Conceptual Management Tools

A Guide to Essential Models
for Knowledge Workers

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Table of Contents

1 Executive Summary

Overview

The executive summary briefly explains the nature of conceptual management tools (by providing a working definition) and their application areas. It highlights the main principles behind this kind of tool and points at its limits.

Rationale

Knowledge work consists of non-routine, complex tasks which involve the use of large quantities of (often incomplete or ambiguous) information, both as inputs and outputs of work processes. Thus, knowledge workers need tools that add value and context to information as they work with it. These tools should reduce complexity through aggregation, organize information through categorization, and make options for action systematically visible.

New and old tools

Some of these tools, like Cartesian coordinate systems, have been used for a while within the realm of management, while others, like the integration map or the strategic game board, have only been in use for a short period of time. The following definition establishes a common denominator for these traditional and recent 'thinking instruments':

Definition

> A conceptual management tool is a structured, model based way of proceeding to improve the problem solving or decision making process either individually or for a group in an organizational context. A conceptual tool achieves this by providing thought structures, action steps, and representation formats to facilitate convergent (analytical) or divergent (creative) thinking.

Review of 34 tools

In total, thirty-five such tools will be explained in this paper. Six of them have been invented by the author (On*Track*, Integration Map, Expert Web, Me Map, Personal Information-Portfolio, Synergy Map). All of them rely on the following five principles that make them valuable for knowledge work:

Conceptual Principles

1. **Categorization**: the tools frame issues into terms that separate the essential from the peripheral.

2. **Visualization**: they transform situations or sequences into graphic forms.

3. **Aggregation**: they combine many pieces of data into manageable chunks.

4. **Elicitation**: they provide mechanisms to make implicit knowledge explicit.

5. **Guidance**: they provide a step-by-step method to gain insights into a problem.

Conclusion

The thirty-five conceptual tools presented in this paper offer a variety of ways to improve managerial problem solving and decision processes. Although all the presented tools rely on the same five basic principles, their application varies widely with the problem at hand (i.e., convergent versus divergent) and the working context or situation (i.e., individual or team problems).

2 Introduction

Overview

The introduction outlines the rationale, the background, and the goals of conceptual management tools. It presents some common situations where they can be applied. The basic principles behind conceptual management tools are discussed.

2.1 Background: Thinking Tools

Motivation

This guide is based on the premise that managerial work is increasingly becoming conceptual. Managers will have to rely more and more on their interpretation, analysis and questioning skills than on their prior knowledge and experience, as their environment becomes increasingly turbulent. JERRY RHODES, conceptual toolmaker and management scholar, thus rightly claims that the future belongs to the conceptual manager. In his acclaimed study on conceptual management, he concludes the following:

> "Conceptualizing is surely the art of the future: not only the skill that managers will need in future, but the skill of handling the future itself."[1]

Three levels of thinking tools

RHODES distinguishes three levels of thinking tools (of which conceptual tools can be viewed as a sub-group).[2] On the *first* level, he sees 'ideas about ideas', that is to say models of mind, general heuristics, principles or scripts. Organizational psychologists frequently refer to this kind of "tool" as theories-of-action or local theories.[3] On a *second*, more pragmatic level, are creative instruments or conceptual checklists, like worksheets or specific thinking procedures that are used to determine the relevance of data. On a *third* and final level, RHODES positions thinking tools that are concrete, task-specific practical procedures, worksheets or matrices.

The tools that are discussed in this guide can be grouped within the second and third level of thinking tools distinguished by RHODES. The term conceptual tool is thus only used for thinking tools of level two and three as exhibit 1 illustrates.

Most of the tools presented in this guide are not specific for one certain task and widely applicable. Some of them, however, such as the strategic game board, the Me Map, or the five forces model, have a limited range of

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[1] See *Rhodes/Toolmaking*, p. 21. For that point see also: *Morris & Meed & Svensen/Intelligent Manager.*

[2] See *Rhodes/Toolmaking*, p. 38.

[3] See *Walsh/Cognition* or *Klimecki et al./Perspektiven.*

applications (in the first and last example within the realm of strategic management). Further limitations to their use will be discussed in section four.
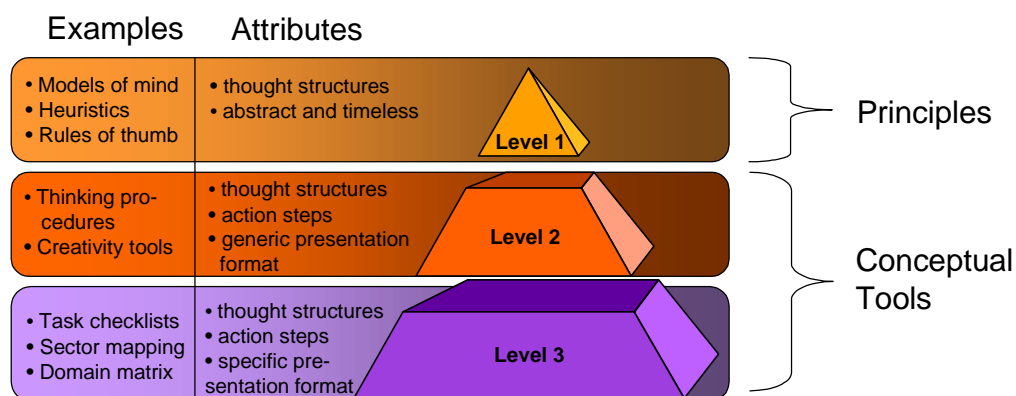
Examples   Attributes

Exhibit 1: The three levels of thinking tools

Elements of conceptual tools

As the definition in the executive summary has pointed out, the conceptual tools discussed in this guide do not only provide *thought structures* (as the first type of thinking tool would), but also *action steps*, and *presentation formats*. They provide tangible frameworks for systematic thinking and are not limited to purely cognitive heuristics. A brief example can illustrate this important difference.

Examples of the three tool levels

Level 1: 'backwarding'

Thinking backwards or starting with the ends in mind, is a thinking tool of the *first* level. Starting with the ends instead of the means is a general heuristic or rule of thumb that many managers use. Like a mountain climber, they trace their way backwards from the peak, or the final goal, to the current state or the present position. By the help of this thought structure (also known as the *backwarding* heuristic), they may be able to re-construct the many small steps that are necessary to reach the desired goal and hence devise an action plan.

Level 2: relevance tree or pyramid principle

A thinking tool of the *second* level, thus a conceptual tool, consists of a more specific procedure that nevertheless follows the same idea of starting with the end. An example of such a tool is the *pyramid principle* where the final answer is taken as a starting point or a hypothesis that is then to be tested by assertions and later fact gathering.[4] Another conceptual tool on this level is the *relevance tree*.[5] In constructing a relevance tree, the manager starts with the main or end goal and maps sub-goals on lower levels of a hierarchic tree.

Level 3: Market entry assessment framework

A thinking tool of the *third* level would use the structure of a pyramid, but would already include the main assertions in order to direct the manager towards useful facts. Exhibit 2 displays such a tool that can assist a manager in assessing the potential success of a market entry. With the help of this pyramid, the manager knows what kind of analysis he or she has to perform to

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[4] See *Minto/Pyramid*.

[5] See *Wadddington/Tools*.

pyramid, the manager knows what kind of analysis he or she has to perform to establish a credible evaluation.

Exhibit 2: The conceptual tool (level 3) that assists a manager in assessing a market entry.

Whereas this tool is fixed in its application for market entries, the tool discussed in level two can be applied to a variety of situations. Exhibit 3 illustrates this point by applying the pyramid principle to devise a knowledge management audit.
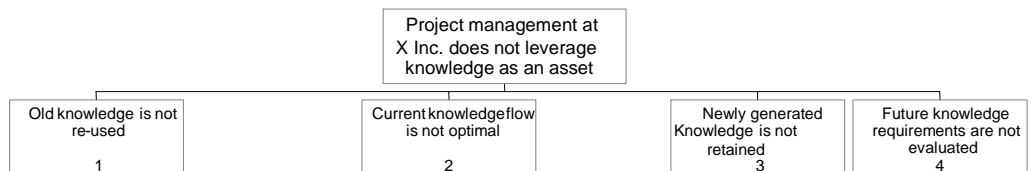

Exhibit 3: The conceptual tool 'pyramid principle' applied to devise a knowledge audit

A second example: From Pareto principle to failure analysis

Another example of this triad can be seen in the three thinking tools *Pareto principle*, *Pareto chart*, and *failure analysis*. The Pareto principle (or 80/20 rule) is a thinking tool of the first order (and thus not yet a conceptual tool). It consists of the maxim that 80 percent of a desired result or perceived problem can be achieved or resolved by focusing on the crucial 20 percent of all issues. This principle can be applied to a variety of sectors (i.e., 20 percent of the clients make 80 percent of the profit, 20 percent of all possible failures cause 80 percent of all quality problems, etc.). When this principle is put to use in a chart, the conceptual tool that is generated is called a Pareto chart. It can be used to portray the drivers of a problem as the following exhibit illustrates. The diagram shows the main complaints of customers and their relative importance simultaneously. If the chart is adapted to a specific field of application (e.g., total quality management), the resulting tool is a conceptual tool of the third level (with a specific representation form).
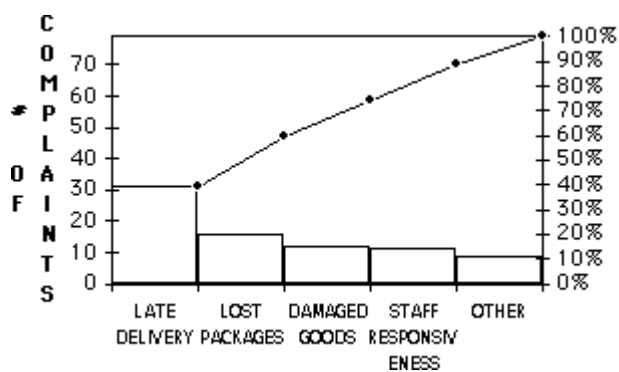
Exhibit 4: A sample Pareto chart[6]

Having outlined the background of conceptual tools within the domain of thinking tools, we can now turn to the general goals of conceptual management tools.

