Create partnerships with other business partners to create intellectual synergies
- Rotate employees between functions, offices, factories, branches, partners, etc. to increase the interaction of ideas and disciplines and provide creative sparks that initiate breakthrough thinking
- Identify courses and software products for ongoing learning, training in the fields necessary to support the new initiatives, stimulating curiosity and aiding discovery
- Emphasize communication, understanding and mutual respect between experts from different disciplines

Metaphors:

KEI holds the generic key to unlocking any organization's full knowledge potential. This key, however, needs to be cut to fit the organizations specific constraint, challenges, needs and opportunities. This can only be done after applying KIM and its related models to draw out the structure and locking mechanism of the organization's own knowledge vault, so that a model outline for the key can be developed.

Examples:

This KEI team has developed and applied KM and IT management concepts to their own work. Ideas and methodologies have been practiced and honed against real world benchmarks and test-beds. Some of the experience gained though this work includes:

- Application and evaluation of the Information Technology Management Model (ITMM) for use in the Bank of America IT through work with the Senior VP for IT planning at Bank of America. The Senior VP also provided course lectures and input on the use of the model.
- Students from the course, now at SAS, used concepts developed in the course to develop the new SAS product 'Balanced Scorecard' which benchmarks an organizations economic progress in the e-commerce economy.
- Students from the course, now with Smith Klein Beecham, have presented an internal KM proposal for all aspects of the organization.
- Work with the Senior VP Marketing at Harris Teeter to review customer tracking technology and coupons and cards in an Internet economy.
- Reviewed the automation of the corporate communications model at a Florida software company using ISO 9000 and active documents.

- A continuing partnership over eight years with one of the nations largest textile firms. Initially TQM quality measures were applied to IT initiatives. A long range Vision and Planning Process was developed for the corporate management. Subsequently a Cornerstone Strategic Planning Process was put in place to allow incremental improvement and re-evaluation of the Technology and Product plans. KEI is now working with the organization to see how the 8-step product planning and design methodology can be applied to their textile and other products.
- Work with Marshall Brain, instigator of the 'How Stuff Works' web-site to gain insight into how to reach youth markets, and how to apply design principles to Web site communications and content.

Resulting Context:

As the e-commerce horizon changes, KEI Knowledge Management methodologies will allow the organization to adapt their e-commerce approach abruptly.

KEI has monitored these and other organizations as they have participated in the IE/CSC 546 course. Senior management personnel in a variety of cutting edge organizations have been captured on videotape and represent an incredible resource of intellectual property.

Communication is the key to exchanging ideas and knowledge. Courses and software products can be real facilitators in this area. However, employees need encouragement and a plan to make effective use of these tools. That is where KEI comes in.

Rationale:

KEI has a staff of consulting professionals that are recognized leaders in the Knowledge Management field. KEI treats Knowledge Management as an ongoing discipline to be developed to meet the unique needs of each of our clients. But our own knowledge tools allow us to do this in a way that permeates the structure of our customers.

Creativity needs constraints to kick against. KEI can find these constraints, both internally within the customer organization and in the external sources available to KEI in our own open intellectual property. KEI can act as catalysts and facilitators for an organization embarking on what is to them uncharted territory. Through our experience and methodologies we can guide customers forward in developing their own e-commerce plans and effectively using available software tools.

Related Patterns:

KEO Book
Magic Illusion
KM Link
Patterns
Pattern Language
PDCA Cycle
KIM

Framer
Sharer
Finder
Maker
KIM cube
ITMM
Abstract Mandala

Known Uses:

KEI has developed powerful intellectual assets that include:

- A powerful iterative eight step process for quick and decisive product design and development, taking into account both internal and external factors
- Emphasis both on incremental improvement and breakthrough development techniques in charting the e-commerce course for the organization
- Visual and conceptual models to align corporate objectives and goals with the opportunities provided by the chosen technologies
- Models, measures and benchmarks for the Return on Investment in Information Technology
- Benchmark material, panel discussions and intellectual property on video tape from Industry leaders in the e-commerce revolution including:
  - Bank of America Senior VP for IT planning
  - Cisco development manager
  - Glaxo Welcome CIO
  - Harris Teeter, senior VP marketing
  - Duke Power year 2000 IT mediation team leader
  - Presidents, CEOs and other senior management from leading software firms in the Knowledge Management revolution, including Haat, and Relativity
  - And many others including Wachovia and CP&L management
- A spherical model that addresses the Knowledge Management variogram, such that timing of decisions in days, months and years may be mathematically compared to the completeness of the knowledge available to make the decision and against the risk of the correctness of the decision

Figure:

References:

KEI Web site

Appendices

The following patterns are included for reference from the preceding sections. The KEO Book pattern in included as a general description of the purpose and significance of this book.

Pattern: Abstract Mandala

Inspirational Quotes:

"The Mandala symbolizes by its central point the ultimate unity of all archetypes as well as of the multiplicity of the phenomenal world…" – *Carl G. Jung*

Pattern Name:

Abstract Mandala

Aliases:

Framework

Context:

You are in a problem environment that lacks order or symmetry. It needs a process of centering.

An instrument or model of the "whole" as a pattern is required to provide a psychological "view-finder" so you can superimpose it on the psychic chaos of the problem environment and place each problem element into its proper order. Thus, the weltering confusion is held together for contemplation and understanding.

Problem:

You are faced with a situation of psychic confusion and perplexity without an instrument of contemplation.

Forces:

- **"**No Silver Bullet**" Skepticism**—Belief that there is no single development, in either technology or in management technique, that by itself promises even one order-of-magnitude improvement in productivity, in reliability, or in simplicity.
- **Complexity, Conformity, Changeability, and Invisibility**
- **The human impulse toward wholeness**
- **Abstraction requires individual creativity, intuition, and experience.** Unfortunately, not everyone has those skills. Some people are better than others at looking at the world and discovering or inventing abstractions of reality.

Solution: ***Construct a MANDALA:***

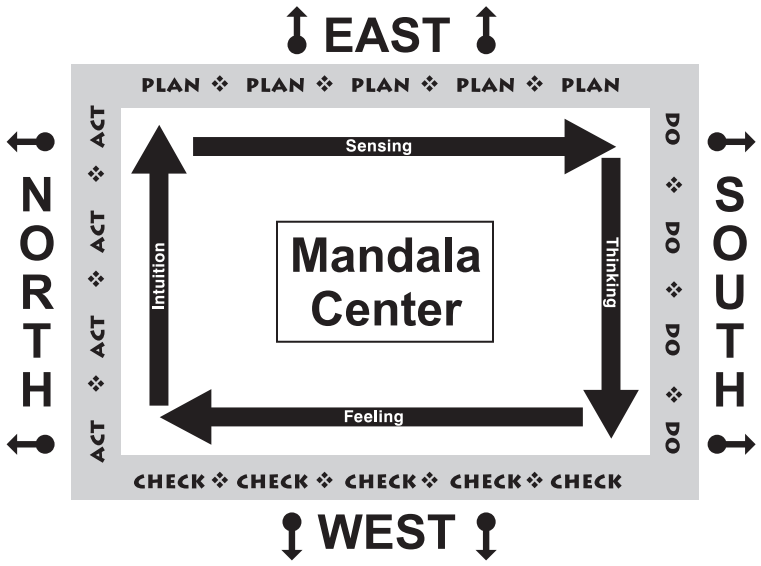


Figure 1

A Mandala is a holistic, schematized representation of the problem environment as a complete, orderly and harmonious system. The Mandala will provide a visually powerful, highly symmetric geometrical design.

The Mandala is a symbolic system of circles, squares, or **golden rectangles** in symmetrical arrangements of the number four and its multiples (**The Quaternion**). The principle of self-similarity among the arrangement of these objects aims for a higher level of integration and provides a vehicle for concentrating the mind so it may pass beyond its usual fetters.

If one understands the Mandala's inherent pattern language, a well-drawn Mandala can be the "story-board" of its objects.

Working our way from the outside of the Mandala, to its core, we begin with the outer edges. The boundaries of the Mandala form what is referred to as the "golden rectangle." A golden rectangle exists when the ratio of the smaller side to the larger side is the same as the ratio of the larger to their sum. The choice of the golden rectangle instead of the circle or square, indicates a vision of reality and not the perfect or completely invariant vision or pattern we are continuing to strive to create.

