

Knowledge Capturing and Codifications

- *If written directions alone would suffice, libraries wouldn't need to have the rest of the universities attached.*

Judith Martin (1938–) *Washington Post*
columnist and author

- first phase of the knowledge management cycle, knowledge capture and/or creation.
- The major approaches, techniques, and tools used to
 - elicit tacit knowledge,
 - to trigger the creation of new knowledge, and to
 - subsequently organize this content in a systematic manner (codification) are presented.

Multidisciplinary derivation

- Knowledge acquisition represent a multidisciplinary methodology that integrates what we have found to be successful in a variety of other fields such as
 - knowledge acquisition for the development of expert systems,
 - Instructional design techniques for course content creation and organization,
 - Task analysis techniques used in the development of performance support systems,
 - and taxonomic approaches that originate from library and information studies.

challenges

- More specifically, tacit knowledge is captured or elicited, and explicit knowledge is organized or coded.
- a distinction needs to be made between the capture or identification of **existing knowledge** and the creation of new knowledge.
- explicit or already identified and coded knowledge typically represents only the tip of the iceberg.
- Traditional information systems departments deal primarily with highly structured (records or forms-oriented) data that makes up much less than 5% of a company's information.

- In knowledge management, we need to also consider knowledge that we know is present in the organization, which we can then set out to capture.
- There remains, however, that interesting area of knowledge that we do not know about.
- This as-yet-unidentified knowledge will require additional steps in its capture and codification.
- Finally, there is knowledge that we know we do not have. We will need to facilitate the creation of this new, innovative content (see Figure 4-2)

Capturing knowledge

- Capturing the knowledge in an organization is not purely about technology.
- Indeed, many firms find that IT plays only a small part in ensuring that information is available to those who need it.
- The approach needed depends on the :
 - kind of business,
 - its culture, and
 - the ways in which people solve problems.
- Some organizations generally deliver standard products and services, while others are constantly looking for new ways of doing things.
- Knowledge capture can therefore span a whole host of activities, from organizing customer information details into a single database to setting up a mentoring program



