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Understanding, Finding, and Applying Core Competencies:

A Framework, Guide, and Description for Corporate Managers and
Research Professionals

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A Framework, Guide, and Description for Corporate Managers and Research Professionals

Introduction

The construct of the core competence—sometimes called by other names such as organizational competencies or distinctive capabilities—has been widely studied in recent years, especially since the publication of Prahalad and Hamel’s influential 1990 article, “The Core Competence of the Corporation.” Since then, empirical and conceptual research on this concept has brought about many views of what these competencies are and how they can be applied to create better products and services.

In general, core competencies have been seen as capabilities held by people within a firm that, when applied to create products and services, make a critical contribution to corporate competitiveness. For a more complete discussion of core competencies, see Edgar and Lockwood (2008), which reviews the core competence literature, describes their components, and identifies research that remains to be done on them.

What has not been published, however, is a paper intended for intellectual leaders within corporations and their executives to help them conceptualize core competencies, discover the ones their firms hold, and know the place of these competencies within the structure of organizational knowledge. This paper provides such direction in three ways.

First, it presents a conceptual framework, drawn from previous research, for understanding the core competencies of a firm, revealing the internal dynamic and elements of the core competence. This is an initial framework and, as will be discussed later, applying it will likely lead to its revision.

Second, the paper presents a useful guide for applying this framework to discover the core competencies held by a particular firm. This guide has several advantages. It draws upon numerous perspectives as to an organization’s competence. It is inexpensive to do. It also illuminates the complexity usually found within a core competence while making one comprehensible. Corporate managers and research professionals may find both the framework and the guide useful for understanding their firms’ core competencies.

Third, the paper places core competencies within the structure of knowledge held by a firm. This reveals how they are supported by underlying bodies of corporate knowledge and in turn how they enable more specific kinds of knowledge, such as familiarity with specific products and services serving customers.

Core Competence Framework

This framework for discovering core competencies draws upon research that examined four corporations (Edgar and Lockwood, 2008), each with annual revenues in excess of one billion dollars. Oriented around providing knowledge and information in different forms, the four corporations provide an array of advanced products such as switches, multiplexers, routers, transmitters, copiers, printers, scanners, and integrated circuits. They also offer complex services such as communication network planning, network design and implementation, and document management.

Across the four firms, five core competencies were identified as enabling these products and services. Three emerged from an understanding of the communication network. A fourth was based upon an understanding of both physical and digital documents. The fifth was based upon understandings of silicon and the creation of silicon-based integrated circuits.

The framework draws upon its underlying research to reveal two things:

- 1) How core competencies work (their internal dynamic)
- 2) What they are made of (their elements)

How core competencies work (their internal dynamic)

The common dynamic among these competencies was initially revealed through conceptual analysis (also known as content analysis) of corporate documents and through interviews with internal corporate professionals. The interviewees stressed the dynamic's progressive iteration.

For instance, Figure 1 depicts one of the three core competencies emerging from an understanding of the communication network. Here corporate understandings of the general phenomena of communication and networks converge into a thorough corporate understanding of the communication network core phenomenon. (These are shown in bold on the Figure, as are the other examples discussed here.) Out of this emerges familiarity with specific product technologies, such as switching, and using an understanding of the general phenomenon of light, with product sub-technologies, such as optical switching. Drawing upon familiarity with the general phenomenon of computing hardware, this focused expertise brings about an understanding of the product class of optical switches.

Emerging from—and contributing back to the understandings of network technologies and product classes—are the functional skills in manufacturing optical switches to be elements of communication networks, as well as the technological skill of optical switching. These skills are in turn part of a larger integrated skill set supporting the creation and management of both the elements of communication networks as well as complete networks.

As this iterative progression occurs, people holding the competence are able to use a range of technologies related to the communication network, and to provide specific products and services arising from them. The result is complex but varied competitive power to meet the networking needs of customers.

What core competencies are made of (their elements)

This progressive, iterative dynamic just described occurs through the interaction of competence elements. Guided by the competence literature, conceptual analysis performed upon corporate documents like annual reports and product catalogs revealed seven major elemental categories of understandings and skills that exist within each of the five identified competencies; it also revealed numerous instances within each category. Understanding of the categories and instances was subsequently refined by the interviews with corporate professionals.

Table 1 presents the elements for three of the five core competencies. For simplicity, Table 1 includes only one of the three competencies based upon the communication network, as shown, since the other two contained similar elements. For all three competencies, the instances, or members, within the seven elemental categories are shown as bulleted items. Only a sample of the most important instances within the categories is presented, since each competence had too many understandings and skills to present them all.