The next stop on our journey inward, we discover the Quaternion. The quaternion is an archetype pattern (cycle) of universal occurrence. It forms the logical basis for any whole judgment. In order to orient ourselves, we must have the following:

FIRST	a function which ascertains that something is there	(Sensation/Plan/East)
SECOND	a function which establishes what is	(Thinking/Do/South)
THIRD	a function which states whether it suits us or not, whether we wish to accept it or not	(Feeling/Check/West)
FOURTH	a function that indicates where it came from and where it is going	(Intuition/Act/North)

This cycle is referred to as the Plan, Do, Check, Act or PDCA Cycle, which is part of the TQM (Total Quality Management) tool set for continuous improvement. Figure 1 incorporates the golden rectangle boundary with the four items of our quaternion.

Next, we take a step further into the Mandala center. The objective behind the Mandala and its creative energy can be understood in terms of two opposite directions—**Object** and **Process**. These opposing directions and forces can be viewed graphically in Figure 2.

Object Directions:

Introversion (North): inward (**Internal**) into the realm of objects, images, ideas, and the unconscious, and

Extroversion (South): outward (**External**) into the world of other people and objects.

The focus of the Mandala creative process can be understood in terms of two other opposite directions. The Process Directions add emphasis that is orthogonal to the Object Directions:

Process Directions:

Discovery (East): new development or innovation of an idea or an object, and

Refinement (West): improvement on an existing idea or object.

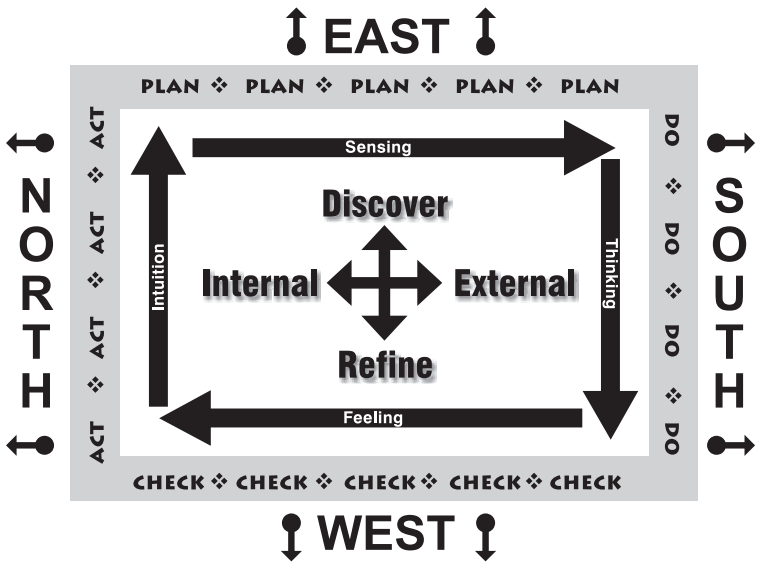


Figure 2: Mandala with Object and Process Direction

As seen in Figure 2, The art, symbols, and color of a Mandala should guide an individual from the distractions of the problem (outer rim of the Mandala), inward to a still center or problem invariant (the center of the Mandala).

The challenge of assimilating emerging technologies generally becomes a central focus in problem solving and will most likely gravitate to the center of your Mandala. The

assimilation process itself is quaternary: Table 1 lists each phase of the quaternary with its description and its association to the ITMM.

Table 1: Phases of problem assimilation within Mandala

Quarternary	Description	ITMM
Phase 1	Technology identification and investment	Innovation
Phase 2	Technology learning and adaption	Learning
Phase 3	Management Control	Rationalization
Phase 4	Widespread technology transfer	Maturity

Metaphors:

- A "personal thematic presupposition" or symbol that drives a person. As in Martin L. King's "I a have a dream..."
- Kepler's model of the planetary orbits as a concentric structure defined by enclosed highly symmetrical solids
- Chaotic situations in Alice in Wonderland or better still the Oz story set confusion as the initial theme then proceeds to achieve a solution. In Oz, a path is decided upon, then roles are assigned. Each role is important to the success of the journey.

Examples:

How a Scientific Discovery Is Made: A Case History American Scientist, Vol 84, 1996 Muller: "If you are familiar with Jung's terminology, the perovskite structure was for me, and still is, a symbol of—it's a bit highfetched—but of holiness. It's a mandala, a self-centric symbol which determined me"

Resulting Context:

A Mandala is designed to guide the viewer into an altered state of awareness through contemplation. As shown in Figure 3, a quaternary grid of the states (quadrants) of problem solving awareness evolves. Table 2 lists the directions of the quaternary and the associated activities. Figure 3 applies the four states to the center of the Mandala.

Table 2 : States of Problem Solving Awareness

Direction	Activity State
Southeast (SE)	External/Discover
Southwest (SW)	External/Refine
Northeast (NE)	Internal/Discover
Northwest (NW)	Internal/Refine

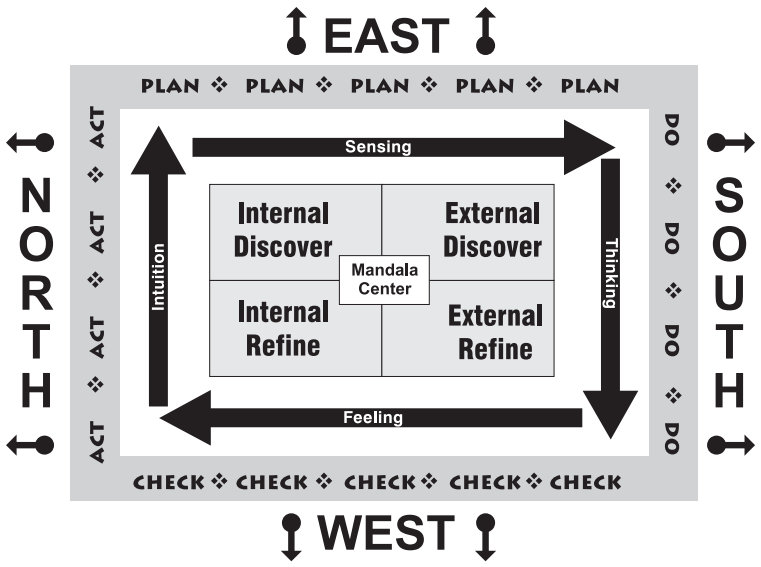


Figure 3: Mandala with problem solving grid

Application of PDCA cycle

Delving deeper into the center of the Mandala, the PDCA cycle is applied to each of the problem solving phases. Figure 4 shows the PDCA pattern applied to each quadrant using the principle of self-similarity.

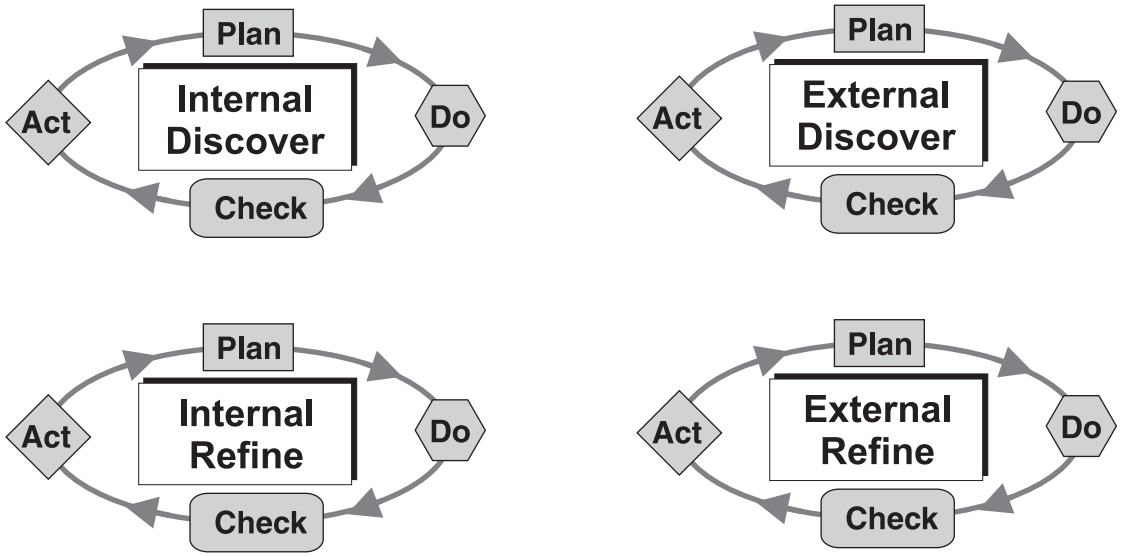


Figure 4: PDCA and the Problem Solving States

Problem Solving States Linked

Figure 5 and Table 3 combine to link together the problem solving states into one state diagram.