93

/ 372



137%



FIGURE 4-1 AN INTEGRATED KM CYCLE

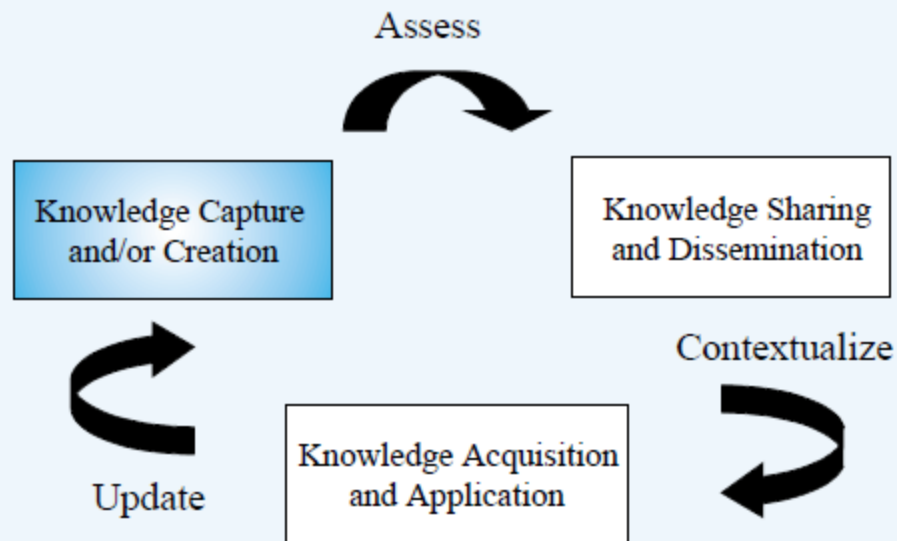


FIGURE 4-2

THE KNOWN-UNKNOWN MATRIX

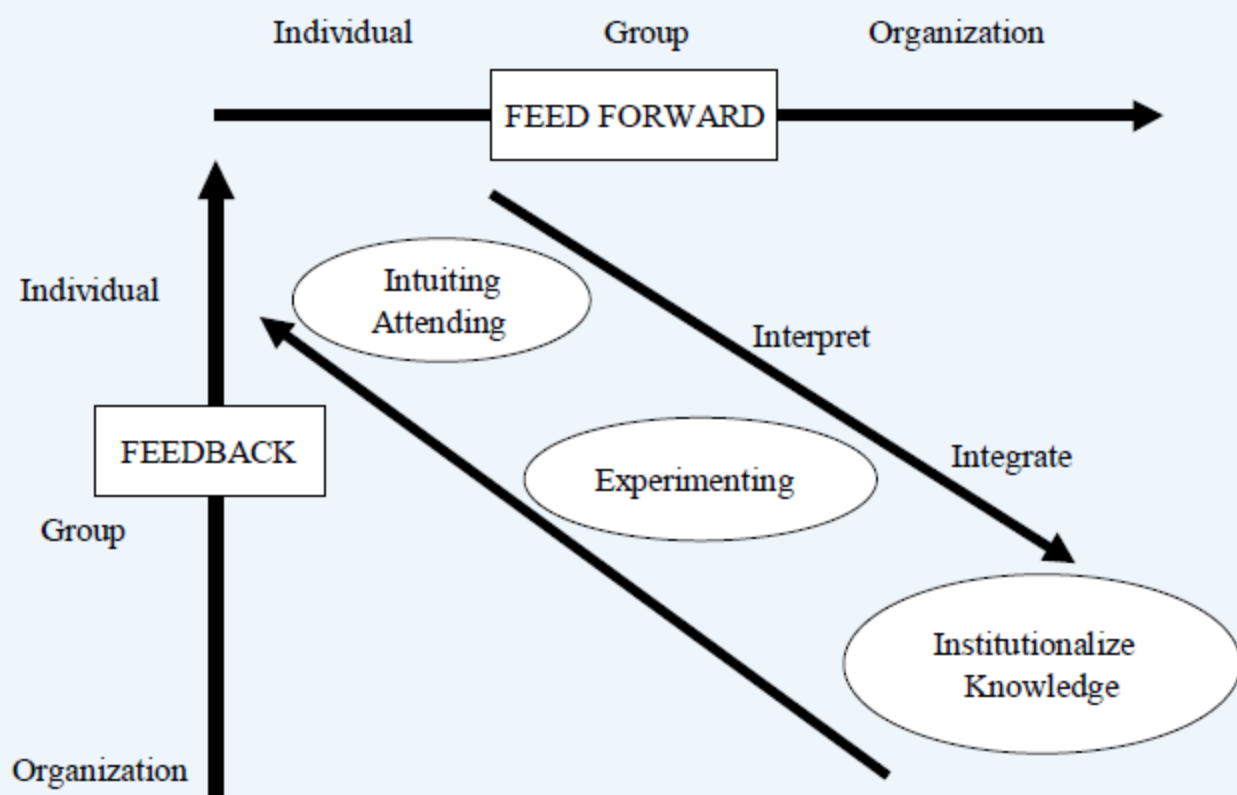
		Information Sources	
		Known	Unknown
User Awareness	Known	Know that we know	Know that we don't know
	Unknown	Don't know that we know	Don't know that we don't know

Source: Frappaolo, 2004.

Capturing Implicit Knowledge

- Learning at the individual level, however, is widely accepted to be a fundamentally social process—something that cannot occur without some form of group interaction.
- Individuals thus learn from the collective, and at the same time the collective learns from individuals (e.g., Crossan, Lane, and White, 1999).
- According to Crossan's 4I model (see Figure 4-3), organizational learning involves a tension between assimilating new learning (exploration) and using what has been learned (exploitation). Individual, group, and organizational levels of learning are linked by the social and psychological processes of
- Four I's
 - Intuiting-means perceiving or sensing,
 - interpreting,
 - integrating, and
 - Institutionalizing (the four I's).

FIGURE 4-3
THE 4I MODEL OF ORGANIZATIONAL LEARNING



Source: Crossan, Lane, and White, 1999.