2.2 Goals of Conceptual Management Tools

Goals of conceptual tools

The main goal of the use of conceptual tools is to improve the quality of the decision or sense making process. In order to achieve this goal, a conceptual tool has to improve the information *-interpretation*, *-representation* (or codification) and *-coordination* tasks of a manager or a management team.[7]

Specifically, this main goal should be achieved through the following sub-goals of a conceptual tool:

- Facilitating, assisting, accelerating cognition and meta-cognition (thinking about the way we reason).

- Reducing complexity by categorizing and structuring it.

- Easing the problem solving process individually and in groups by making implicit issues explicit and tangible.

- Aggregating information so that individual pieces of information can be compared.

- Comparing options by breaking up various possibilities visibly.

- Facilitating reasoning by showing a sequence of events together.

The various tools described in section three can be used to achieve one or many of the above goals. The capacity to represent dynamic aspects of reality, for example, differs significantly among the various tools (e.g., mind mapping as a tool with significant limitations in this respect, and system diagrams as a tool with great potential to depict dynamic developments).

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[6] See: http://web.mit.edu/tqm/pareto.html

[7] For this point see *Eppler/Overload*.

2.3 Situations for Conceptual Tool Use

Typical situations that call for conceptual tools

To reach the types of goals described above can be crucial in a variety of management situations. The following list outlines some managerial situations in which conceptual tools are generally used. In many of these situations managers are confronted simultaneously with a *large amount of information* and a high degree of *uncertainty*. The conceptual tools that can be used in the specific situation below are mentioned in brackets.

- The claims of conflicting parties in a joint venture project need to be analyzed and settled fairly (argument mapping).

- In a team meeting, a difficult issue has to be tackled in an effective way and a decision has to be reached relatively quickly (On*Track*, decision tree).

- The main causes of a quality problem have to be identified and counter-measures have to be planned (Pareto chart, pyramid structure, fish bone diagram)

- The consumer's potential reactions to a new product need to be anticipated (system diagram, concept map, coordinate systems, network)

- The future development of a technology needs to be assessed (s-curve, portfolio).

- The strategic options for a company need to be re-evaluated in light of a new market entrant (strategic game board, intervention quadrant, five forces model).

- Ideas for a new marketing campaign have to be generated, evaluated, and prioritized (mind-mapping, clustering, integration mapping, morphological box).

- The various business units of a company have to be systematically compared to devise an investment strategy (portfolio, matrix)

- The new company vision has to be broken down to specific projects and initiatives (relevance tree, clustering).

- Various potential suppliers need to be compared with an objective and consistent frame of reference (spider web graph).

- An executive has to explain what it takes to do the job to his successor (Expert Web, Personal Information-Portfolio).

This list could be easily appended since the application areas for conceptual management tools are as diverse as the problems that managers face today. However, all of these situations have three things in common: They require the *interpretation* of a large amount of information, the *representation* of that information in a form that is accessible, and the systematic comparison of options for action (*coordinating* the information with the tasks to be performed). Thus, these three activities can be used to describe the essence of knowledge work.

2.4 Principles of Conceptual Tools

Conceptual Principles

As mentioned in the executive summary, the various conceptual tools discussed in this guide rely, in the opinion of the author, on the same five principles. These principles are:

1. **Categorization**: they frame issues into terms that separate the essential from the non-essential.

2. **Visualization**: they transform abstract situations or temporal sequences into tangible, graphic forms.

3. **Aggregation**: they combine many pieces of data into manageable chunks.

4. **Elicitation**: they provide mechanisms to make implicit knowledge explicit.

5. **Guidance**: they provide a step-by-step method to gain insights into a problem.

To enable managers and researchers to find further conceptual tools, or even devise their own methods, these five principles will be described and explained below.

1. Categorization

That categorization is the central cognitive mechanism to reduce complexity has been shown in various studies on effective problem solving or sense making. For the realm of management, SCHNEIDER and ANGELMAR have concluded the following in their review of cognition in organizational analysis:

> "Cognitive structures are representations of knowledge that contain and organize information. These include *categories*, construct systems, causal systems and scripts which refer to the structures and not the contents of those structures. *Categories* are formed based on similarities of attributes... At the individual level, for example, managers sort events into categories of 'strategic issues' (Dutton, Walton and Abrahamson 1989[8]) and problems (Cowan 1986[9]). **Categories in turn are the basic building blocks which form more complex structures: constructs, causal systems, and scripts."**

Whether managers use only a few, specific categories (as experienced managers do) or a large set, the theoretical literature clearly suggests that categories are instrumental in processing information effectively. This view was systematically articulated by MICHAEL POLANYI, a pioneer in the domain of studying knowledge, as KARL SVEIBY states below.

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[8] See: J. Dutton, E. Walton and E. Abrahamson, Separating the wheat from the chaff: The important dimensions of strategic issues, in: Journal of Management Studies, 26/4, 1989, pp. 379-396.

[9] See: D.A. Cowan, Developing a process model of problem recognition, in: Academy of Management Review 11/4, 1986, pp. 763 - 776.

> "Inspired by Gestalt Psychology, Polanyi regards the process of knowing as fragmentary clues, senso-motoric or from memory, which are integrated under categories. **We make sense of reality by categorizing it.** The patterns of categories contain theories, methods, feelings, values and skills which can be used in a fashion that tradition judges as valid." [10]

Before POLANYI, other thinkers and researchers in the areas of philosophy, linguistics, and sociology have highlighted the central importance of categorization for the intelligent use of knowledge. Long before that, THOMAS AQUINAS has coined the sentence: Sapientis est ordinare. [11] That categories influence heavily how we think and act has recently been demonstrated very effectively by linguist GEORGE LAKOFF who has shown that the way we use or misuse categories reveals a lot about the quality of our thinking.[12] LAKOFF has shown through various case studies that the way we use categories, the way we frame problems by the linguistic acts that create them, influences the way we perceive and resolve issues to a great extent.[13]

The following conceptual tool illustrates the central function of categories to separate the essential from the peripheral. It categorizes all projects of a business unit according to their cost and time performance and according to their level of completion.
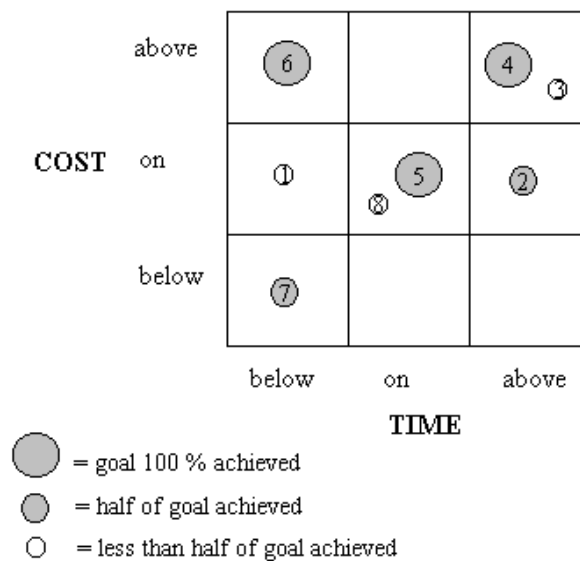
Exhibit 5: A project portfolio categorized in terms of costs, time, and completion

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[10] See *Sveiby/Transfer*, p. 380.

[11] It is the function of the wise man to order. THOMAS AQUINAS cited in *Doob/Labyrinth*, p. 202.

[12] See *Lakoff/Categories*.

[13] For this issue, see *Eppler/Overload*.

Conclusion

Categorization is a crucial prerequisite to deal adequately with a problem or process a great amount of information. The wrong type of categorization (i.e., framing a problem in only one way) can lead to a distorted image of reality and block out possible solutions. Hence, conceptual management tools need to provide ways in which various categories (to frame an issue) can be systematically exploited and evaluated.

2. Visualization

Visualization or the use of graphic symbols, whether imagined or drawn, is one of the most versatile tools of thought available to mankind. Since we often automatically think in images, visualization is a natural thinking and communication tool.[14] This type of 'visual cognition' can be described as the use of mental imagery in thinking.[15] Mental imagery can be used in the following ways:[16]

- for reasoning: combining familiar elements in a new way,

- in learning a skill: for example, the use of visualization in sports, dance or craftsmanship training,

- to comprehend a verbal description since a mental image facilitates the interpretation of an unfamiliar concept, and

- to foster creativity through the discovery of unexpected patterns.[17]

To further comprehend the nature and functioning of a diagram, we can rely on the following explanation by cartography specialist MICHAEL P. PETERSON:

Diagrams explained

"Firstly a diagram offers a synoptic, global representation of structure or a process and this contributes to the globality and the immediacy of understanding. Secondly, a diagram is an ideal tool for bridging between a conceptual interpretation and the practical expression of a certain reality. A diagram is a synthesis between these two apparently opposed types of representations – the symbolic and the iconic. Diagrams are not, generally, the direct image of a certain reality. It is the figural expression of an already elaborated conceptual structure, like any other symbolic system."[18]

The use of such diagrams to inform oneself or to convey knowledge to others can be called *diagrammatic reasoning*. PETERSON explains the meaning of this

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[14] For this point, see: *Doelker/Bild* or *Pörksen/Weltmarkt.*

[15] *Peterson/Cartography*, p. 34

[16] Research findings presented in *ibid.*, p. 34.

[17] For explanations of this phenomenon see *Margolis/Patterns* and *Sopher/Patterns*.

[18] Efraim Fischbein cited in *May/Denken*, p. 303.