Table 3 : Explanation of States

	State	State of Idea	ORB Web Model	ITMM Cycle
1	**Logical Solution**	The Embryonic Prototype	Bridge Thread and First Fork	Plan
2	**Solution Development**	The Shell Prototype	Fame and Secondary Radii Tertiary radii	Do
3	**Physical Solution**	The Working Prototype	Hub and Strengthening Zone Temporary Spiral (Hub to Frame)	Check
4	**Solution Process**	The Operational Prototype	Rest Viscid Thread or Final Spiral (Frame to Hub) Balance and Stabilimentum	Act

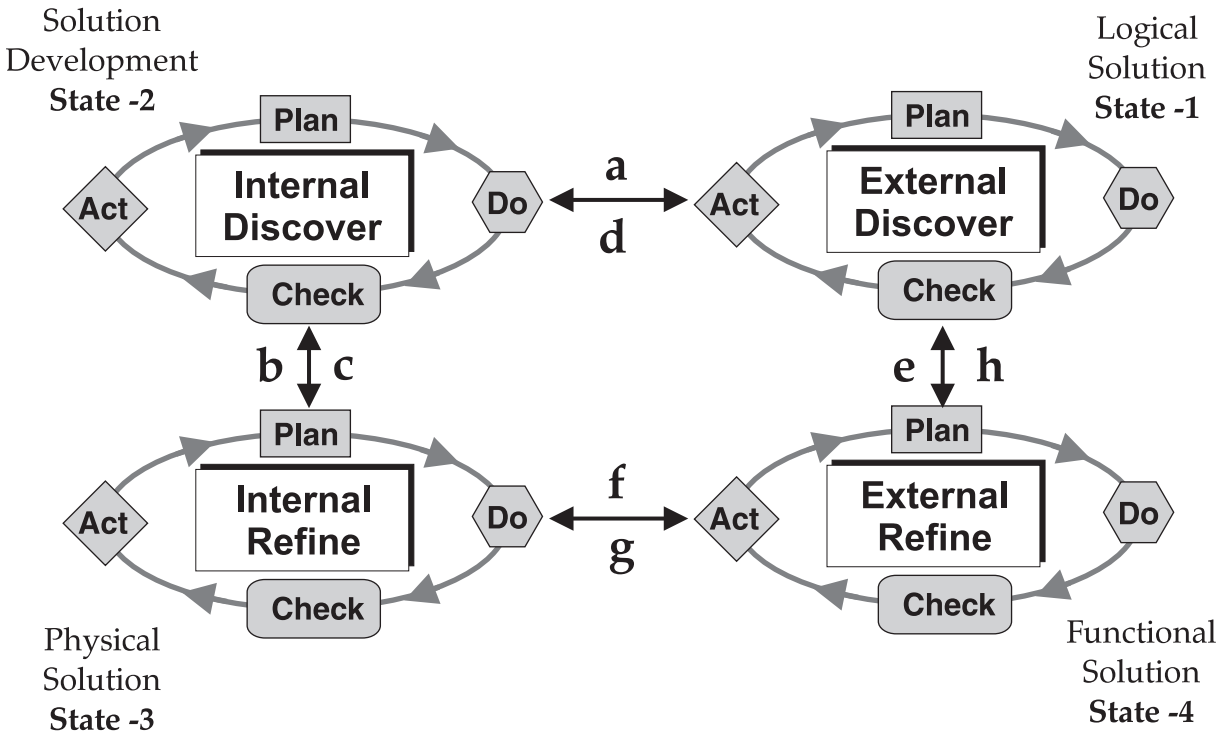


Figure 5: State DiagramLink Problem Solving States one Through Four

Lastly, we link the Object and Process Directions to the Quaternary of Phases. The following transition data is given in Table 4:

Table 4: Transitions between States

Object Direction			
Link	**From**	**To**	**Process**
a	State 1	State 2	Innovation
d	State 2	State 1	Learning
f	State 4	State 3	Rationalization
g	State 3	State 4	Maturity

Process Direction			
Link	**From**	**To**	**Object**
e	State 1	State 4	Solution Increment
c	State 3	State 2	Consolidate
b	State 2	State 3	Solution Increment
h	State 4	State 1	Consolidate

Table 5: Matrix

Transition Matrix				
	State 1	State 2	State 3	State 4
State 1		**a**		**e**
State 2	**d**		**b**	
State 3		**c**		**g**
State 4	**h**		**f**	

Rationale:

A Mandala becomes the "Container of Essence".

Self-Similarity Principal:

Parts of the whole are recreations of the whole. In our example, the PDCA cycle replicates itself around each stage of Problem Solving. The smaller PDCA cycles are identical to the overall PDCA cycle of the entire Mandala.

Related Patterns:

PDCA Cycle

Known Uses:

Software Architecture:

Historically, mandalas have been made by all cultures from the Aztecs to the Navajo Indians to people today. Recently, this approach to problem solving has been applied by Philippe Kruchten of Rational Software Corp. to the subject of Software Architecture in his article entitled "The 4+1 View Model of Architecture."

Kruchten's problem solving technique organizes a "description of software architecture using five concurrent views… Architects capture their design decisions in four views and use the fifth view to illustrate and validate them."

There "4+1" Model fits well within the Mandala pattern. First, the "4+1" Model seeks to solve a huge and complex problem (Software Architecture). Secondly, it takes a chaotic situation and captures it in the four views (a Quaternion).

Also, as with the Mandala, there are four directions in the problem solving activity that are involved in an iterative process (the Mandala uses the Plan, Do, Check, Act (PDCA) Cycle). Lastly, the center of the model's Mandala is captured in scenarios. There is also a correspondence between each of the views. Figure 6 shows the "4+1" model graphically.