Tacit Knowledge Capture at Individual and Group Levels

- Knowledge acquisition from individuals or groups can be characterized as the transfer and transformation of valuable expertise from a knowledge source (e.g., human expert, documents) to a knowledge repository (e.g., corporate memory, intranet).
- Reporters, journalists, writers, announcers and instructional designers have been practicing knowledge acquisition for years.
- system analysts have functioned in a very similar role in the design and development of conventional software systems”

- Explicit knowledge is well presented
- Tacit knowledge, on the other hand, may require much more significant up-front analysis and organization before it can be suitably described and represented.
- Ways in which we can tackle tacit knowledge range from :
 - simple graphical representations
 - sophisticated mathematical formulations.

- In the design and development of knowledge-based systems, or expert systems, knowledge engineers interviewed subject matter experts, produced a conceptual model of their critical knowledge, and then “translated” this model into a computer-executable model such that an “expert on a diskette” resulted

- ***Procedural knowledge*** is knowledge of how to do things, how to make decisions, how to diagnose, and how to prescribe.
- The, ***declarative knowledge***, denotes descriptive knowledge or knowing “what” as opposed to knowing “how.”

- In the field of artificial intelligence, The major tasks carried out by knowledge engineers included;
 - Analyzing information and knowledge flow.
 - Working with experts to obtain information.
 - Designing and implementing an expert system

Expert need to provide the following:

- Explain important knowledge and know-how.
- Be introspective and patient.
- Have effective communication skills.

Subject or domain experts were usually “sole sources of information whose expertise companies wish to preserve”

Another artificial intelligence researcher, Parsaye (1988), outlined the following three major approaches to knowledge acquisition from individuals and groups:

- 1. Interviewing experts.
- 2. Learning by being told.
- 3. Learning by observation.

Interviewing Experts

- **Structured Interviewing**
 - Normally at the time of exit of expert
 - Expert should be deep grasp of the subject
 - Strong communication skill
- The interviewer should outline specific goals and questions for the knowledge acquisition session.
- The interviewee should be provided with session goals and sample lines of questioning but usually not the specific questions to be asked.

- Two major types of questions are used in interviewing:
 - open and
 - closed questions.
- Open questions tend to be broad and place few constraints on the expert.
- They are not followed by choices
- they are designed to encourage free response (Oppenheim, 1966).
- These types of questions allow interviewers to observe the expert's use of key vocabulary, concepts, and frames of reference.

The expert can also offer information that was not specifically asked for. Some examples would be:

- “How does that work?”
- “What do you need to know before you decide?”
- “Why did you choose this one rather than that one?”
- “What do you know about . . .”
- “How could . . . be improved?”
- “What is your general reaction to . . . ?”

Closed Questions

- Closed questions set limits on the type, level, and amount of information an expert will provide.
- A choice of alternatives is always given.
- A moderately closed question would be something like: “which symptom led you to conclude that . . . ?”
- A very strong closed question is one that can only be answered by
- yes or no.

- The structured interviewing process is primarily a people-focused one, and as such, techniques that serve to facilitate the interactions can greatly contribute to the successful outcome of such sessions.
- Reflective listening helps in cases where words may have multiple meanings. The interview participants may hold :
 - very different mental models, and
 - personal characteristics
- such as background, attitude, training, and level of comfort with current position in the organization, may influence how an expert communicates his or her knowledge.

- The four major techniques used in reflective listening include
 - Paraphrasing
 - clarifying,
 - summarizing, and
 - reflecting feelings.

Paraphrasing

- *Paraphrasing* is the restating of the perceived meaning of the speaker's message but using your own words.
- The goal is to check the accuracy with which the message was conveyed and understood.

Examples include:

- “What I believe you said was . . .”
- “If I am wrong, please correct me but I understood you to say . . .”
- “In other words, . . .”
- “As I think I understand it . . .”

- *Clarifying* lets the expert know that the message was not immediately understandable.
- These responses encourage the expert to elaborate or clarify the original message so that the interviewer gets a better idea of the intended message.
- One should always focus on the message and not on the expert's ability to communicate, and the expert should be encouraged to elaborate or explain by using open questions wherever possible.
- Examples include
 - "I don't understand . . ."
 - "Could you please explain . . ."
 - "Please repeat that last part again . . ."
 - "Could you give me an example of that . . ."