[19] See *ibid.*, p. 300.

term, which was invented by the American philosopher C.S. PEIRCE below:

> "For PEIRCE, the term diagrammatic reasoning refers to the construction, manipulation and observation of (representing objects and their mutual relationships in) diagrams. Diagrams support the mental models or analogies in the thinking process by facilitating conclusions and evaluations. Diagrammatic reasoning is a type of mental experimentation …"[19]

Elements of a diagram

The type of diagrammatic reasoning discussed in this paper typically consists of two levels of diagrams. The first level represents *individual pieces* of information (such as the circles in a cluster-diagram). The second level provides a super-diagram that structures the pieces in a coherent *framework* (such as the frame of an integration map). The elements within such a framework can be distinguished by several features, namely by *size, color, orientation, form,* and *position.*

General advantages of visualization

The advantages of such a tool are manifold. ALESANDRINI, professor of information ecology, points out the following traits of such abstract images:[20]

I   nstant: they can be grasped at one glance.

M   emorable: they can be easily recalled because we think in pictures.

A   utomatic: their design logic is often automatically understood.

G   lobal: they literally enable us to see the big picture.

E   nergizing: they can motivate viewers and stimulate their emotions.

Making connections visible

HERBERT W. FRANKE, one of the pioneers of computer graphics, sees some other critical advantages in the use of visualization techniques:

> "Visual languages allow us on the other hand to see those very important connections which manifest themselves as loop processes, interactions, communication networks, and so forth. Perhaps our inability to think in terms of networks is due in no small measure to our restriction to the descriptive system of verbal language." [21]

General disadvantages

As far as the opponents of visualization are concerned, FRANKE argues that most of their objections are not justified:

> "If they assert that pictures leave much less room for imagination than a written text, they can be refuted. ... Pictures do indeed fix one kind of information more strongly than words do, but enough gaps are left for the viewer to fill."[22]

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[20] *Alesandrini/Overload*, pp. 102-105

[21] *Peitgen & Richter/Fractals*, p. 183

[22] *Ibid.*

FRANKE cites several visual media to illustrate the point, for example, the comic strip which requires a great deal of interpretation from the reader to reconstruct the social contexts of the scenes portrayed.

Advantages for management

Managers can benefit in several ways from the above advantages of visualization techniques.[23] A German study of 1995 of 92 managers found unanimous approval for the use of visualization in management, mostly for the use of graphics. The advantages mentioned by the managers interviewed were:[24]

- They are helpful in the *problem* solving process.

- They are helpful in illustrating *issues*, making them more transparent.

- They speed up group and individual *processes* and thus save time.

Visualizations were not, however, associated with avoiding errors, being precise or establishing connections.

Disadvantages for management

The disadvantages of visualization for management mentioned by the managers or, in other words, the barriers to a widespread use of visualization in management, were:[25]

- The necessary resources and tools are not continuously available (i.e., on business trips).

- The difficult overview of visualization techniques and tools (knowledge of what is available).

- The often high time investment which is necessary to learn a visualization technique.

These disadvantages will be taken into account when formulating the selection criteria for the conceptual tools in the survey in the next section.

Conclusion

Visualization theorist UWE PÖRKSEN writes in his analysis of the use of images that, in the future, the critical use of visual information will be one of the main characteristics of intelligence.[26] The following survey of conceptual tools would like to contribute to this type of intelligence by providing managers with a range of tools to visualize issues, and by pointing out the possible disadvantages of visualization in specific contexts.

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[23] For an in-depth discussion of this topic see: S.L. Jarvenpaa and G.W. Dickson, Graphics and Managerial Decision Making: Research Based Guidelines, in: Communications of the ACM, Vol. 31, Nr. 6, pp. 764-774.

[24] See *Meyer & Grundei/Akzeptanz*, p. 372.

[25] *Ibid.*

[26] See *Pörksen/Weltmarkt*, p. 35.

3. Aggregation

One of the nicer things about information is that it can be synthesized, combined and aggregated. The tools discussed in this guide all rely on the systematic aggregation of information in order to provide a global picture of a given problem, situation, or knowledge domain. In order to aggregate a large amount of information, the tools rely on various practical mechanisms, such as reduction to *key words*, the building of *strings* or variables that contain various sub-terms, the use of icons or *symbols* to represent data sets, or the use of so called *chunks*, that is to say information elements of no more than seven items.

Aggregating information into new supra-entities through chunking is one of the most effective ways of conceptual thinking. RAINER KLUWE, a researcher in the domain of complex technical systems, calls this the „compression" of information.[27] Because chunking as an aggregation method has proven to be very effective for decision making, it is examined in detail in the following paragraphs.

The theoretical background behind this principle can be found in the works of GEORGE A. MILLER, HERBERT A. SIMON, and ROBERT E. HORN.

GEORGE A. MILLER has demonstrated through psychological experiments that the short-term memory has a capacity of about seven chunks.[28] The term chunk refers to familiar units of information. For a beginner in chess, a chunk might be the position of an individual piece, whereas a chunk for an experienced chess player may consist of an entire constellation of various pieces.

Nobel laureate HERBERT A. SIMON's work has confirmed MILLER's findings. SIMON found an average of five chunks as a limitation to the short-term memory.[29] While the two researchers came to slightly different conclusions as far as the exact number of units stored by the short-term memory is concerned, their findings stress the crucial point that the chunking or assembling of information eases the cognitive load on an individual and can improve decision making.

ROBERT E. HORN has turned the insights of MILLER and SIMON into a pragmatic principle that is one of the core elements of his information mapping methodology (a method to improve the organization of information).[30] The

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[27] KLUWE states that chunking is a central characteristic of experienced operators. See *Kluwe/Wissen*.

[28] See: George A. Miller, The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information. In: *Psychological Review*, Vol. 63, No. 2, March 1956, pp. 81-89.

[29] See: Herbert A. Simon, How Big is a Chunk? In: Models of Thought, New Haven: Yale University Press, 1979, pp. 50-61.

[30] See *Horn/Mapping*, p. 85.

chunking principle recommends the following: Group all information into small, manageable units, called blocks (= paragraphs that contain fewer than seven statements) and maps (≈ 7 blocks).

This principle is followed by all of the reviewed tools since they rarely incorporate more than seven branches or levels (usually four to six).[31]

Conclusion

Information aggregation is one of the key functions of conceptual management tools. It enables managers to compare a large set of information simultaneously. A very effective way of aggregation is chunking. It takes the limitation of our short-term memory into account and groups information into sets of no more than seven elements.

4. Elicitation

One of the main advantages of the tools discussed in this guide is their potential to articulate implicit knowledge, that is to say to render knowledge structures transparent that are often unarticulated, subconscious or unreflected. Every single conceptual tool can serve as a – as POLANYI calls it – "fixed interpretative framework", that brings out inherent notions and makes them communicable. It renders implicit knowledge explicit because it provides a mutual context for comprehension. In the following paragraph, POLANYI outlines this notion:

> "The capacity for deriving from a *latent knowledge* of a situation a variety of appropriate routes or alternative modes of behaviour amounts to a rudimentary logical operation. It prefigures the use of an *articulate interpretative framework* on which we rely as a representation of a complex situation, drawing from it ever new inferences regarding further aspects of that situation."[32]

According to POLANYI, three mechanisms are needed to render implicit knowledge explicit, they are: *denotation* (findings symbols to represent thoughts), *reorganization* (manipulating these symbols to find patterns), and a *reading* of the results (interpreting the emergent patterns).[33] The tool called integration mapping that is explained in the survey in section 3 works exactly

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[31] The Internet provides a large stock of information on chunking. At http: //www.coe.uh.edu/ courses/cuin7345/cognitivism/chunking.html the following explanation can be found: "Chunking is a general term that covers a large set of organizing strategies. These strategies allow complex ideas to be put into a rational order or classification scheme. Chunking aids learners in the intellectual management of large amounts of data as well as very complex processes or events. This method of organization is often preparatory and deeper processing through the use of other cognitive strategies is necessary for better comprehension, however, re-chunking or re-organizing often aids in better comprehension."

[32] *Polanyi/Knowledge*, p. 74

[33] *Ibid.*, p. 82

by those three steps. Another tool that renders implicit knowledge explicit is the Expert Web. It "forces" an executive to structure his or her external contacts according to his or her three maim domains of expertise, and according to one area of improvement. Experts in the relevant domain have to be framed within a box and connections between the various people are drawn as dotted lines. In this way, the executive generates an explicit picture of his network for a given domain. This can help his or her colleagues or successors to find relevant expertise, and it can enable the manager to reflect systematically about the way he or she networks with peers and manages professional contacts (the 'know-who'). The instructions to the Expert Web lead a manager to reflect about the main competency and improvement areas in his or her work and reveal deficits in the web of contacts.[34]