Identifying them as conceptual categories, the documentary analysis and interviews of corporate professionals revealed the first five competence elemental categories included complex understandings of different phenomena, disciplines, technologies, and types of products or services (Table 1, left column). Similarly, they showed the last two categories to involve singular and integrated skills.

Figure 1. Core Competence Chart.

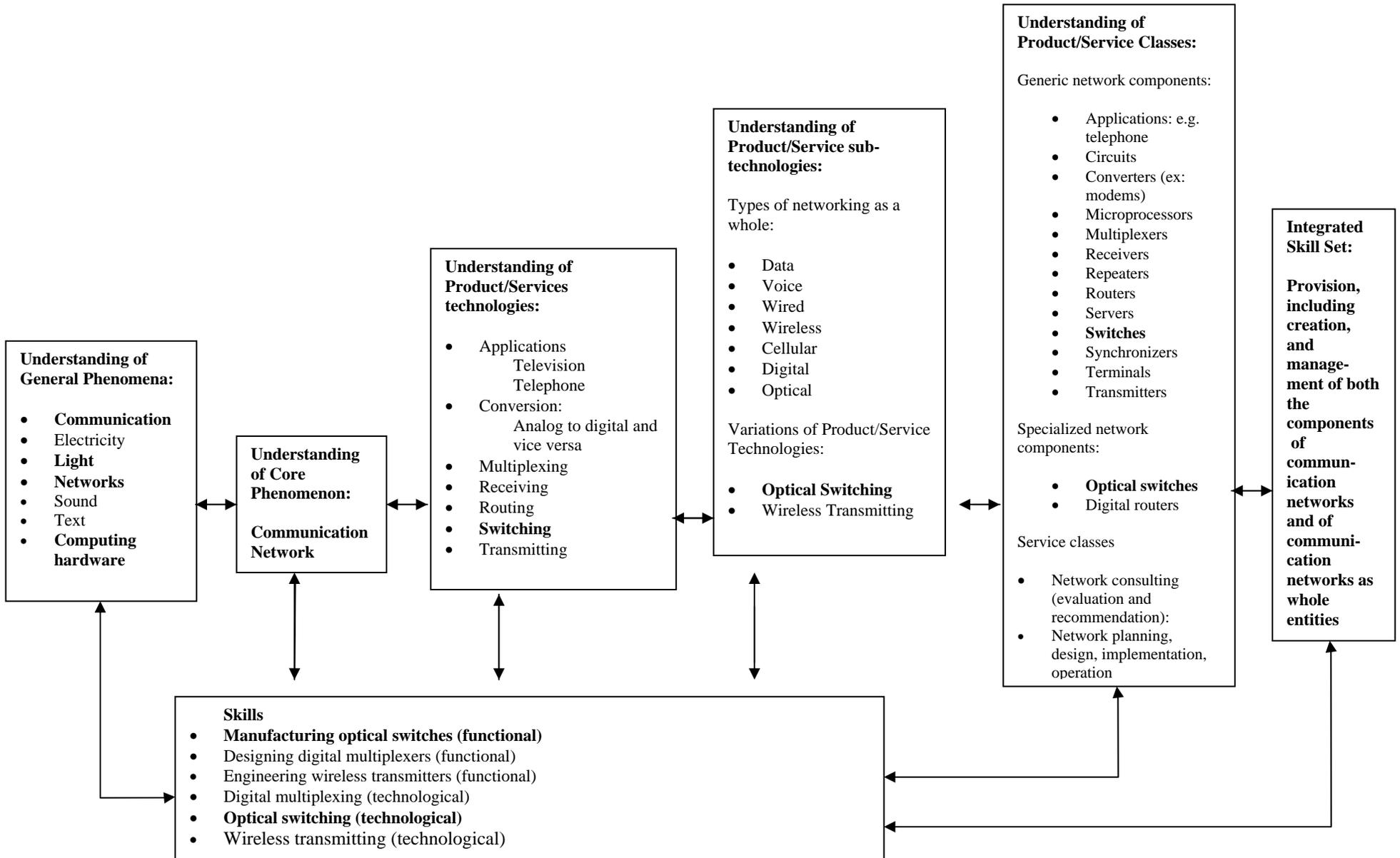


Table 1: Core Competence Components

Competence Component Categories		Competence Components		
		Competence One	Competence Two	Competence Three
Understandings	1) Core Phenomenon	<ul style="list-style-type: none"> • Communication Network 	<ul style="list-style-type: none"> • Document 	<ul style="list-style-type: none"> • Silicon • Design integrated circuits • Manufacture integrated circuits
	2) General Phenomena	<ul style="list-style-type: none"> • Communication • Electrical Systems • Networks • Light 	<ul style="list-style-type: none"> • Text • Paper • Color • Digital format for content 	<ul style="list-style-type: none"> • Electrical systems • Materials
	3) Product/ Service Technologies	<ul style="list-style-type: none"> • Switching • Multiplexing • Routing • Transmission 	<ul style="list-style-type: none"> • Imaging • Marking 	<ul style="list-style-type: none"> • Controlling content • Storing content
	4) Product/ Service Sub-technologies	<ul style="list-style-type: none"> • Optical Networking • Optical Switching • Optical Transmission 	<ul style="list-style-type: none"> • Color Digital Imaging • Color Copying • Digital Printing 	<ul style="list-style-type: none"> • Personal computing • Server computing
	5) Product/ Service Classes	<ul style="list-style-type: none"> • Optical switches • Optical Transmitters 	<ul style="list-style-type: none"> • Color copiers • Digital printers 	<ul style="list-style-type: none"> • Micro-processors • Routers
Skills	6) Functional and Technological Skills	<ul style="list-style-type: none"> • Manufacturing optical switches • Manufacturing optical transmitters • Optical switching • Optical transmitting 	<ul style="list-style-type: none"> • Installing color copiers • Repairing digital printers • Color Imaging • Digital marking 	<ul style="list-style-type: none"> • Designing microprocessors • Manufacturing routers • Microprocessing • Data routing
	7) Integrated Skills	<ul style="list-style-type: none"> • Provision, and management of communication networks and their components 	<ul style="list-style-type: none"> • Provision of document management equipment, software, and services 	<ul style="list-style-type: none"> • Provision, including creation, of computers and their components.

1) Understandings of core phenomenon and related disciplines (Table 1; Row 1). A core phenomenon, the foundation of a core competence, is the entity(ies) which people holding a core competence *understand* most thoroughly. Understandings of general phenomena, discussed below, converge into the thorough understanding of this phenomenon, and it is out of this thorough

understanding that the other understandings and skills comprising the rest of a firm's core competence emerge. These understandings are often enriched by corporate employees' knowledge of related disciplines. Analysis revealed four variations of core phenomena. They include the following:

1. Something created by the company holding the competence.
2. Something the company's customers create.
3. Something that exists naturally.
4. Something that people within the firm do (an activity).