Summarizing

- helps the interviewer compile discrete pieces of information and form a knowledge acquisition session into a meaningful whole.
- It also helps confirm that the expert's message was heard and understood correctly.
- The summary should be expressed in the words of the interviewer.
- Examples would be:
- “To sum up what you have been saying . . .”
- “What I have heard you say so far . . .”
- “I believe that we are in agreement that . . .”

Reflecting feelings

- *reflecting feelings* mirrors back to the speaker the feelings that seem to have been communicated.
- The main focus is on emotions, attitudes, and reactions, and not on the content itself.
- The purpose is to clear the air of some emotional reaction or negative impact of the message.

Some examples are:

- “You seem frustrated about . . .”
- “You seem to feel that you were put on the spot . . .”
- “I sense that you are uncomfortable with . . .”

Stories

- Stories are another excellent vehicle for both capturing and coding tacit knowledge.
- An organizational story is a detailed narrative of management actions, employee interactions, and other intra organizational events that are communicated informally within the organization.
- A story can be defined as the telling of a happening or a connected series of happenings, whether true or fictitious (Denning, 2001).
- Snowden (2001) defines a narrative as: “not just about telling, constructing or even eliciting stories, it is about allowing the patterns of culture, behaviour, and understanding that are revealed by stories to emerge” (p. 1).
- An organizational story can be defined as a detailed narrative of past management actions, employee interactions, or other key events that have occurred and that have been communicated informally (Swap et al., 2001).

- Conveying information in a story provides a rich context, causing the story to remain in the conscious memory longer and creating more memory traces than is possible with information not in context.
- Stories can greatly increase organizational learning, communicate common values and rule sets, and serve as an excellent vehicle for capturing, coding, and transmitting valuable tacit knowledge

- A number of conditions must be in place, however, in order to ensure that storytelling in its various enacted forms creates value in a particular organization.
- Sole and Wilson (2002) argue that although all stories are narratives, not all narratives are good knowledge-sharing stories.
- As an example, they cite movies, which tell stories designed primarily to entertain and therefore need not necessarily be authentic—or even believable.
- In contrast, in organizational storytelling, stories are often used to promote
 - knowledge sharing,
 - inform, and/or prompt a change in behavior,
 - as well as communicate the organizational
 - culture and
 - create a sense of belonging.

- In order to achieve these organizational objectives, knowledge-sharing stories need to be:
 - authentic,
 - believable,
 - and compelling.
- Stories need to evoke some type of response, and, above all,
- they need to be concise , in order to align with the organizational lesson learned can be easily understood, remembered, and acted upon.
- In other words, organizational stories should have an impact: they
- should prevent similar mistakes from being repeated, or
- they should promote organizational learning and adoption of best practices stemming from the collective organizational memory.

Major Characteristics are outlined as

- The explicit story should be relatively brief and detailed just enough that the audience can understand it.
- The story must be intelligible to the specific audience so that they are “hooked.”
- The story should be inherently interesting.
- The story should spring the listener to a new level of understanding.
- The story should have a happy ending.
- The story should embody the change message.
- The change message should be implicit.

- The listeners should be encouraged to identify with the protagonist.
- The story should deal with a specific individual or organization.
- The protagonist should be prototypical of the organization's main business.
- Other things being equal, true is better than invented.
- One should test, test, and test again

Learning by Told

- In learning by being told, the interviewee expresses and refines his or her knowledge, and at the same time, the knowledge manager clarifies and validates the knowledge artifact that renders this knowledge in explicit form.
- This form of knowledge acquisition typically involves :
 - domain and task analysis,
 - process tracing, and
 - protocol analysis and simulations.

- Task analysis is an approach that looks at each key task an expert performs
- characterizes the tasks in terms of :
 - prerequisite knowledge/skills required,
 - criticality,
 - consequences of error,
 - frequency,
 - difficulty, and
 - interrelationships with other tasks and individuals,
 - as well as how the task is perceived by the person (routine, dreaded, or eagerly anticipated).

Learning by Observations

- There are at least two types of discernible expertise: skill or motor based
- (e.g., operating a piece of machinery, riding a bike) and
- cognitive expertise (e.g., making a medical diagnosis).
- Expertise is a demonstration of the application of knowledge.
- The learning-by-observation approach involves presenting the expert with a sample problem, scenario, or case study that the expert then solves.
- Although we cannot observe someone's knowledge, we can observe and identify expertise.
- The key is to use audio or video to record what the expert knows. People think of video mainly as a presentation device. However, experience has shown again and again that video recordings of informal and unrehearsed expert demonstrations form a permanent record of task knowledge— one that can be mined repeatedly.