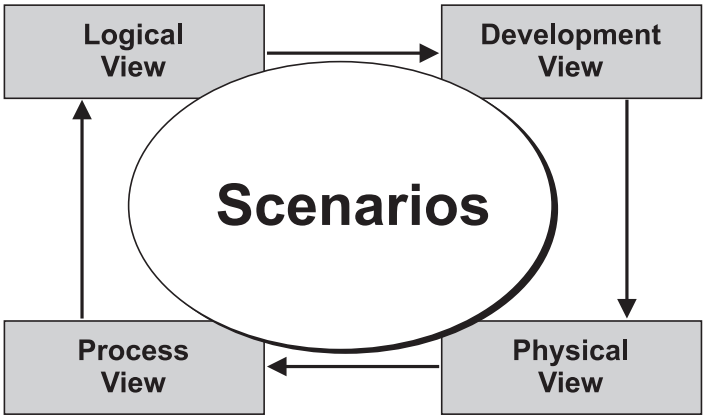


Figure 6: "4+1" View Model of Architecture

Pattern: Abstract Mandala

ITMM

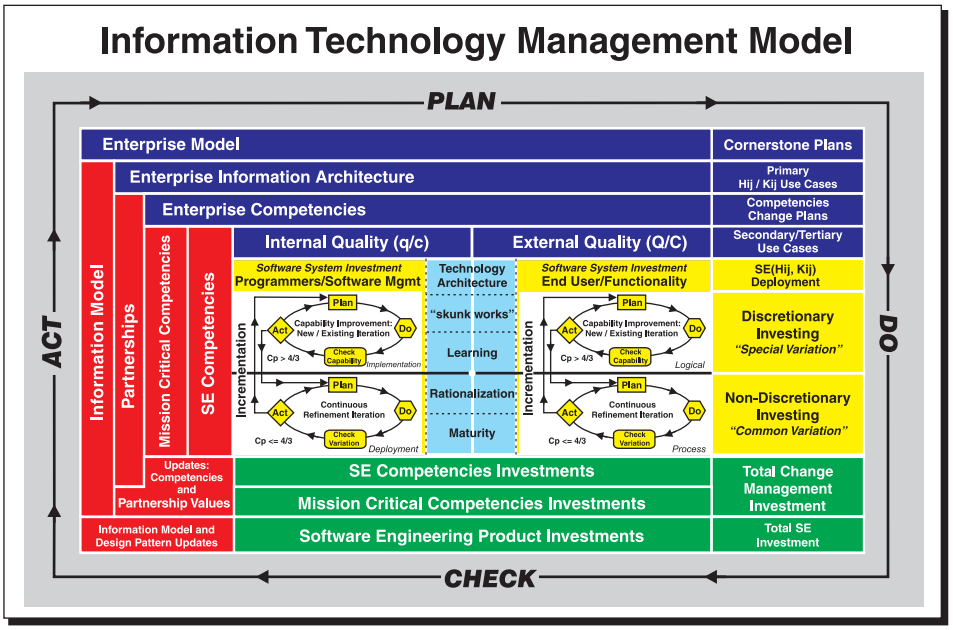
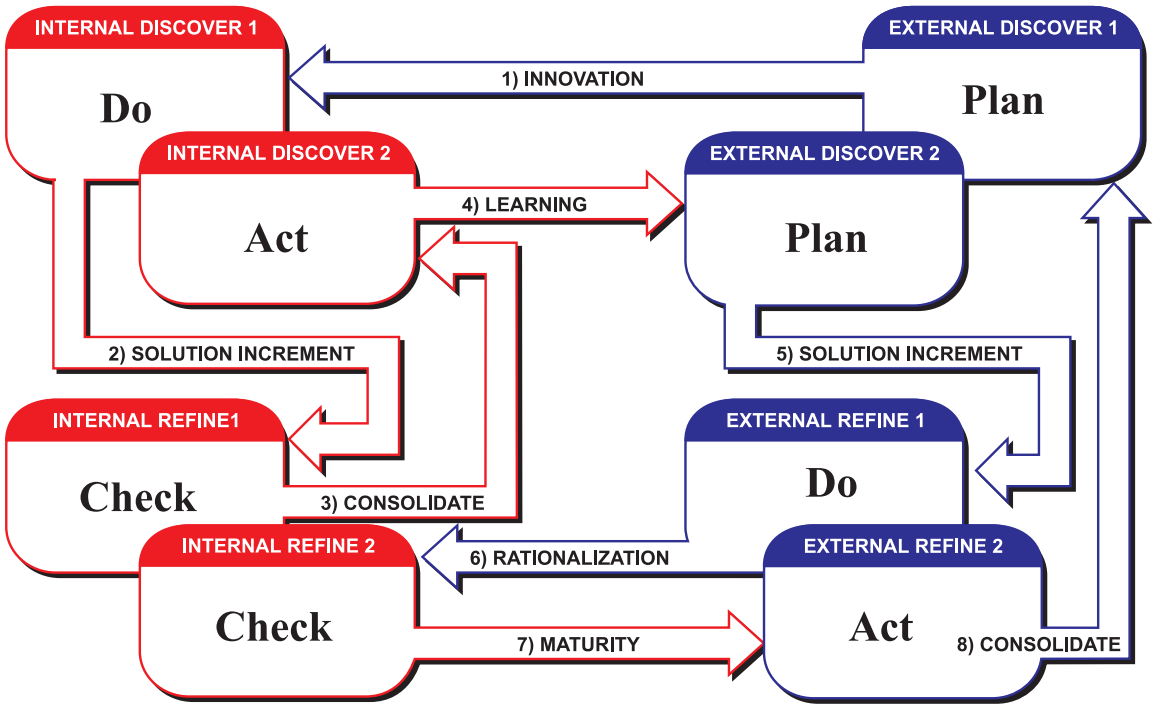


Figure:



Abstract Mandala / 8-step model

Reference:

ITMM:

Information Technology Management Model created at NC State University. (http://www.csc.ncsu.edu/eos/info/csc_info/citmr/enterprise.html)

"No Silver Bullet" Articles:

"What if There's a Silver Bullet … And the Competition Gets it First?" (www.virtualschool.edu/cox/CoxByte.html)

"No Silver Bullet; Essence vs. Accidents of Software Engineering"

Jungian Glossary from Memories, Dreams, Reflections (http://www.jungindex.net/glossary/)

Muller (1996)

Pattern: Information Technology Management Model

Inspirational Quotes:

"If money is your hope for independence, you will never have it. The only real security that a man can have in this world is a reserve of knowledge, experience and ability."
– *Henry Ford*

Pattern Name:

Information Technology Management Model

Aliases:

ITMM

Balanced Scorecard Solution (SAS Product)

Context:

Today, all organization's have to depend on Information Technology (IT) for all their business and operational processes. They are all faced with the IT dilemma: having to keep up with the constant change of IT available, selecting and applying it to their specific needs.

Problem:

Managing IT investments to fit an organization's specific needs.

Forces:

IT often fails for multiple reasons:

- IT assets are under-managed
- IT division is not a strategic partner
- It is difficult to show clear return on investment (ROI)
- Business process/technology is not understood
- IT investments are usually left to technologists

Solution:

The Information Technology Management Model (ITMM) provides a framework (Figure 1) for managing IT investments effectively and efficiently, and for measuring return on IT (ROIT). ITMM is based on concepts from the Total Quality Management (TQM) model.

Four core features of ITMM:

- Emphasize continuous improvements
- Focus on satisfying customers internal and external to the organization

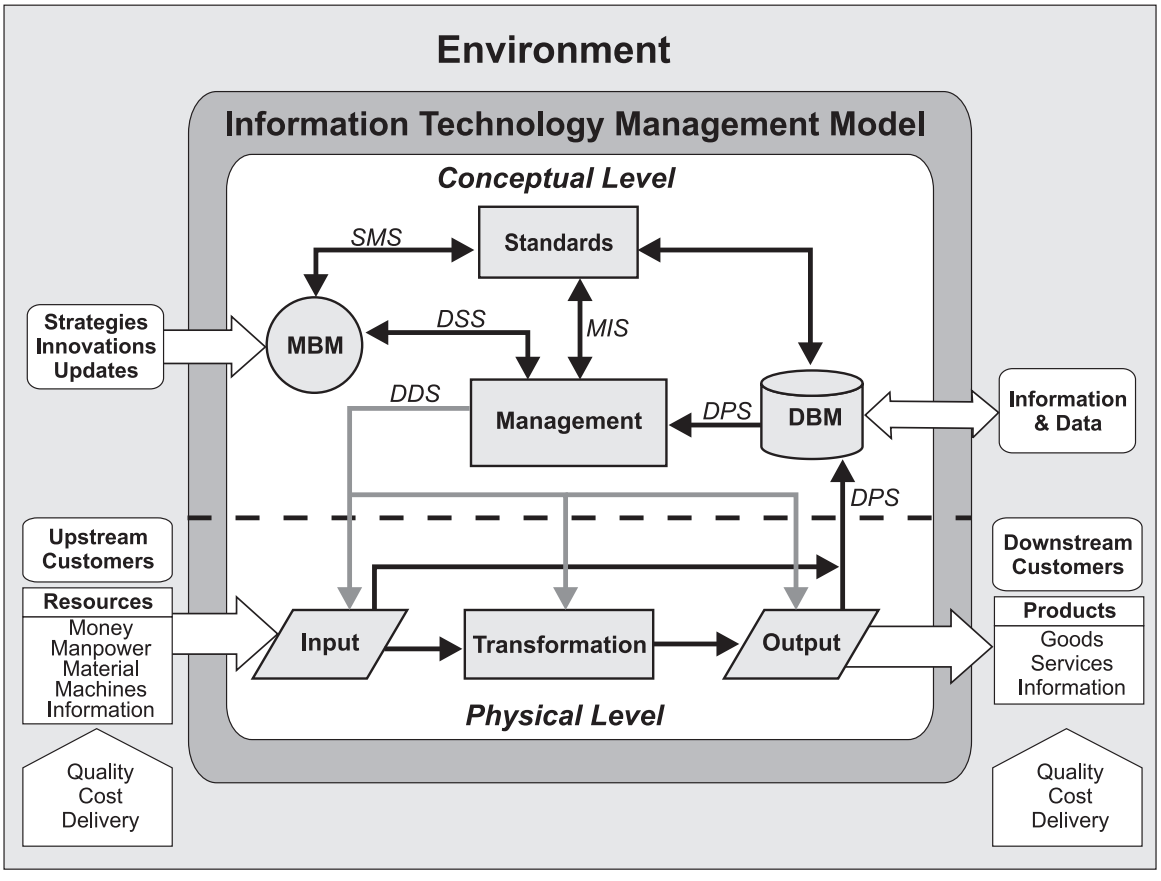
- Stress factual information and techniques to gather, organize and evaluate TQM
- Require employee empowerment

Metaphors:

The cockpit of the largest jet passenger airplane.