The example below lists the main competency areas of the author (knowledge management, information overload, and Internet/Intranet technology) and one of his improvement areas (information quality). His initials are positioned in the center of the diagram. The diagram reveals that he has the most contacts in the field of knowledge management and that a few interconnections between his contacts exist.
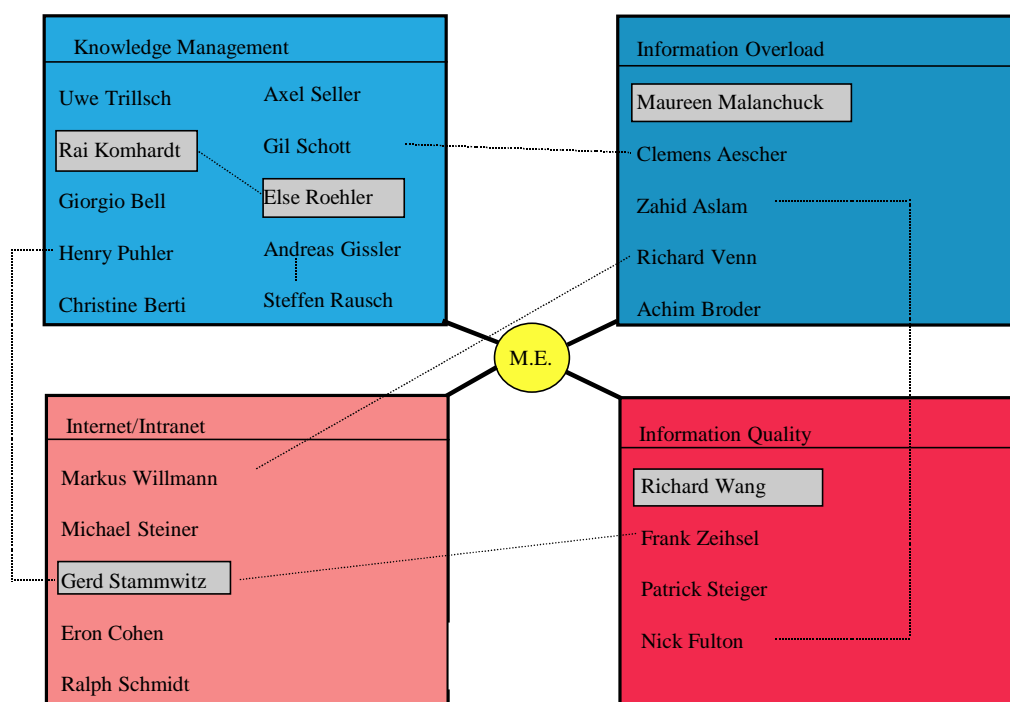
Exhibit 6 : Expert Web as a way to elicit implicit knowledge ('know-who' in this case)

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[34] The use of this tool in management seminars given by the author has frequently generated "aha" effects for many executives, since they were previously not aware of the fact that they lacked vital peers in one of their competency or improvement domains.

Conclusion	The conceptual tools discussed in this guide provide ways in which implicit knowledge can be articulated through the use of structuring techniques and pre-given forms. Elicitation works by denotation, reorganization, and reading of one's implicit (or latent) knowledge.

5. Guidance

The goal of a conceptual management tool is not to present a definitive road map towards a pre-given solution. It merely offers a systematic framework for orientation and progress. It provides steps, structures, and formats that synchronize actions and allow groups and individuals to proceed in a coordinated manner. In this sense, the guiding philosophy behind conceptual management tools is similar to the vision of the *evolutionary management approach* of KLIMECKI, PROBST and EBERL. In their manifesto on management tools, they conclude the following that also holds true for this tool guide:

> "From a development perspective, it's not a question of presenting a ready-made toolbox, but rather a question of gaining an 'evolutionary consciousness' for the adequate use of these instruments. We aim for the reflective and critical use of instruments and not for general recipes for success."[35]

In this sense, the following tools can be seen as a starting point for managers to construct their own toolbox based on the five principles outlined above. In doing so, managers will notice that some tools fit their individual working style better than others. This can be due to their *cognitive style* (e.g., whether they are keen to work with models or not, with figures or with charts, with templates or revisions, with single or with multiple perspectives) or their specific *working context* (i.e., heavy time-pressure, lack of IT support, interdisciplinary work teams, etc.).

Conclusion	The guidance principle of conceptual management tools signifies a flexible, and evolutionary coordination mechanism that provides logical steps towards a clearer image of an issue, and not a generic recipe for success.

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[35] *Klimecki et al./Perspektiven*, p. 126

2.5 Selection Criteria for the Tool Directory

Selection criteria for the 33 tools

The techniques outlined below have been chosen according to the following five criteria:

1. They can structure and condense a great amount of information ergonomically. In other words, they add value to information by providing a hierarchic, aggregated visual *framework*.

2. They are *directly applicable* to management. They can assist executives in various managerial processes, such as planning, decision making, negotiation, problem formulation, issue analysis, etc.

3. They are relatively *easy to master* and thus not very time consuming.

4. They can be used by individual managers or by an entire management team (*scalability*).

5. They can be used electronically (as a computer-based application) or with a simple pen and a sheet of paper (the tools are in this sense often technological *hybrids*).

Because these five selection criteria have been rigorously applied, many sophisticated management tools have not been included in this guide (such as team syntegrity, synectics, balanced scorecard, competitive gaming, flow teams or lateral thinking).
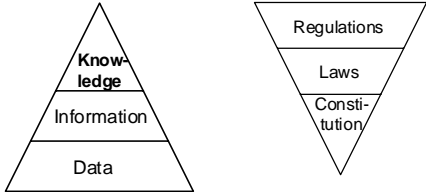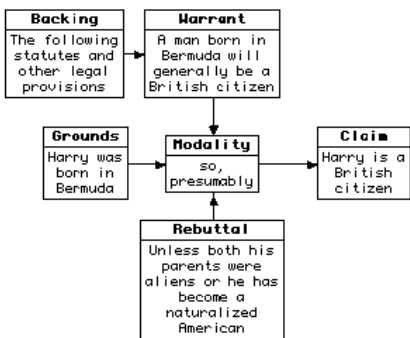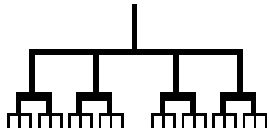
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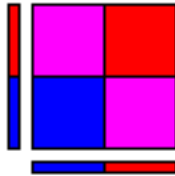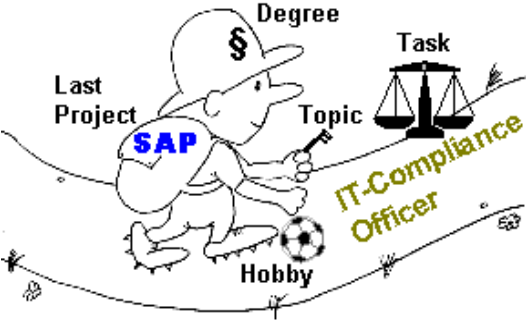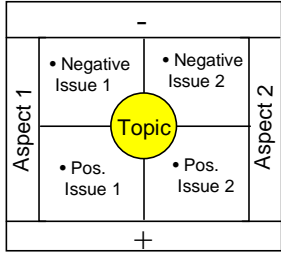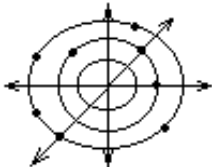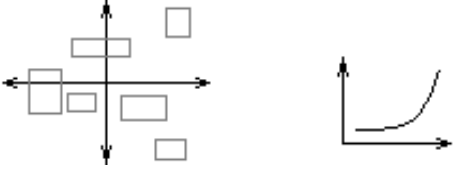
The five criteria outlined above (framework, direct application, ease-of-use, scalability, hybrid) ensure that the following tools ease the information load of a manager and do not contribute further to it.
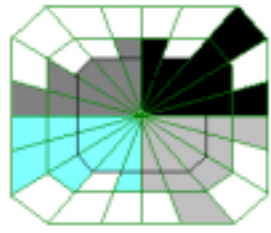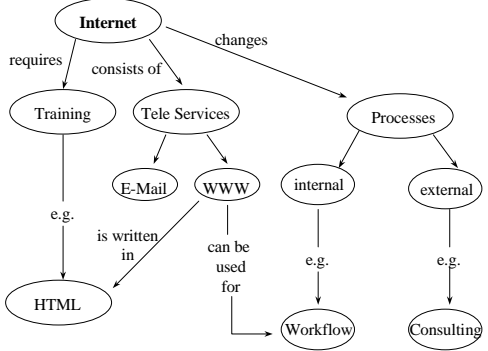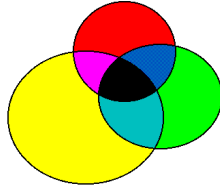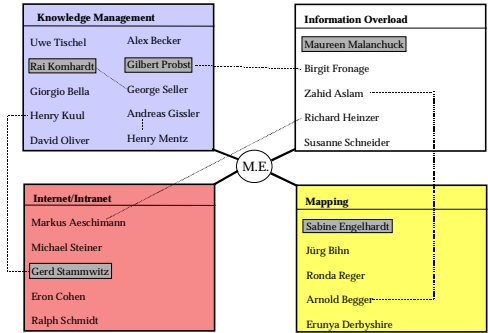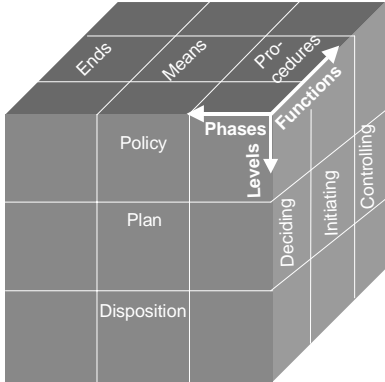
3 Survey: A Conceptual Management Tool Directory
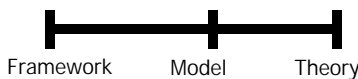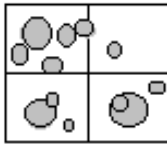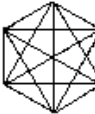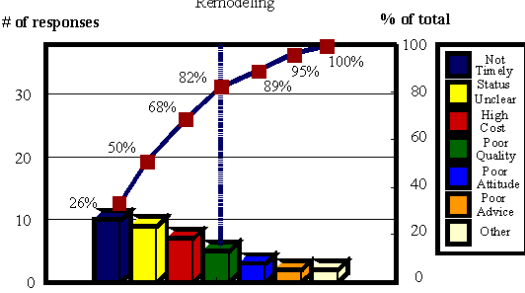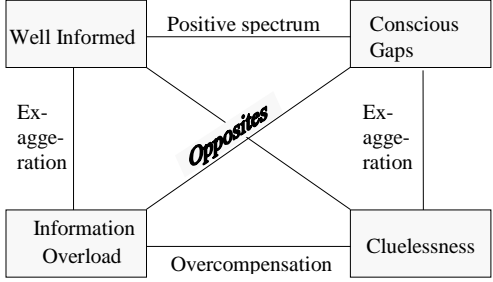
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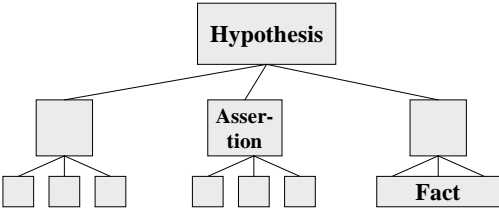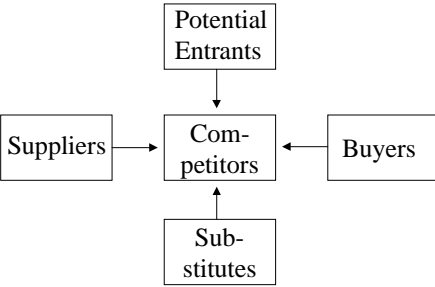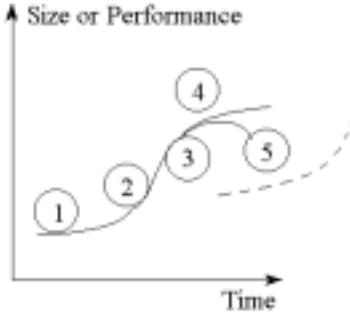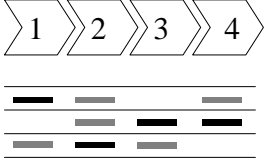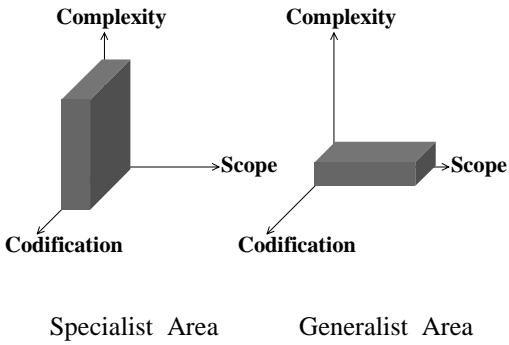
The table below provides a summary of the types of tools discussed in this guide and briefly reviews their most widely used name, application and format. The bracketed figure at the end of every description indicates whether the tool is of level two or three. The 33 tools are sorted according to their capacity to represent dynamic aspects. The most capable tools in this aspect are at the end of the table.
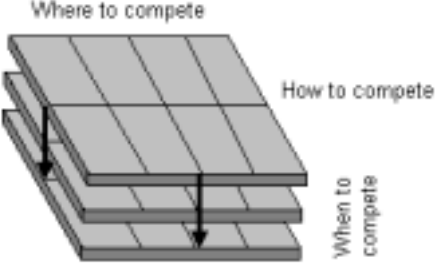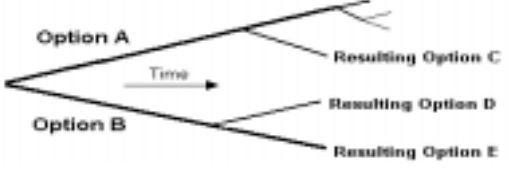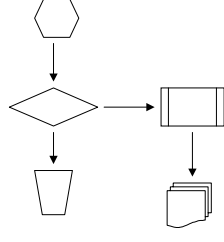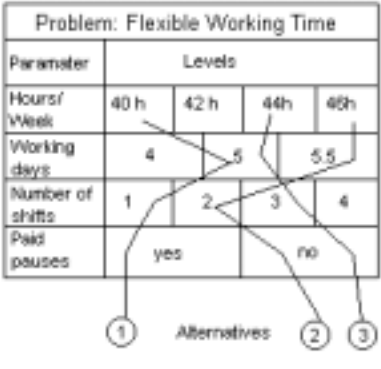
Name of the technique	Description/Application	Example
1. Hierarchic Pyramid	This familiar conceptual model is often used to hierarchically structure various layers of an object, phenomenon or field which build on one another. The pyramid or triangle image portrays a broad base layer on which the subsequent levels reside or vice versa. [2]	
2. Mind-Mapping	Invented by TONY BUZAN to facilitate note-taking and the structuring of ideas. The central circle contains the topic, the branches contain sub-topics. See *Buzan & Buzan/Map.* [2]	
3. Argument Mapping	It structures arguments with clusters proposed by STEPHEN TOULMIN. The main application lies in the structuring and analysis of complex disputes. The method enables a manager to understand differing opinions and their underlying assumptions. In addition, the technique can be used as a collaborative tool to discuss differing views in a systematic way. See *Horn/Mapping* or *Huff/Mapping.* [3]	
4. Relevance Tree	Often used in strategic planning to derive a hierarchy of goals and thus structure information and devise an action plan. A main goal is divided into various sub-goals which are then split up into tasks and sub-tasks or into information which is needed to complete the goal. See *Waddington/Tools.* [2]	