- However, one should always accommodate the particular expert or interviewee at all times;
- many individuals end up feeling much less comfortable if they know they are being recorded.
- The happy medium is to bring along recording equipment but allow the subject the choice and hand over the controls to them—so they can mute whenever they wish to “speak off the record.”
- For physical demonstrations, inexpensive digital camcorders are recommended.
- For software demonstrations, screen capture movie software that records the action directly from the desktop is recommended.
- Together, simple equipment and simple techniques can capture an amazing range of information and demonstrations.

Other Methods of Tacit Knowledge Capture

- Ad hoc sessions- informal in nature, no prior agenda, happens in the form of brain storming, last for around 30 minutes.
- Road maps-formal, prior agenda, development of solution of day today basis.
- Learning histories-
- Action learning-
- E-learning-
- Learning from others through business guest speakers and benchmarking against best practices.

Tacit Knowledge Capture Form

FIGURE 4-5

SAMPLE KNOWLEDGE ACQUISITION SESSION TEMPLATE

Knowledge Acquisition Session Notes	
Project Name	_____
Date	_____
Person interviewed	_____
Interviewer	_____
Technique	_____
Objective	_____
Duration _____	
Reference materials collected _____	
Recorded session? Y/N _____	
Next scheduled interview _____	
Next topics to be addressed _____	
Summary of key findings _____	

EXPLICIT KNOWLEDGE CODIFICATION

- Knowledge can be shared through personal communication and interaction, as we saw in the first quadrant, socialization, of the Nonaka and Takeuchi KM model.
- This occurs naturally all the time and is very effective, though rarely is it cost-effective.
- Knowledge codification is the next stage of leveraging knowledge.
- By converting knowledge into a tangible, explicit form such as a document, that knowledge can be communicated much more widely and with less cost.
- Interaction is limited in scope to those within hearing or able to have face-to-face contact.
- Documents can be disseminated widely over a corporate intranet
- They persist over time, which makes them available for reference as and when they are needed, both by existing and by future staff.
- They constitute the only “real” corporate memory of the organization.

- There are, of course, costs and difficulties associated with knowledge codification.
- The first issue is that of quality, which encompasses
 - (1) accuracy,
 - (2) readability/understandability,
 - (3) accessibility,
 - (4) currency, and
 - (5) authority/credibility.

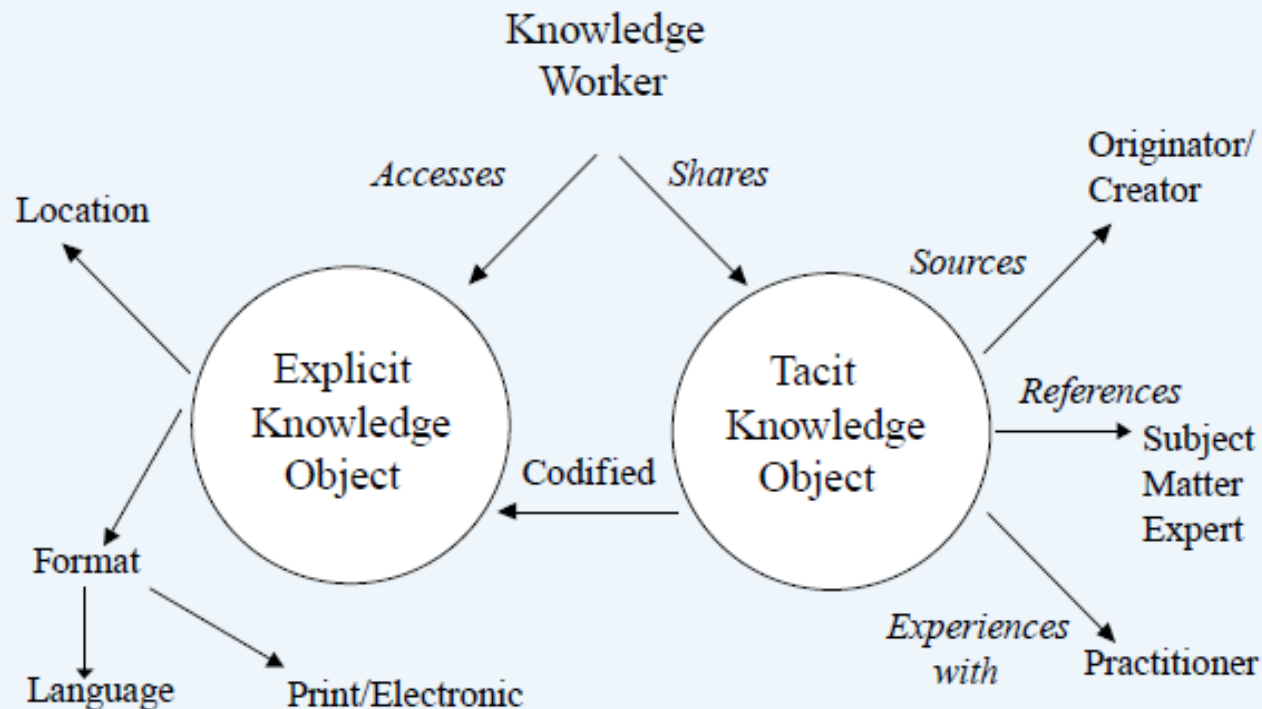
- The codification of explicit knowledge can be achieved through a variety of techniques such as :
 - Cognitive mapping,
 - decision trees,
 - knowledge taxonomies, and
 - task analysis.