An example of the first variation occurs in Competence One (Table 1), since its core phenomenon is the communication network, which the host firm provides to customers. Related disciplines for it include computer science and mathematics. Competence Two (Table 1) is an example of the second variation, since its core phenomenon is the customer documents the host firm manages. Related disciplines supporting it include linguistics and psychology. Competence Three is an example of the third variation, since one of its core phenomena is the element silicon. Related disciplines supporting it include materials science and engineering. Competence Three is also an example of the fourth variation, since its other core phenomena are the design and manufacture of silicon circuits.

2) Understandings of general phenomena (Table 1; Row 2). General phenomena are ones that can be used in many areas of life, not just with regard to the core competence. However, they often combine to form a core phenomenon, as occurs in Competence One, where the two general phenomena of communication and network combine to create the core phenomenon of the communication network. This also happens in Competence Two, where the general phenomena of text and paper are combined to create the core phenomenon of the document.

3) Understandings of product/service technologies (Table 1; Row 3). Product/service technologies emerge directly from the core phenomenon. Sometimes they are activities that create it. An example occurs in Competence One, where the product/service technologies of switching and transmission act together to form the communication network core phenomenon.

A second variation occurs when the product/service technologies are the activities that can be done to the core phenomenon. Competence Two is an example. In this, product/service technologies are actions such as imaging and marking that can be performed upon the document core phenomenon.

A third variation happens when product/service technologies are the activities that arise from understanding of a core phenomenon that exists naturally. Competence Three is an example. In this case, the functions of computing (e.g., controlling data or storing it in memory) are made possible by a thorough understanding of the natural element of silicon.

A fourth variation develops when product/service technologies arise from skills necessary to do the core phenomenon. This occurs in Competence Three. Here, the functions of computing, such as controlling data, are made possible by the activities of designing and manufacturing integrated circuits.

4) Understandings of product/service sub-technologies (Table 1; Row 4). Product/Service sub-technologies emerge from product/service technologies, usually in combination with general phenomena. Essentially, they are more specialized versions of product/service technologies. Several variations exist.

First, product/service sub-technologies can arise from the application of one general phenomenon to one product/service technology. This occurs in Competence One with optical transmission, which is performed when the general phenomenon of light is applied to the product/service technology of generic transmission.

Second, they can emerge through the application of one general phenomenon to multiple product/service technologies. This also occurs in Competence One, where the general phenomenon of light is applied to all the functions within a network, such as switching and multiplexing, to create optical networking. In Competence Two, this happens in the application of the general phenomenon of color to the product/service technologies of imaging and marking to create color copying.