5. Matrix	Matrices can be used to structure information according to two criteria that are subdivided into two levels (i.e., high and low, positive and negative, etc.) Larger matrices can be used to compare various alternatives. See *Mok/Designing*. [2]	
6. Clustering	This technique is adequate for a first structuring of information into a hierarchic framework. The clustering technique can be applied when there are no interdependencies between the elements. [2]	
7. Me Map	The Me-Map is a simple tool that can be used to provide rapid and vivid information on the professional background of a person. This can be important when people need to understand more about each other for their teamwork. By positioning vital personal information - such as academic background and interests, project experience, hobbies or task responsibilities – in a cartoon-like figure, that information can be more easily remembered since it is positioned in a vivid context. In a project-kick-off, team members draw their own me-map figures and use a provided template to record background information on their peers. [3]	
8. Integration Mapping	This technique can be used when a great amount of details need to be creatively summarized in one chart. The main topic is written into the central circle and the four main aspects are drawn as a border around it. Then, specific items are placed in the four resulting quadrants (which always combine two aspects). See *Eppler/Overload*. [2]	
9. Polar Graph	Polar graphs can be used to position information within a framework of ordinal scales (from small to big or from insignificant to important). The combined radial and Cartesian framework allows for more context to be present in the organization of information. For an insightful application see *Varela/Invitation*, p.121. [2]	
10. Coordinate System	Coordinate systems can be used to map temporal developments or cycles. Alternatively, one can use the four quadrants generated by the coordinate system to position elements according to two spectrums (along the x- and the y-axis).[2]	

11. Spider web graph	This type of diagram can be used to visualize a set of evaluation criteria regarding one object. The diagram can be clustered into four segments, each of which consists of a number of slices that represent individual criteria belonging to one cluster. The center point of the diagram represents scale zero, the outer frame the highest ranking. See *Eppler/Overload*. [2]	
12. Concept map	Invented by NOVAK, this type of map can structure a complex set of propositions in a logical way. It is mostly used for pedagogic goals, i.e. to explain difficult concepts and demonstrate their constituents. In addition, it can be used to structure complex issues or problems in a transparent way. See *Forkel/Werkzeuge*, p. 226. [2]	
13. Venn diagrams	These familiar diagrams can be used to group elements of overlapping groups visually and highlight overlapping members. Every information is placed within at least one of the circles and can thus be visually categorized. See *Mok/Designing*. [2]	
14. Contact Web	This type of diagram, invented by the author, can be used to visualize one's contacts according to their main fields of expertise. The manager himself is positioned in the center. Each square represents one of his knowledge domains. Within it, peers knowledgeable in the domain are positioned. Specialists are framed in a gray box. Experts who know each other or work together are connected with a dotted line. The manager can use this map to manage and cultivate his contacts or to help a successor establish them. See *Eppler/Overload*. [3]	
15. Leadership Cube	Based on the St. Galler Management concept by H. ULRICH, this cube can serve as a framework for the organization of management work. Specifically, it structures the management task according to three dimensions: functions of management (deciding, initiating, and controlling), phases of management (ends, means, procedures), and levels (policy, planning and disposition). See *Jeschke/Management-modelle*. [3]	

16. Continuum	This simple form of a conceptual tool can be used to position various pieces of information on an axis that represents a continuum from one extreme to the other. It is similar to a 2-D coordinate system. [2]	
17. Portfolios (Bubble Charts)	Portfolio diagrams cluster a number of projects, products, or even employees according to a set of criteria. Famous examples are the BCG and the McKinsey portfolios that cluster products according to their market share and growth potential (e.g., cash cows versus dogs). [2]	
18. Metaphoric Maps	These maps use the visual form of a common object such as a house, a temple, a park, a balance, or a globe to structure and order information. Locations, responsibilities, or documents can be structured in that way (used in this manner at Siemens, Roche, and Silicon Graphics). For an application of this tool in the bibliographic context, see the bibliography at the end of this text. [2]	
19. Networks	Networks structure information that is heavily interrelated. Each node represents a piece of information. Lines represent connections between the pieces of information. [2]	
20. Pareto Charts	Pareto charts are analytic graphs that illustrate the fact that a few factors can cause the majority of a problem. It is based on the Pareto principle which states that 80 percent of all possible aspects of a problem can be explained by focusing on the relevant 20 percent of all possible causes. Specifically, the chart simultaneously maps the main causes of a problem and their estimated impact level (in percentages). [2]	
21. Intervention Quadrants	Originally developed by Helwig to render value differences transparent, Romhardt has applied them to assess the impact and adequate dosage of interventions into organization. They show how a management intervention should be balanced between extremes. See *Romhardt/Organisation*. [2]	