Cognitive Maps

- Once expertise, experience, and know-how have been rendered explicit, typically through some form of interviewing, the resulting content can be represented as a cognitive map.
- A cognitive or knowledge map is a representation of the “mental model” of a person’s knowledge and provides a good form of codified knowledge.
- A mental model is a symbolic or qualitative representation of something in the real world.
- It is how human minds process and make sense of their complex environments.
- A cognitive map is a powerful way of coding this captured knowledge because it also captures the context and the complex interrelationships between the different key concepts.

- It is also very important to include individual views, perceptions, judgments, hypotheses, and beliefs as they form part of the interviewee's subjective worldview.
- The nodes in a map are the key concepts, and the links represent the interrelationships between the concepts.
- These may be drawn manually by taping small note pages on a wall, a whiteboard, or visualization software, ranging from simple brainstorming mapping tools to 3-D depictions.
- Figure 4-6 shows an example of a cognitive map in response to the question: "describe the major differences between tacit and explicit knowledge objects."

FIGURE 4-6
EXAMPLE OF A CONCEPT MAP



Decision Trees

- The decision tree is typically in the form of a flowchart, with alternate paths indicating the impact of different decisions being made at that juncture point.
- A decision tree can represent many “rules,” and when you execute the logic by following a path down it, you are effectively bypassing rules that are not relevant to the case in hand.
- You do not have to look at every rule to see if it “fires,” and you also take the shortest route to the correct outcome.
- Their graphical nature makes them very easy to understand, and they are obviously very well suited for the coding of process knowledge.

- An example would be a preventive maintenance process for factory equipment.
- Figure 4-7, helps guide the decision to consolidate or to develop a new product as a risk management decision tree.