Examples:

- ITMM was built on concepts used at Procter&Gamble and Milliken
- For Milliken : each phase of development was 'benchmarked' with Milliken
- CSC/IE 546

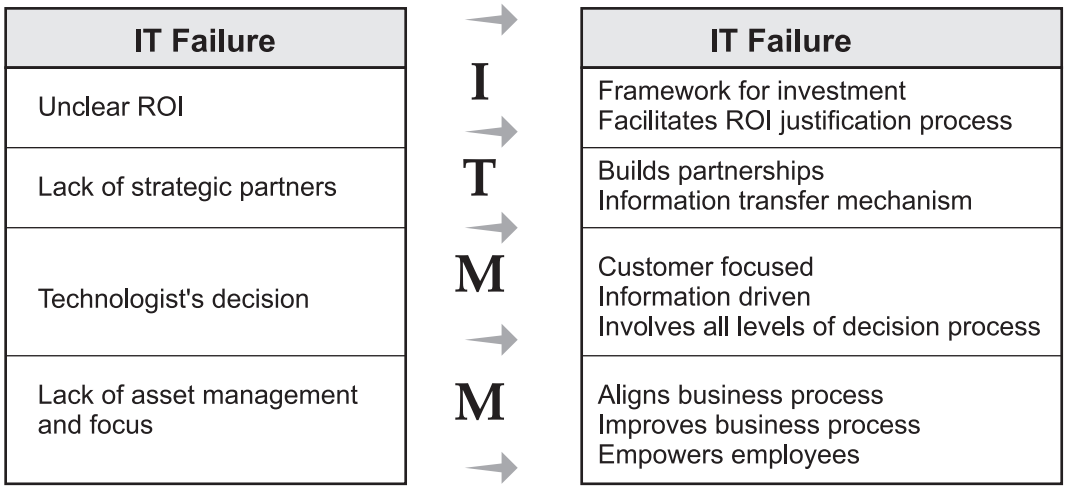


DDS = Decision Delivery System (Textual)
DBM = Data Base Management System (Factual)
KBM = Knowledge Base Mgt System (Conceptual)
DPS = Data Processing Systems (Transactional)
MIS = Management Information Systems (Informational)
DSS = Decision Support Systems (Strategical)
ERP = Enterprise Resource Planning (Holistical)
SMS = Simulation And Modelling Systems (Normative/Skunk Like)

Pattern: Information Technology Management Model

Resulting Context:

IT failures can be avoided and turned into successes:



Rationale:

Turn Measures into Strategies Through Focus and Alignment - SAS

ITMM:
CORPORATE OBJECTIVES:
PROFITABLE GROWTH THROUGH FOCUSED INNOVATION WITH A BALANCED APPROACH
CORPORATE STRATEGIC ISSUES:
TOTAL COST REDUCTION, CORNERSTONE PLANNING, AND HOOSHIN (BREAKTHROUGH)
PLANNING BREAKTHROUGH:
"A DRAMATIC CHANGE IN LEVEL OF PERFORMANCE HERETOFORE NOT ACHIEVABLE"

Related Patterns:

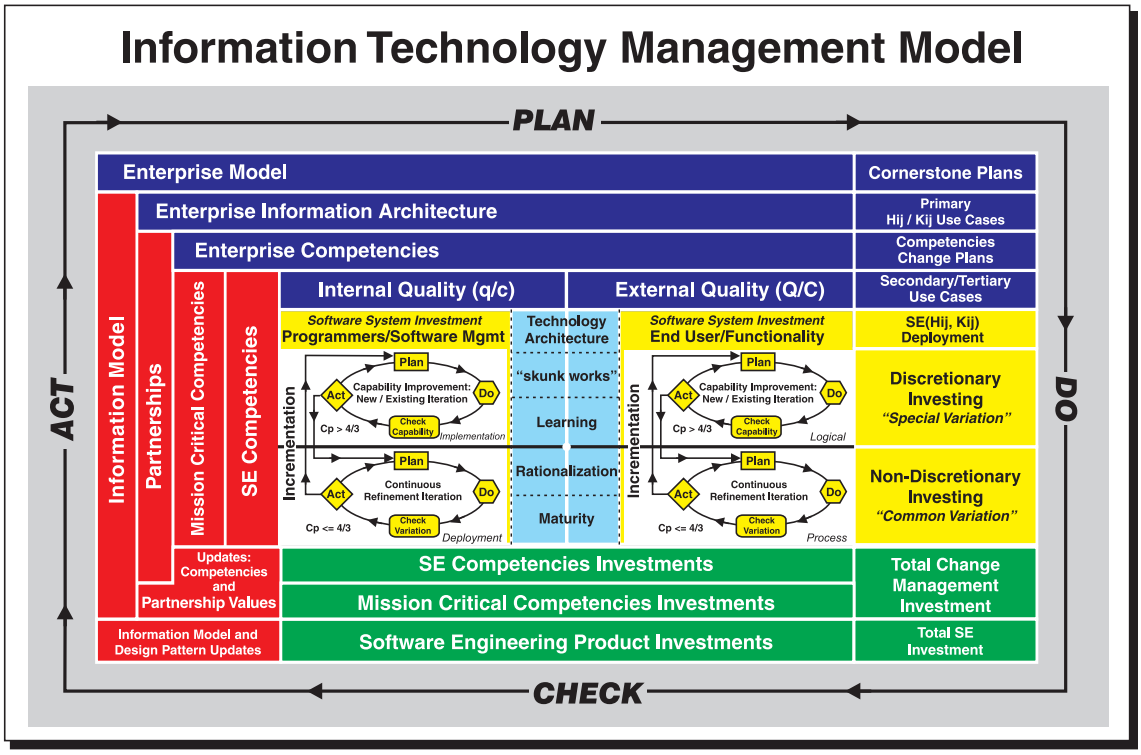
PDCA Cycle
KIM
Framer
Sharer
Maker
Finder

Known Uses:

SAS Product:

You only get what you measure. But, when it comes to performance management, how can you be sure you are measuring the right things? And communicating the right information to the right people? The answer is simple: SAS. Our balanced scorecard solution is the cornerstone of effective management — allowing you to align and support key processes...and to translate strategy into operational objectives, measures, targets and initiatives.

Figure:



ITMM

References:

Holanek et al., "Managing Information Technology Investments in Today's Business". PPT presentation IE 546, 1997?

CITMR. Information Technology and quality improvement: A business model for the next millenium.

Pattern: KM Advance Organizer

Inspirational Quotes:

There is no saturation in education.

Tell me, and I will forget.

Show me, and I may remember.

Involve me, and I will understand.

It is not the desire to succeed that insures success, it's the discipline to prepare yourself for it.

– *All of the above are quotes and mottoes on Roger Milliken Center walls*

Pattern Name:

KM Advance Organizer

Aliases:

Subsumption
Theory of Meaningful Verbal Learning.
Abstract Metaphor.

Context:

Any learning environment in KM where the learner's prior knowledge must be reorganized to incorporate new knowledge.

Problem:

You are faced with the need for introductory materials, which provide the learner with a framework within which the particulars of KM can be understood.

Forces:

- Concerned with how students learn large amounts from verbal or textual presentations in the classroom setting.
- A main component of learning is subsumption where new material is related to relevant ideas in our existing schema on a general level.
- To connect what is known and unknown

Solution:

One way to relate this new material is through the use of KM Advance Organizers (KMAO).