22. Pyramid Principle	The pyramid principle describes a way of structuring the information gathering process that is lead by an initial hypothesis. Based on that hypothesis, various sub-hypothesis or assertions are deduced which in turn need to be backed by a set of facts that can be gathered empirically. The pyramid diagram summarizes these three levels in one chart that groups relevant findings logically (either by induction, bottum-up, or by deduction, top-down). See *Minto/Pyramid*. [2]	
23. Five Forces Model	Invented by MICHAEL PORTER to ease the strategy formalization and prior analysis process, the five forces diagram aims at providing a systematic overview on the forces that shape the competitive environment of an organization. It consists of suppliers, new entrants, buyers, current competitors, and substitutes (products that can replace one's offerings). See *Porter/Strategy*. [3]	
24. S-Curve	This conceptual tool is based on the premise that many developments follow an S shape curve over time. The S-curve can be split into five phases (points 1 through 5). They are: seed, growth, stagnation, saturation/re-launch, and decay. A new curve (or technology) usually starts with a lower performance, but quickly exceeds the old standard (see the dotted line in the chart.) Application areas are, for example, technological assessments or product life cycle analyses. [2]	
25. Process or Task Map	These maps show the sequence of steps of a process or task and relates them to knowledge, roles and tools that are used in a certain process step. Such a map can also visualize the interdependencies between various processes. [3]	
26. Personal Information Portfolio	The personal information portfolio is a conceptual management tool that enables a manager to visualize various domains of expertise according to their complexity, scope, and documentation intensity. By comparing various portfolios, the executive can anticipate deficits or time constraints (i.e., if too many blocks are in a specialist area). For further uses of this diagram see *Eppler/Overload*. [3]	

27. Strategic Game Board	Invented by McKinsey & Company, this 3D-diagram can be used to identify the strategic management options in a competitive landscape by showing the executive that (s)he can choose where (market segments), how (business system) and when (timing) to compete. [3]	
28. Decision Tree	The decision tree maps the chronological sequence of a series of decisions horizontally and thus enables a manager to compare various decision sequences and their likely outcomes. See for example *Kotler/Marketing*, p. 123. [2]	
29. Fish-diagram / Fishbone Chart	The arrangement of information in this way enables a manager to hierarchically structure a great amount of information along a timeline or along a developing stream of topics. ISHIKAWA first used it in quality management to analyze production problems. See for example *Merx/Qualität*. [2]	
30. Flow Diagram	It allows a manager to visually devise the sequential tasks of a procedure. This can be combined with yes or no questions that lead to different branches in the flow diagram. Standard icons are used to designate different events, activities, or documents. [2]	
31. Morphological Box	The morphological box was invented by ZWICKY to foster creativity in a systematic way ('thinking in totalities') through the transparent combination of various options that can be combined to a possible solution. It can be used for marketing, innovation management, product improvement, and process integration. See *Brauchlin /Ent-scheidungsmethodik*, p.301. [2]	

32. Synergy-Map	The Synergy Map can be used to find synergies between various activities or goals. It can be used on a personal level or in groups. On a personal level, it can be used to find synergies among one's personal goals. In a workshop context, it can be used to tie together various action points. It is used as follows: 1. List your ten foremost goals, activities, projects or to-do's on a separate list. 2. Write down these ten activities or goals in order of their time schedule along the circle (from short term goals in the first quarter – counter-clock-wise – to the last quarter for permanent goals or activities). 3. Assign priorities to these ten issues. 4. Try to establish as many synergies leading to the top three items as possible. [3]	
33. Decision Discovery	This tool can be used to elicit past crucial decision processes or future decision sequences. It usually starts at the bottom of the diagram with a mishap or failure that is then traced back to its causes which in return are linked to decisions. Thus, crucial points in the sequence of events can be made visible and group learning about better courses of action can take place. The chart is divided into three sections to reflect the origination of a decision (in the team itself in them middle row, in management left, at the client's side in the right column). [3]	
34. On*Track*	On*Track* is a simple conceptual tool to assist the problem solving or decision process in teams in a meeting context. The main topic line represents the meeting agenda with the main milestones. During a meeting, the topic line is tracked and presented to all participants. Comments are mapped as side-lines unto the topic line. [3]	
35. Systems diagram / Feedback-system diagram / Cycles	This technique can be used to visualize the dynamic interchange between a set of variables in cause-effect chains, including feedback loops, reinforcing cycles, and destabilizing cycles It is often used to assist the strategy formation process or to deal with dynamic developments. The arrows connect nouns that symbolize states. Arrows labeled with a plus are of the type: more X leads to more Y. Arrows labeled with a minus are counter effects (more leads to less). See *Probst & Gomez/Vernetztes Senge/Discipline.* [2]	

4 Evaluation

Overview

This chapter provides a transparent set of criteria to evaluate the quality of the aforementioned tools. This should enable a manager to test a tool's benefit for his or her working environment. In addition, the chapter offers a review of some advantages and disadvantages of conceptual management tools.

4.1 Tool Clustering

Different leverages

The tools portrayed in the survey above can be clustered according to their focus areas, that is to say where their leverage seems to be especially high. The following exhibit proposes such a clustering. The tools are grouped according to their strength of improving convergent (analytical) or divergent (creative) thinking and according to their application context. Some of these tools are mostly used in a collaborative context (such as On*Track* or Pareto charts) while others are used by individuals working by themselves (such as mindmapping, or expert webs)
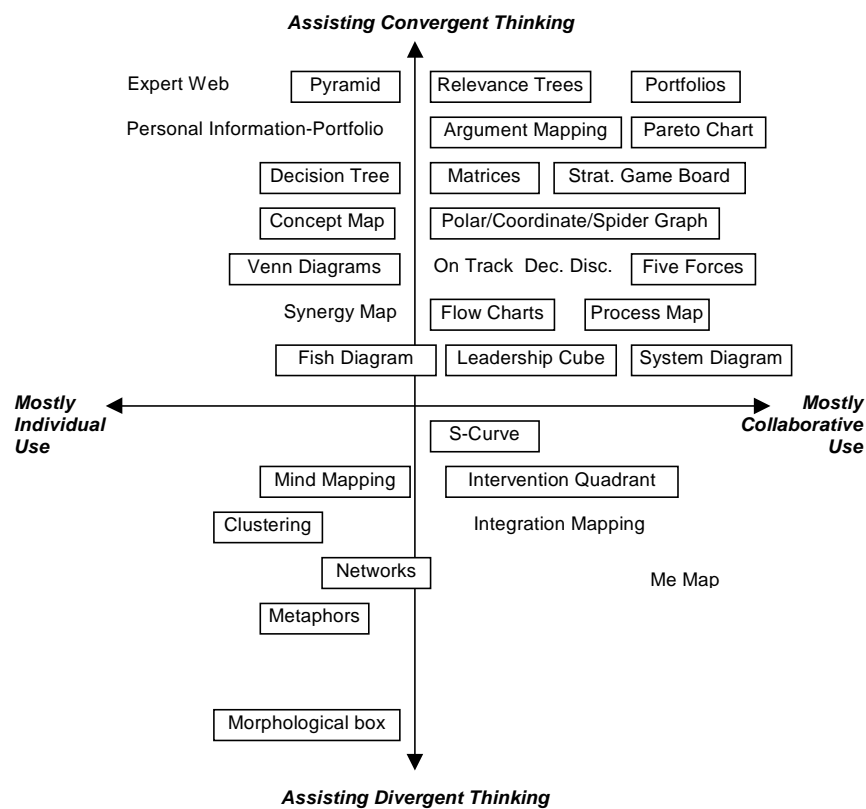
Exhibit 7 : Application areas of the conceptual management tools[36]

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[36] Tools proposed by the author are placed without a box.

4.2 Evaluation Questions

As a manager, you can evaluate the tools discussed in this guide by answering the following four questions in sequence.

1. **What is your current mix of conceptual tools?**
    Is it balanced and sufficient? Are you applying conceptual tools of the first (such as integration mapping) and second order (such as the five forces model)? Which tools do not provide you with the expected benefit?

2. **What type of tool is lacking in your 'management toolkit'?**
    Are there reoccurring problems in terms of information processing that can be resolved through the use of a conceptual tool? Identify such potential solutions and proceed with question three.

3. **Can the tool be personally valuable to you?**
    Is it the right tool for you? Can you work it? Do you like it? Does it amplify your strong points and complement your weak ones? Which kind of tool can help you to improve your metacognitive skills (the way you organize your thinking)? How could you adapt a tool to your specific preferences and information environment at work?

4. **Is the tool applicable to your organizational context?**
    How would other members of your team, your department react to it? What group situations can you envision for its use?

*Use of the four
questions*

The four diagnostic questions should allow a manager to prioritize the application of new conceptual management tools. The first question ensures that the manager has a clear idea of the conceptual tools that he or she may already be using. The second question focuses on possible deficits in the managerial toolkit. It can lead a manager to examine one of the presented tools more closely. If that is done, the third question needs to be addressed. Basically, it deals with issues of personal preferences and style. If a tool is seen as compatible to one's working style and rhythm, then the last question needs to be answered: can the tool also work within the organizational context that the manager faces. The use of mind maps, for example, in company presentations may be inadequate if the employees are used to a table-based argumentation.

4.3 Quality Criteria for Conceptual Tools

*Three quality
criteria for
conceptual tools*

The quality of the results obtained through conceptual tools depends heavily on the quality of its application. The application can be improved by respecting three simple quality criteria. They are as follows:

1. A conceptual tool needs to focus its users on the *content*, and not on the

form of representation. From this requirement, we can deduce the fact that a conceptual tool has to have a *self-explaining design logic*.

2. A conceptual tool has to *avoid distortions* and prevent misinterpretations. It must aim for clarity and ease of interpretation. This implies that is uses *consistent scales*.

3. A conceptual management tool has to present information on different *detail levels*. It should therefore always contain at least one main and one substructure.[37] This eases the cognitive load on the people who need to work with a given conceptual tool.

Conclusion

The quality of one's thinking depends to a large degree upon the clarity of one's thought structures. By following three simple rules, the impact of conceptual tools on the clarity of thinking can be significantly improved.

4.4 Future Requirements

Conceptual tools for virtual environments

As of now, the conceptual management tools presented in this guide are mainly used in an environment that is based on face-to-face meetings and regular desk work. In the future, however, this may dramatically change, as telecommuting, virtual team-rooms, web-based collaboration, etc. become a reality of the daily business life. As teams work together on complex issues at various locations, in different cultures, time-zones, and economic contexts, the conceptual tools used will gain critical importance to provide a mutual "mental roadmap" for the various people working together in a team.