FIGURE 4-7
EXAMPLE OF A DECISION TREE

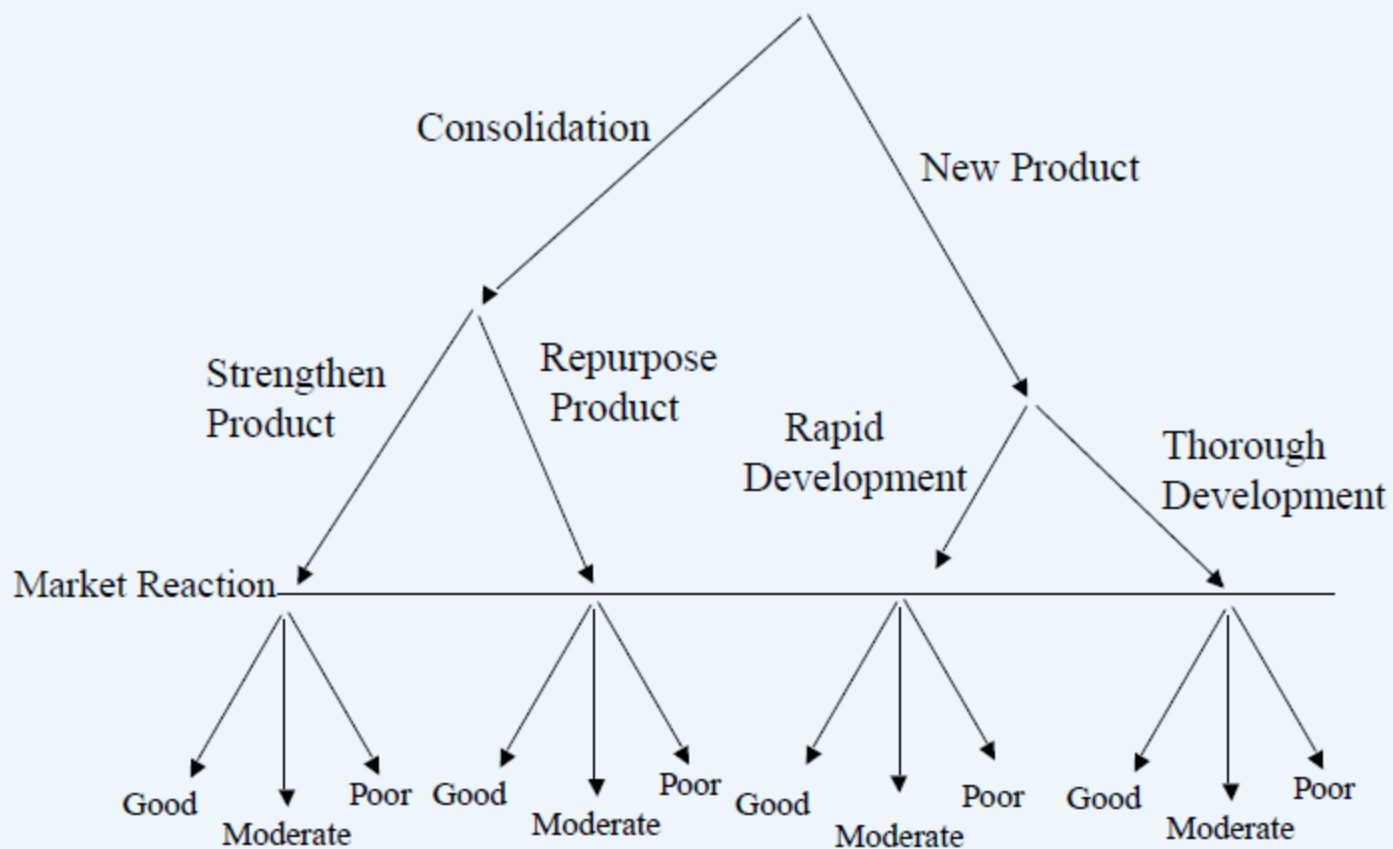
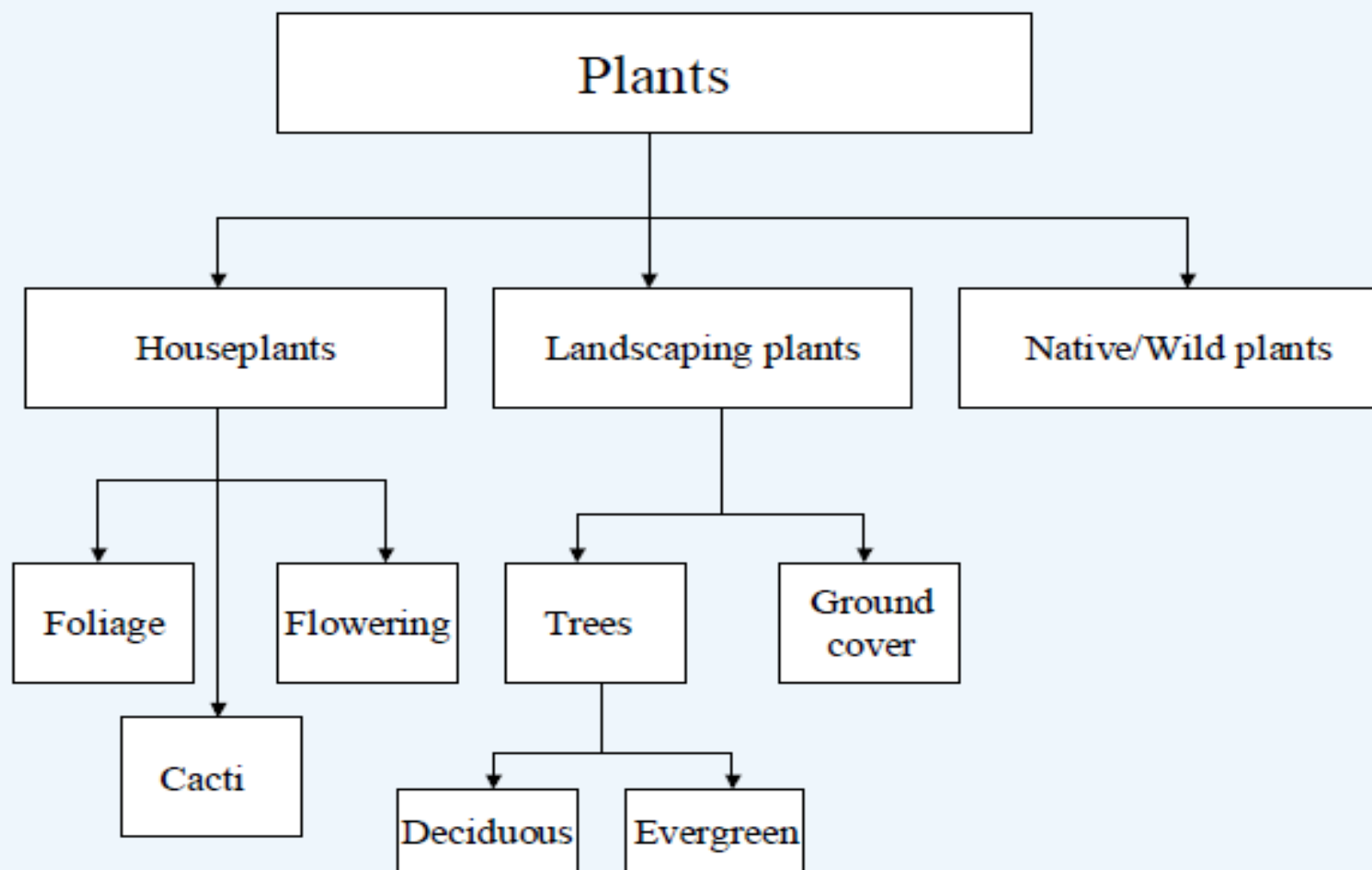