The PURPOSE of an Advance Organizer is to connect what is known and unknown. It is a way to use students' prior knowledge about material and to see how they have organized the information in their schema. The process of using Advance Organizers

allows students to reflect on what they know and assists students in comprehending the new knowledge.

The STRATEGY behind the Advance Organizer is to organize new material for presentation by outlining, arranging, and sequencing the main idea of the new material based on what the learner already knows.

Advance Organizers are created by the KM instructor to help students learn. They are not created by the students as part of their learning. Advance Organizers use verbal information to aid the learner in knowing the what, how and when information about the new material.

There are seven FEATURES of an Advance Organizer:

1. It is a brief, abstract prose.
2. It is a bridge that links between similarities of the unknown with the known.
3. It is used as an introduction to the new material.
4. It is an abstract outline of new information and a restatement of old knowledge.
5. It helps to structure the new information.
6. It encourages students to transfer and apply old knowledge.
7. It consists of concrete intellectual information.

Advance Organizer Template:

http://wphs.ocps.k12.fl.us/tl/Advance%20Organizer%20Template.htm

It is one of two cognitive strategies (the other is Metaphor) that enables the learner to recall and transfer prior knowledge to the new topic.

An Advance Organizer is a bridging strategy that provides a connection between one unit and another. It also acts as a schema for the learner to make sense out of the new material.

The Advance Organizer is a brief prose passage about a paragraph of length. It introduces the new material before it is presented. It is a rich and powerful transition statement.

Metaphor:

Your living will as in legal document.

Examples:

Plan of work for the Master's degree using an Advance Organizer

Previously, we have learned that there are various components in developing the instructional strategy. There are several cognitive strategies that an instructional designer could draw upon when developing the various components of the instructional episode. We have already learned that Metaphors are bridging cognitive strategies useful in informa-

tion assimilation. Advance Organizers are another form of bridging strategies. Remember that in designing the instructional episode, recall of prior knowledge relevant to the new knowledge is important. This is done before you begin presentation of the new material. Well, Advance Organizers like Metaphors could be used to make a strong connection and transition from the prior learned material into the new material to be presented. In this unit, we will define the characteristics of the Advance Organizer.

Plan of work for the Master's degree using the Keyword Method

ASSURE is an acronym utilizing the keyword method to aid recall of the various components of a classroom oriented instructional design model developed by Heinich, Molenda & Russel (1989).

A Analyze Learners
S State Objectives
S Select Media and Materials
U Utilize Materials
E Evaluation /Review

Resulting Context:

KMAOs are introduced in advance of learning itself, and are also presented at a higher level of abstraction, generality, and inclusiveness; and since the substantive content of a given organizer or series of organizers is selected on the basis of its suitability for explaining, integrating, and interrelating the material they precede, this strategy simultaneously satisfies the substantive as well as the programming criteria for enhancing the organization strength of cognitive structure.

Rational:

Provides the user with a ready-made Frame.

Related Patterns:

KM Magic
Framer
Sharer

Known Uses:

Higher Education

Figure:

References:

Heinich, Molenda & Russel (1989).
Ausubel, D. (1968)
Ausubel, D.P. and Fitzgerald, D. (1962)

Inspirational Quotes:

"If your organization knew what your organization knows, it would be three times as profitable" – *This is a paraphrase of a quote by Hewlett Packard CEO Lew Platt*

"The greatest waste of our natural resources is the number of people who never achieve their potential"

Pattern Name:

KEO Book

Aliases:

KEO Book background and objective

Context: *years of research, case studies and applications*

This book presents a methodology for knowledge management, sharing and stimulation based on the Knowledge Insight Model (KIM). This book was part of a post-doctoral research project I conducted in collaboration with Dr. Thomas Honeycutt from the Computer Science Department at North Carolina State University.

Over the last six years Dr. Tom Honeycutt at North Carolina State University has become a recognized expert in the development of Knowledge Management concepts. Experience has been gained in applying these principles not only to Information Technology (IT) constructs, but also to the greater e-commerce reality. Dr. Honeycutt is the professor for the NCSU class IE / CSC 546 Management Decision and Control Systems. Through the work of this class, Dr. Honeycutt has drawn around him a group of professionals from academia, from the e-commerce industry, and from the Information Technology sector. Students in CSC 546, industry participants in class presentations, seminars, and panel discussions have allowed a focus on real world information technology and knowledge management issues.

I took Dr. Honeycutt's IE 546 class in the Fall of 1998. I had just finished my literature review for my Ph.D. dissertation. I found myself in a state of confusion and needed some model, method, tool and/or framework to help me organize all the information I had just reviewed. Based on concepts presented in Dr. Honeycutt's class, I was able to customize a methodology to organize the knowledge I had acquired in my literature review and to articulate it in a way that would help others integrate it very quickly and profit/grow from it.

Other students had the same enlightening experience as I did using these same concepts and applying them to their specific needs. Two professionals from the IT sector, Jim Bender and John L. Baines, Dr. Honeycutt and myself decided to form a team called Knowledge Enabled International (KEI) that would actively pursue the progression of these concepts and all their potential applications. This KEI team has developed and applied KM and IT management concepts to their own work. Ideas and methodologies have been practiced and honed against real world benchmarks and test-beds. KEI has monitored organizations

as they have participated in the IE/CSC 546 course. Senior management personnel in a variety of cutting edge organizations have been captured on videotape and represent an incredible resource of intellectual property.

All of these resources have been used to develop a holistic dynamic methodology that would help capture all of this knowledge and experience so it could be shared, used to benchmark and tutor other organizations. It is in this context that the idea to publish this book was born.

Problem: *Objective of the book*

Our objective in writing this book was to present the valuable concepts that had proven so helpful to enlighten professionals both in industry and academia in our knowledge driven new economy. The problem was to develop a methodology that could be useful and understandable to the widest public possible. We needed to develop a very abstract version of the Knowledge Insight Model (KIM) and provide the tools to customize KIM to ones specific needs.

Forces: *Challenges and opportunities*

Enterprises today face daunting challenges of the new economy

- They must cope with constant change in order to face the economic shifts created by the Internet and other technology driven opportunities.
- Information technology is creating e-commerce opportunities that can be implemented incrementally.
- Technology is now strategic, in that the products and support tools that can be built today could not exist before today's Internet technology.
- Timing is critical to benefit from these technology driven opportunities
- Planning must be incremental on very short horizons.
- Firms need to reinvent themselves relentlessly, just to remain competitive.
- Many companies are going out of business daily because they just cannot keep up the pace.
- They must learn to identify and use their existing knowledge assets in new and imaginative ways if they are to compete in a fast-paced e-commerce environment.
- Corporate culture and organizational structure can make it difficult to identify the real value in the employee infrastructure and all the available underlying knowledge.

Opportunities must be identified internally and externally.

- Only a few organizations will find new and creative ways to blend their existing knowledge resources with new technology and will become the emperors of the Internet economy.

- These firms will welcome the changes in technology and see them as golden opportunities rather than obstacles to overcome. They will build new strong e-commerce products using the Knowledge Management software and learning tools.
- First organizations must look inside themselves and examine their existing knowledge assets. Firms may not find this easy; today's products are often built upon unwritten assumptions that have never really been examined.
- The knowledge assets detected must be nurtured, protected, shared and added to grow the knowledge base within the organization to support the new e-commerce opportunities to come.
- The successful organization must develop new economic courses, build new product designs, and use the valuable knowledge assets identified within the organization in creative new ways. In this way, existing investments and assets can be put to work anew in e-commerce vehicles.
- It is not enough to be inward looking in the quest for Knowledge Management.
- The winning established enterprise must continuously monitor changes in e-commerce, whether the challenges are B2C, or B2B, or whatever comes next.
- The leaders in the enterprise need a very clear vision of their objectives. They must move quickly to take advantage of favorable short-term environmental influences. But they must not look too far ahead, or they may miss sudden shifts and drive the organization into calamity.
- Control processes, enabling checks and balances against e-commerce goals and objectives must be built into the new organizational framework to allow constant refocusing of plans.
- With the constant evolution of Information Technologies, organizations must solicit and develop business partners that can help in developing new skills and applying software tools to support the creative new products.
- But they must go further than that in finding ways to build Knowledge Management methodologies and processes in to the very waft and weave of the organization.