The limited media richness will cause problems

Hence, conceptual tools like the ones discussed above will be more and more applied in virtual contexts, that is to say in technology-mediated environments provided by the new media, where they will serve as common interpretative spaces. In how far they will have to be modified to meet the new needs of distributed collaboration remains to be seen. Issues that will gain additional relevancy will probably be the prevention of ambiguity, misinformation, and biases, since the new media provide less context than the natural "real-life" business environment.

Conclusion

It can be stipulated that conceptual management tools will play a crucial role in bridging perceptual differences among teams working on common problems in different locations or cultures because they can provide coordination mechanisms through mutually shared action steps and representation formats.

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[37] For similar quality criteria, see *Wurman/Anxiety* who relies on the analyses of E. TUFTE.

5 Conclusion

Overview	The final chapter summarizes the main findings and provides an overall conclusion.

Background   Conceptual management tools can be situated within the larger domain of thinking tools. They represent tangible thinking tools that provide not only thought structures, but also action steps and representation formats.

Goals   The goal of conceptual management tool use is to improve the quality of the decision making or problem solving process. This should be achieved by improving communicative, cognitive, and meta-cognitive processes.

Application   Conceptual management tools can be used in a variety of situations that are characterized by a large amount of information and a great degree of uncertainty.

Principles   All conceptual tools discussed in this paper rely on the same five principles. They aggregate a lot of information to make it comparable, they visualize information to enable a global view, they categorize issues to derive manageable chunks, they render implicit knowledge explicit, and they provide a certain degree of guidance for the user.

Evaluation   Conceptual management tools can be used to assist and improve convergent (analytical) and divergent (creative) thinking individually or in groups. The use of a certain tool depends on the specific situation and the manager's cognitive style. In its application, the tool should satisfy certain minimal quality criteria.

The future   In the future, conceptual management tools will need to function in a technology-mediated environment. They will be used by virtual communities that collaborate through sophisticated information and communication technologies. In that context, they will provide common interpretative spaces that facilitate understanding and coordination. The prevention of ambiguity and misinformation will be a key challenge in that respect.

Conclusion   Conceptual tools are a key resource for the personal knowledge management of an executive working in an information abundant environment. In addition, they can facilitate the team work of knowledge workers by providing mutual contexts, even if these contexts are virtual and only established through the use of information and communication technology.

6 References

Overview	The references list and outline the works cited in the text. Bold entries are especially pertinent to managers, since they provide clear guidelines and examples of conceptual management tool applications.

Alesandrini/Overload: Kathryn Alesandrini, Survive Information Overload, The 7 best ways to manage your workload by seeing the big picture, Homewood: Business One Irwin, 1992

(The author, a professor of information ecology, develops a pragmatic approach to handle information, encapsulated in the acronym SURVIVE= Synthesize details, Underscore priorities, Reduce paperwork, View the big picture, Illuminate meetings issues, Visualize new concepts and Extract the essence).

Brauchlin /Entscheidungsmethodik

Emil Brauchlin, Problemlösungs- und Entscheidungsmethodik, Bern: Haupt, 1978

(This timeless guide illustrates various problem solving and creativity techniques in a compact manner and outlines possible application scenarios).

Buzan & Buzan/Map: Tony Buzan and Barry Buzan, Das Mind-Map Book, Landsberg: mvg, 1993

(The book provides a systematic introduction to mind mapping and many insightful examples of the tool's application in management).

Doelker/Bild: Christian Doelker, Ein Bild ist mehr als ein Bild, Visuelle Kompetenz in der Multimedia-Gesellschaft, Stuttgart: Klett-Cotta, 1997

(This innovative textbook, written by a professor of media education, presents a systematic categorization of image types according to production and use, and suggests various criteria and guidelines in designing such images).

Doob/Labyrinth: Penelope Reed Doob, The Idea of the Labyrinth from Classical Antiquity through the Middle Ages, Ithaca: Cornell, 1990

(In this comprehensive literary overview the author discusses the two types of labyrinths, uni-cursal and multi-cursal, their similarities, namely the center, the paths, the duality and the subjective ignorance, and the labyrinth's potential as a metaphor).

Engelhardt/HyperCom:Sabine Engelhardt, Das Projekt HyperCom als mnemotechnisches Unterstützungssystem in einer Umgebung der Industrieforschung, Master Thesis, Berlin: Freie Universität Berlin, 1996.

(This thesis examines the insights of mnemonics to devise an efficient and visually appealing hypertext document management system).

Eppler/Overload: Informative Action: An Analysis of Management and the Information Overload, Unpublished PhD Thesis, Geneva: University of Geneva, 1998. (This thesis examines through four perspectives – a theoretical, pragmatic, interpretive, and empirical one – the issues related to information overload in management and derives a curriculum for a business school context that prepares future managers for an information abundant environment).

Forkel/Kognitive Werkzeuge:

Malte Forkel, Kognitive Werkzeuge - ein Ansatz zur Unterstützung des Problemlösens, Berlin: Hanser, 1996

(The research report examines the creative and analytical processes involved in problem solving and develops tools and models how they can be facilitated with cognitive tools such as knowledge maps).

Horn/Mapping: Robert E. Horn, Mapping Hypertext, Analysis, Linkage, and Display of Knowledge for the Next Generation of On-Line Text and Graphics, Waltham: The Lexington Institute, 1989

(An outstanding collection of information mapping applications to such fields as scientific abstracts, manuals and on-line documentations which result in a information which is more actionable and browsable).

Huff/Mapping: Ann Huff (Ed.), Mapping Strategic Thought, New York: Wiley, 1990 (This anthology examines various ways of visualizing strategic assumptions and plans and suggests a taxonomy of such maps).

Jeschke/Managementmodelle:

Wolfgang Jeschke, Managementmodelle, Ein kritischer Vergleich, PhD Thesis, Munich: Verlag Barbara Kirsch, 1992

(This PhD thesis from Munich briefly illustrates and compares various management models, outlines their components and rates their application potential).

Klimecki et al./Perspektiven:

Rüdiger Klimecki, Gilbert J.B. Probst, Peter Eberl, Entwicklungsorientiertes Management, Stuttgart: Schäffer-Poeschel, 1994

(This 'manifesto' discusses the basic concepts of a development perspective of management – namely constructivism, self-organization, and organizational learning –, highlights three perspectives for change [system identity, heterarchy, flexibility] and develops a framework for the evaluation of management tools).

Kluwe/Wissen: Rainer H. Kluwe, Informationsverarbeitung, Wissen und mentale Modelle beim Umgang mit komplexen Systemen, in: Karlheinz Sonntag and Niclas Schaper (Eds.), Störungsmanagement und Diagnosekompetenz, Stuttgart: B.G.Teubner Verlag, Stuttgart, 1996, pp. 13- 36

(The text examines the role of mental models in the operating of complex systems, such as industrial machines and discusses various cognitive mechanisms to reduce complexity).

Kotler/Marketing: Philip Kotler, Marketing Management: Analysis, Planning, Implementation, And Control. Englewood: Prentice-Hall, 1991
(For many, this is the definitive marketing bible that outlines, among other things, the key tools for marketing management and their applications).

Lakoff/Categories: George Lakoff, Women, Fire, and Dangerous Things, What Categories Reveal about the Mind, Chicago: The University of Chicago Press, 1986
(This seminal work on a new way of viewing categories, philosophically framed as experiential realism, thoroughly examines the role of categories for our cognitive models and provides many vivid examples to illustrate its hypotheses).

Margolis/Patterns: Howard Margolis, Patterns, Thinking and Cognition, A Theory of Judgement, Chicago: The University of Chicago Press, 1986
(This unconventional book on cognition written by a professor of political science tries to establish pattern recognition as the central concept of human judgement and illustrates this idea with examples from the history of science).

May/Denken: Michael May, Diagrammatisches Denken: Zur Deutung logischer Diagramme als Vorstellungsschemata bei Lakoff und Peirce, in: Zeitschrift für Semiotik, Band 17, Heft 3-4, 1995, p. 285 - 305
(May from the technical university of Denmark argues that PEIRCE, and not only Lakoff, already explained the cognitive functioning of diagrams by describing the tension between the diagram's concrete properties and the abstract properties of the image schema).

Meyer & Grundei/Akzeptanz:
Jörn-Axel Meyer and Jens Grundei, Akzeptanz visueller Informationsdarstellung im Management, in: JFB Journal für Betriebswirtschaftslehre 5-6/95, pp. 365-380.
(The article presents a survey among 92 managers to examine the acceptance of visualization techniques and finds that managers see graphics as a helpful tool that can save time but are difficult to learn).

Merx/Qualität: Oliver Merx (Ed.), Qualitätssicherung in Multimedia-Projekten, Berlin: Springer Verlag, 1999
(This anthology assembles innovative contributions of academics and practitioners to the new field of multimedia quality management).

Minto/Pyramid: Barbara Minto, The Pyramid Principle, Logic in Writing and Thinking, London: Pitman Publishing, 1995
(A major contribution to the field of structured thinking and writing and its

application in the consulting industry that focuses on the effective and insightful grouping of ideas).

Mok/Designing: Clement Mok, Designing Business, Multiple Media, Multiple Disciplines, San Jose: Adobe Press, 1996

(This book on designing identity, information and interactivity – it was elected Business „how to" book of the year by the Financial Times – offers a variety of design methodies [such as DADI - definition, architecture, design, implementation] and design case studies [such as the Microsoft Network or Sony] and contains various insights on the nature of the information economy).

Morris & Meed & Svensen/Intelligent Manager:

Steve Morris, John Meed and Neil Svensen, The Intelligent Manager, Adding Value in The Information Age, London: Pitman Publishing, 1996

(A well written and designed guide book to the new information environment of management that explains the new skills, models and terms that are necessary by offering cases, tools and anecdotes).

Peitgen & Richter/Fractals:

H.-O. Peitgen, P.H. Richter, The Beauty of Fractals, Images of Complex Dynamical Systems, Berlin: Springer Verlag, 1986

(The authors present their research on complex mathematical systems, labeled by Mandelbrot as fractals, and their visualization, as well as their background and implications).