FIGURE 4-8
EXAMPLE OF A KNOWLEDGE TAXONOMY



MAJOR TAXONOMIC APPROACHES TO KNOWLEDGE CODIFICATION

Taxonomic Approach	Key Features
Cognitive or concept map	<ul style="list-style-type: none">■ Key content represented as a node in a graph, and the relationships between these key concepts are explicitly defined.■ Can show multiple perspectives or views on the same content.■ Fairly easy to produce and intuitively simple to understand but difficult to use for knowledge related to procedures.
Decision tree	<ul style="list-style-type: none">■ Hierarchical or flowchart type of representation of a decision process.■ Very well suited to procedural knowledge—less able to capture conceptual interrelationships.■ Easy to produce and easy to understand.
Manual knowledge taxonomy	<ul style="list-style-type: none">■ Object-oriented approach that allows lower or more specific knowledge to automatically incorporate all attributes of higher-level or parent content they are related to.■ Very flexible—can be viewed as a concept map or as a hierarchy.■ More complex; will therefore require more time to develop as it must reflect user consensus.
Automated knowledge taxonomy	<ul style="list-style-type: none">■ A number of tools are now commercially available for taxonomy construction.■ Most are based on statistical techniques such as cluster analysis to determine which types of content are more similar to each other and can constitute subgroups or thematic sets.■ Good solution if there is a large amount of legacy content to sort through.■ More expensive and still not completely accurate—will need to validate and refine for maximum usefulness.