Solution: *holistic dynamic methodology centered around KIM*

We view Knowledge Management as an ongoing discipline to be developed to meet the unique needs of each organization. But our own knowledge tools allow us to do this in a way that permeates the structure of a specific organization.

The **Knowledge Insight Model** we developed can help any organization manage its knowledge and activities between internal and external sources, and for both discovery and refinement processes. KIM is at the center of a holistic dynamic methodology (Knowledge Enabling Organon, a.k.a. KEO) that can be used not only to capture existing knowledge but also to plan what new knowledge is needed, how to create it, share it and ensure

its best possible deployment. The methodology involves several models, concepts and tools all presented using a pattern format.

- The term "pattern" here refers to generic problem-solving patterns empirically proven to be successful in a specified context of forces. Each pattern is a relationship between a certain context, a certain system of forces which occurs repeatedly in that context and gives rise to a certain problem, and a certain solution which allows these forces to resolve themselves. The pattern defines both what you have to do to generate an entity and the entity itself. For this reason all the concepts, models and tools mentioned in this book are presented in pattern format. Each pattern explains both what the concept, model or tool is and how to apply it to your specific needs. Further more patterns are related to one another. This allows constructing a pattern language which not only is specific to the individual needs of the user but also allows to articulate the dynamics of these concepts, models and tools. For those of you familiar with patterns, you probably have noticed that this book is written in pattern format using a series of related patterns. For those of you who are not familiar with patterns, you may want to briefly review the patterns defining what a **Pattern** and **Pattern Language** are before reading on.
- **KIM** provides its users with a KM framework and a set of related models (**Framer, Sharer, Finder, Maker**) that can help any organization manage its knowledge and activities.
- Users are guided into altered states of awareness within each related model by a series of Plan-Do-Check-Act (**PDCA**) problem solving cycles.

Metaphors:

Guiding device in unpredictable turbulent waters

Enterprises today face daunting challenges like a lifeboat in troubled waters. On the one hand they must learn to identify and use their existing knowledge assets in new and imaginative ways if they are to remain afloat in an e-commerce sea. At the same time enterprises must cope with constant change in order to face the economic storms created by the Internet and other technology driven opportunities. The winning established enterprise must continuously survey the constantly changing seascape of e-commerce, whether the challenges are B2C, or B2B, or whatever comes next. The leaders in the enterprise need a very clear vision of the course they are charting. They must move quickly to take advantage of favorable e-commerce breezes. But they must not look too far ahead, or the economic weather patterns will change and drive the organization into calamity. Planning must be incremental on very short horizons. Firms need to reinvent themselves relentlessly, just to remain competitive, as e-commerce clouds move and shift in the economic sky. These firms must see the changes in technology as e-commerce silver linings, rather than sandbanks or economic rocks on which to founder.

But how do we push out from shore on this e-commerce sea? And what compass do we use to plot our economic direction, as magnetic north moves? What radar sees through the

fog of hype and vaporware claims that surround the rocks of technological folly? How do we identify and build our e-commerce vessels quickly according to proven patterns?

The patterns presented in this book provide flexible orientation tools that can be interpreted and applied by each user according to their specific navigation needs and chosen destination:

- to understand what is the enterprise's current situation,
- where it should go,
- what are the necessary resources to get there,
- what are the available internal resources,
- where to find the missing resources externally, and
- how to combine all these resources so that the most efficient and effective course may be followed.

"The story of visual discoveries in art"

Inspired by E.H. Gombrich

Our formula of schema and correction, in, fact, illustrates this very procedure (KIM). You must have a starting point, a standard of comparison (Framer) in order to begin that process of making (Maker) and matching (Finder) and remaking (Sharer) which finally becomes embodied in the finished image. The artist (knowledge worker) cannot start from scratch but he can criticize his forerunners.

Examples: *practical applications*

The University community is defined in an "open information" environment—one where knowledge is open to the public. Our business is to discover knowledge, to learn from our knowledge breakthroughs, to rationalize and share knowledge by teaching it to our students, and to transfer mature knowledge to the public domain. Therefore, if KM is the key managerial issue of the next few decades in the work place, does it stand to reason that a successful KM strategy at the University level may well be the necessary and sufficient strategy for all?

The full nature of our book is directed to answer the above question. The mission of the research university is three fold: Research, Teaching, and Public Service. Our four fundamental knowledge patterns of our book address each of the missions from various directions:

The Maker — Research ➠ to discover

The Sharer — Teaching ➠ to learn, to rationalize

The Finder — Public Service ➠ to transfer

The Framer — Knowledge Is Our Business ➠ to manage

Resulting Context: *consequences of applying KEO*

The tools and models presented in this book enable its users to:

- objectively analyze and seek out all their potential knowledge assets
- determine what critical knowledge assets are missing and fill that gap
- capture and certify new knowledge
- ensure the maintenance and constant growth of a reliable updated knowledge pool
- deploy pertinent available knowledge to users where, when, and in the format they need

Rationale: *why KEO works with the forces involved*

Organizations must look inside themselves and examine their existing knowledge assets. Firms may not find this easy; today's products are often built upon unwritten assumptions that have never really been examined. Knowing how to run a delivery service did not look that valuable twenty years ago. Federal Express coupled that knowledge with a global plane network, and then an Internet-based self-service tracking and scheduling system. FedEx became poised to take the consumer e-commerce delivery market by storm by combining an old-world delivery service with today's world aviation and information technology. And their timing was perfect to supply this service to Internet dot coms and their customers.

The patterns presented here enable the users to take an objective look at their enterprise and assess their internal resources and external opportunities. By capturing existing knowledge and planning what new knowledge is needed, how to create it, share it and ensure its best possible deployment, they can ensure the nurturing and growth of the valuable knowledge base within the organization to support the new e-commerce opportunities to come.

Related Patterns:

Magic Illusion
KM Link
Patterns
Pattern Language
PDCA Cycle
KIM
Framer
Sharer
Finder
Maker
KIM cube
Knowledge Enabling LLP
Abstract Mandala
ITMM

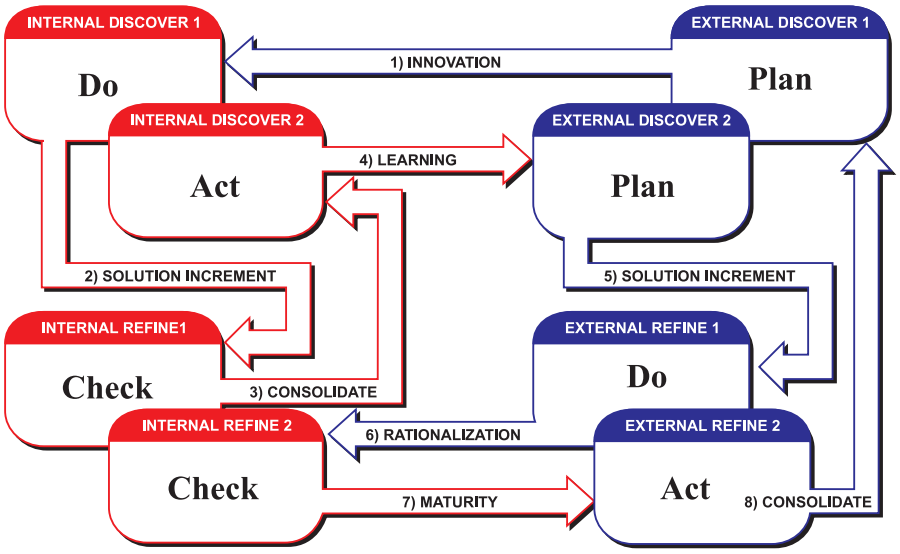
Known uses: *in industry and academia*

- KE LLP— See pattern called Knowledge Enabling
- *A Brief History of Everything* by Ken Wilber