Peterson/Cartography: Michael P. Peterson, Interactive and Animated Cartography, New Jersey: Prentice Hall, 1995

(An introductory guide to the history, functioning, design, implementation and usage of [hyper]cartography).

Polanyi/Knowledge: Michael Polanyi, Personal Knowledge, Towards a Post-Critical Philosophy, London: Routledge & Kegan Paul, 1958

(An important work on the process of knowing that introduces such important notions as the tacit dimension of knowledge (such as certain skills) or the focal nature of awareness)

Pörksen/Bilder: Uwe Pörksen, Weltmarkt der Bilder, eine Philosophie der Visiotype, Stuttgart: Klett-Cotta, 1997

(In this innovative analysis and critique of the usage of diagrams in the scientific discourses in such fields as biology or philosophy, the author outlines the functions and limitations, the threats and opportunities for visualizations as an instrument of insight).

Porter/Strategy: Porter, M.E. Competitive Strategy, Techinques for Analyzing Industries and Competitors, New York: Free Press, 1980

(This eminent work on competitor analysis and industry mapping, explains the

concept of the five forces model and provides case studies for illustration purposes).

Probst & Gomez/Vernetztes Denken:

Gilbert J.B. Probst and Peter Gomez, Vernetztes Denken: ganzheitliches Führen in der Praxis, Wiesbaden: Gabler, 1989

(This book shortly outlines the methodology of systemic problem solving and presents various real-life applications of the technique in management).

Rhodes/Toolmaking: Jerry Rhodes, Conceptual Toolmaking, Expert Systems of the Mind, Oxford: Blackwell Publishers, 1994 (1st Edition: 1991)

(In this insightful and pragmatic book, Rhodes describes 25 „thunks" as fundamental thinking activities and several questioning and information organizing tools for thinking that can be applied in management, namely mapping, quality assurance thinking, and conceptual learning).

Romhardt/Organisation:

Kai   Romhardt,   Die   Organisation   aus   der   Wissensperspektive, Möglichkeiten und Grenzen der Intervention. Wiesbaden: Gabler, 1998

(This thesis examines the building blocks of knowledge management and their limits and possiblities with the aid of so called intervention quadrants).

Senge/Discipline: Peter M. Senge, The Fifth Discipline, The Art and Practice of the Learning Organization, New York: Doubleday Currency, 1990

(An enthusiastic book about the power of system thinking and its benefits for organizational learning, as well as an essay-like treaty on personal development, mental models, and team building).

Sopher/Patterns: H. Sopher, The archetypal patterns of discourse, in: Semiotica 109-1/2, 1996, pp.1 - 27

(In this article, the senior discourse analyst SOPHER suggests that there are six general patterns in the organization of stories, namely hierarchic, circular, linear, parallel, the zigzag pattern and the Chinese box or concentric pattern).

Sveiby/Transfer: Karl-Erik Sveiby, Transfer of Knowledge and the Information Processing Professions, in: European Management Journal, Vol. 14, No. 4, 1996, pp. 379-388

(In this article Sveiby, a manager turned researcher, describes Polanyi's notion of knowing and distinguishes Wiener's and Shannon's notion of information in order to derive a new undestanding of information and demonstrate the need for a media that can covey tacit knowledge and not only information).

Varela/Invitation: Francisco J. Varela, Invitation aux sciences cognitives (originally published as: Cognitive Science. A cartography of Current Ideas, 1988), Paris: Editions du Seuil, 1996

(In this concise essay VARELA outlines the major differences between the cognitivist, the connectionist and the enactement perspective on cognition).

Waddington/Tools: C.H. Waddington, Tools for Thought, How to Understand and Apply the Latest Scientific Techniques of Problem Solving, New York: Basic Books, 1977
(This unique and valuable book provides the theory [natural and moral philosophy, systems theory, information theory] and practice of conceptual tools [such as the relevance tree, trend exploration, or cross-impact matrices]).

Walsh/Cognition: James P. Walsh, Managerial and Organizational Cognition: Notes from a Trip down Memory Lane, in: Organization Science, Vol.6, No. 3, May-June 1995, pp. 280-321
(Professor WALSH provides the research community with a comprehensive review of the research in the domain of knowledge structures and outlines a possible future research agenda for the domain of managerial and organizational cognition).

Wurman/Anxiety: Richard Saul Wurman, Information Anxiety, What to do when information doesn't tell you what you need to know, New York: Bantam Books, 1990
(A tremendously useful book to understand – through case studies and principles – the pitfalls of the information age and transform data into understanding by examining the form in which information is presented).

7 Web Guide

Overview

The Web guide assembles some of the relevant Internet links in regard to the conceptual management tools discussed in this paper. The following link list has been gathered in March 1999.

Tool	Web-Addresses
1. Hierarchic Pyramide	• http://management.bus.okstate.edu/classes/fall97/mgmt3013e/motiv/sld002.htm • http://www.investing.rutgers.edu/unit01.html
2. Mind-Mapping	• http://www.mindman.com/ • http://www.weyrich.com/book_reviews/mindmapping.html • http://www.ozemail.com.au/~caveman/Creative/Mindmap/mindmapfaq.html
3. Argument Mapping	• http://www.unl.edu/speech/comm109/Toulmin/layout.htm • http://www.cbl.leeds.ac.uk/rachel/Presentations/caus2/sld008.htm • http://yuma.acns.colostate.edu/Depts/WritingCenter/references/reading/toulmin/page2.htm
4. Relevance Tree	• http://payson.tulane.edu/intd79901/projman/iv/4a2_tree_diagram.htm
5. Matrix	• http://www.mckinseyquarterly.com/organiz/pupe96.htm • http://www.sdcoe.k12.ca.us/score/actbank/tcomp.htm
6. Clustering	• http://www.sdcoe.k12.ca.us/score/actbank/tcluster.htm • http://www.urich.edu/~writing/cluster.htm
7. Me Map	• http://www.knowledgemedia.org
8. Integration Mapping	• http://www.knowledgemedia.org
9. Polar Graph	• http://mason.gmu.edu/~mmankus/Handson/polar.htm
10. Coordinate System	• http://www.nr.no/home/marius/phd/Ch4.html • http://www.icw.com/ncss/plots.html
11. Spider web graph	• http://www2.southwind.net/~furtweng/rsi/Spider.html • http://quality.org/TQM-MSI/TQM-glossary.html

12. Concept map	• http://www.to.utwente.nl/user/ism/lanzing/cm_home.htm • http://cctr.umkc.edu/user/alodom/jenkins.jpg
13. Venn diagrams	• http://www.co.frederick.md.us/fcps/curriculum/language-elem/graphic.html • http://www.sdcoe.k12.ca.us/score/actbank/tvenn.htm
14. Contact Web	• www.knowledgemedia.org
15. Leadership Cube Contact Web	• No information available on the Internet.
16. Continuum	• No information available on the Internet.
17. Portfolios	• http://www.cosmic-solutions.co.uk/so4.htm • http://www.officecert.com/excel/chprgrss.asp
18. Metaphoric Maps	• http://www.geocities.com/Athens/Academy/3784/dobbs/gogard.jpg
19. Networks	• http://www.ncrel.org/sdrs/areas/issues/students/learning/lr2grap.htm
20. Pareto Charts	• http://web.mit.edu/tqm/pareto.html • http://www.west.asu.edu/tqteam/pareto.html • http://www.clarsandon.com/Border_PAR.htm
21. Intervention Quadrants	• http://www.cck.uni-kl.de/wmk/papers/public/DissRomhardt/
22. Pyramid Principle	• http://www.graphic.org/cluster.html • http://www.businesssavvy.com/100123n.html
23. Five Forces Model	• http://www.hmco.com/college/hjinstruct/powerpt/ch03/sld003.htm
24. S-Curve	• http://www.srtca.shell.nl/anthology/curve.html • http://www.albany.net/~dmills/scurves.htm • http://www.infosys.utas.edu.au/people/individuals/bob_godfrey/teaching/guide/forum/scurve.html
25. Process or Task Map	• http://www.sungem.bc.ca/process1.html • http://arri.uta.edu/sime/BWS_98/19process/ppframe.htm
26. Personal Information	• www.mindarea.ch

	Portfolio	• http://www.lanner.at/information.html
27.	Strategic Game Board	• http://www.cio.com/archive/011598_game.html
28.	Decision Tree	• http://www.mckinseyquarterly.com/corpfina/homu98.htm • http://www.mindtools.com/dectree.html
29.	Fish-diagram/ Fishbone Chart	• http://web.mit.edu/tqm/cause_effect.html • http://www.sdcoe.k12.ca.us/score/actbank/tfish.htm • http://www.goalqpc.com/RESEARCH/7qc.html
30.	Flow Diagram / Flow Chart	• http://web.mit.edu/tqm/flowchart.html • http://www.inspiration.com/ • http://www.nepr.org/flow.htm
31.	Morphological Box	• http://www.ozemail.com.au/~caveman/Creative/Techniques/morph.htm • http://www.focus.de/D/DB/DB38/DB38A/DB38AB/db38ab.htm • http://www.bwl.univie.ac.at/bwl/org/folien/BE/BE1_20.htm
32.	Synergy Map	• http://www.knowledgemedia.org
33.	Decision Discovery	• As a basic software for its development: www.inspiration.com • Short description: www.knowledgemedia.org
34.	On*Track*	• http://www.knowledgemedia.org
35.	Systems diagram / Feedback-system diagram	• http://www.sdcoe.k12.ca.us/score/actbank/tcycle.htm • http://www.sol-ne.org/pra/tool/loops.html • http://www.acs.ucalgary.ca/~djcote/671/system.htm • http://web.mit.edu/jsterman/www/SDG/ford_sterman.html

Comments on additional links or other tools are greatly appreciated and can be e-mailed to Martin.Eppler@unisg.ch