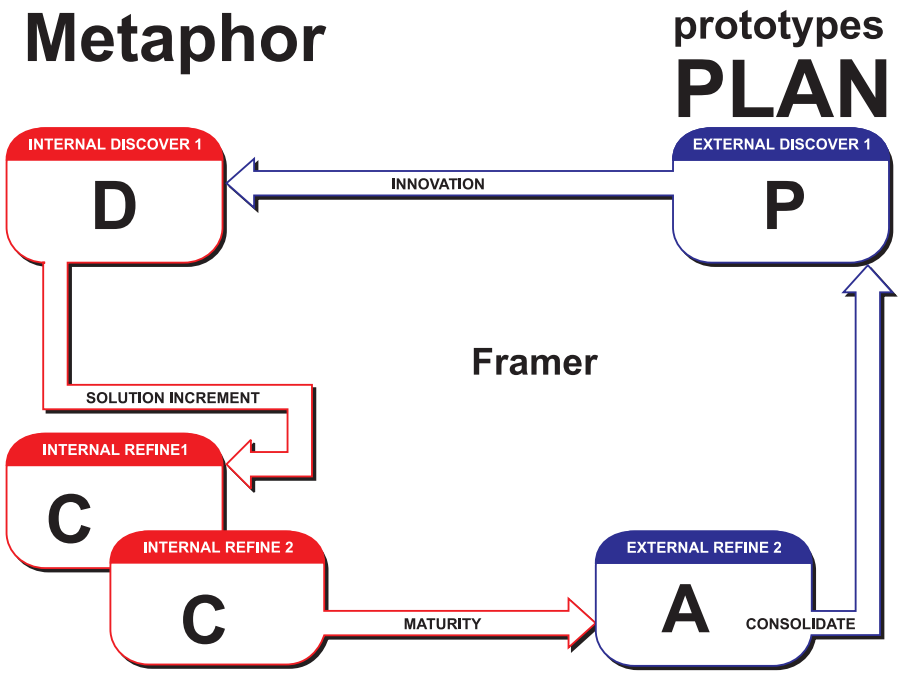
Pattern: KEO Book

Our book called KEO goes well beyond this book's catchy title. Although the Wilber book is based on man's need to have the four-quadrant model, it only fills in with "history"— it does not use the four quadrants to explain things. The ideas of Jung, archetypes , the Mandala as the core of KIM, make our book unique in KM.

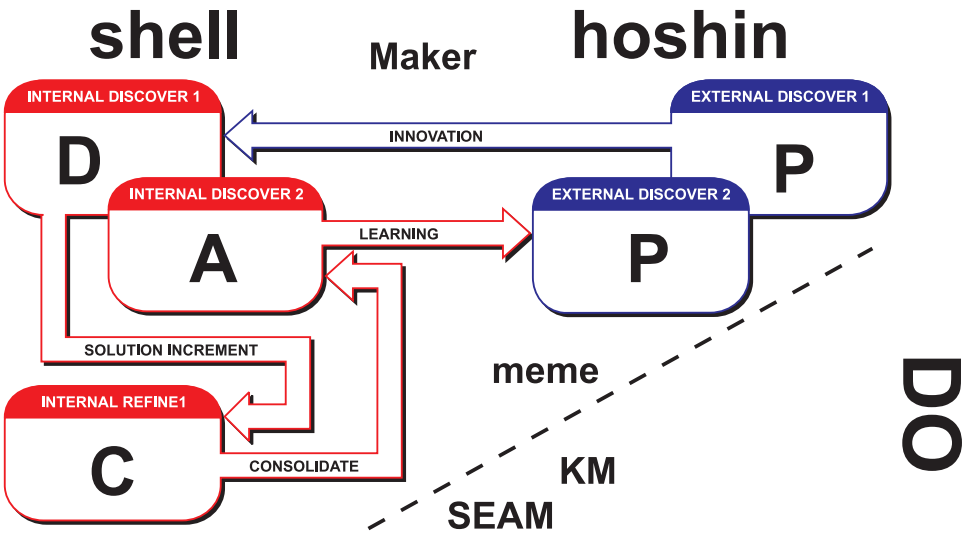
Figure:



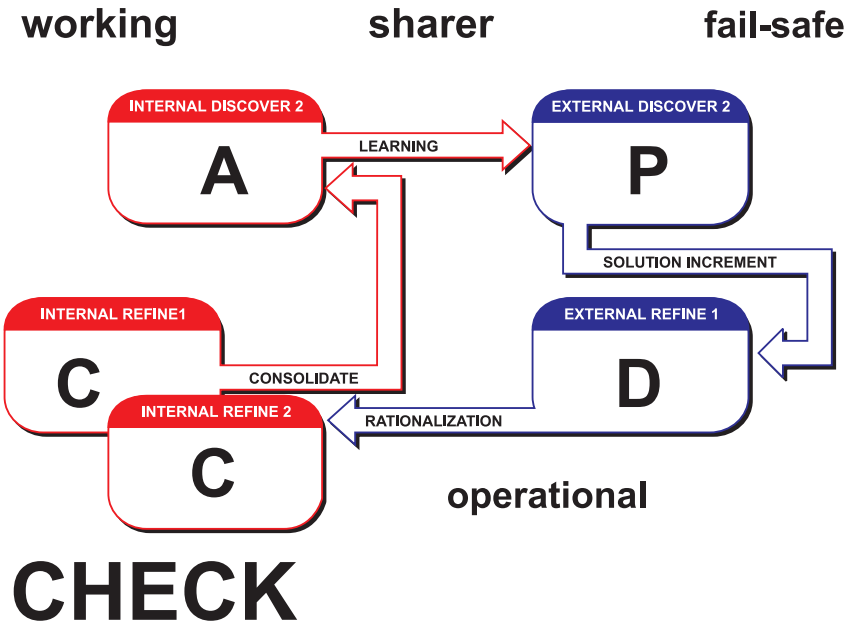
PDCA Cycle



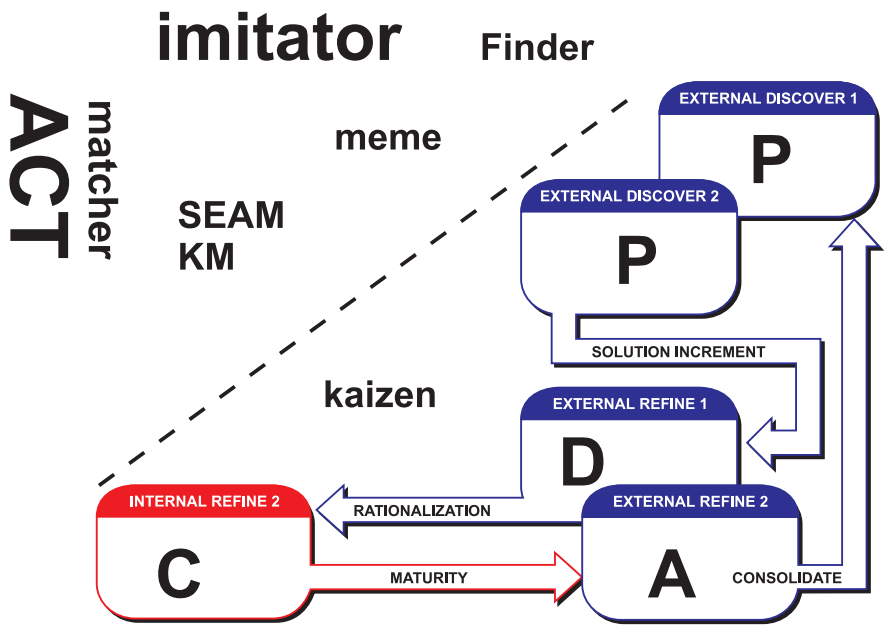
Plan Cycle



Do Cycle



Check Cycle



Act Cycle

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Alexander
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Joe
Patty O'Neil, Executive Administrator of ArgoMed Inc.

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Table of Acronyms

B2B:	Business to business
B2C:	Business to consumer
GoF:	Gang-of-Four
IT:	Information Technology
KEO:	Knowledge Enabling Organon
KEO:	Knowledge Executive Officer
KIM:	Knowledge Insight Model
KM:	Knowledge Management
KMAO:	Knowledge Management Advanced Organizer
OOD:	Object Oriented Design
OOPSLA :	Object-Oriented Programming, Systems, Languages and Applications
PDCA:	Plan-Do-Check-Act
PL:	Pattern Language
PLoP:	Pattern Languages of Programming
ROI:	Return on Investment
ROIT:	Return on IT
TQM:	Total Quality Management