Third, product/service sub-technologies can arise through the application of multiple general phenomena to one product/service technology. This occurs in Competence Two, where the general phenomena of color and electricity are applied to the product/service technology of imaging to create color digital imaging.

Fourth, they can arise through the application of multiple general phenomena to multiple product/service technologies. One example occurs in Competence Three. In this, the general phenomena of electrical systems and materials are applied to the product/service technologies of controlling and storing intellectual content such as data to support personal computing.

5) *Understandings of product/service classes (Table 1; Row 5).* Product/service classes are types of products and services made possible by product/service technologies and sub-technologies, often in combination with an understanding of a general phenomenon. An example occurs in Competence One. Here the product technology of switching, the sub-technology of optical switching, and the general phenomenon of light enable the production of optical switches.

6) *Skills (Table 1; Row 6).* A core competence's skills—the ability to do something—can exist in functional or technological forms. Functional skills are made possible by understandings of classes of products and services (Table 1, Row 5). Examples of functional skills include manufacturing optical switches (Competence One) and designing microprocessors (Competence Three).

Technological skills, in contrast, are made possible by understandings of technologies related to specific products or services. Differing from the technological understandings shown in Rows 2-4 of Table 1, these skills are the capability of people to use the technology itself. For instance, in one of the firms, the people contributing to Competence Two have an understanding of the product/service technology of imaging (Row 3), but they also can *apply* this to the next step and actually create color images (Row 6).

7) *Integrated skills (Table 1; Row 7).* This is the ability to do an activity caused by the functional *and* technological skills discussed above. This integrated skill consists of the individual skills and the relationships between them. An example is the ability to provide communication networks as whole entities (Competence One). These networks arise from the integration of functional skills in engineering and manufacturing of optical network components; however, they also emerge from the integration of technological skills in optical switching and transmission.

Given this structure of competence elements, note that general phenomena take two forms. Sometimes they are what can be thought of as “entities” because they are relatively unchanging, stable objects, such as the general phenomenon of paper is for the core competence based upon the document. Other times, however, they can be thought of as “processes” because they involve relatively dynamic, changing things that occur repetitively, such as the general phenomenon of light is for the core phenomenon based upon the communication network. Either way, general phenomena can be considered the “raw materials” of core competencies because understandings of them are repeatedly incorporated into understandings of core phenomena, product/service technologies and their variations, and classes of products and services.

Framework Summary

Employees' competence-related understandings include ones of general and core phenomena; supporting product or service specific technologies; and classes of products and services arising from the understood technologies. The skills within a competence can be specific ones, as well as integrated ones encompassing multiple functional or technological skills. Functional skills emerge from understandings of types of products or services, while technological skills arise from understandings of technologies. Utilized together, the different understandings enable the competence's specific and integrated skills, and the skills in turn reinforce the corporate understandings of phenomena, disciplines, general or product/service specific technologies, as well as of types of services and products.

This core competence framework identifies how core competencies work and what they are made of. It shows that core competencies are a set of progressive, iterative understandings and skills held by corporate employees that collectively operate at the core level, providing the intellectual foundation for corporate competitiveness.

A Guide to Discovering Core Competencies

Far more than an abstraction, this framework can be applied using a three-step guide to discover a particular firm's core competencies. The first step is to determine the competence's breadth using conceptual analysis of key corporate documents. The second is to verify and revise results from the conceptual analysis by integrating them into a core competence chart. The third step is to use this chart to interview key corporate managers and professionals, enhancing understanding of the competence gained during the first two steps.

Step One: Determine Core Competence Breadth

The first step of the guide to discovering a firm's core competencies is to apply conceptual analysis to corporate documents concerning the company's products and services. One assumption here is that strong evidence of a firm's competencies will be found in the documents it creates and maintains to support the products and services which are created by the competencies' application.

In order to determine the breadth of each company's core competencies, the authors recommend that a team of perhaps two or three investigators work together to identify a set of representative, publicly available documents either authored by the company or approved by them. Ideally, to protect the firm's competitive secrets, the investigators should not use confidential documents, and, to aid in conceptual analysis, the documents should be available digitally. Designed to provide a reader with an overview of the firm's capabilities, the documents can include the following:

- Business statements within annual reports of the last two to three years
- Current corporate profiles and factbooks
- Product overviews
- Product catalogs
- Research laboratory agendas and reports
- Technical briefs and white papers

It is possible to use "outside" documents not approved by the firm, such as journalistic accounts of its activities in trade publications. The advantage of this is the potential objectivity of perspectives outside the firm as to its core competence. The disadvantage could be the lack of intimate familiarity with the firm held by its insiders.

Once the documents are identified, the process of conceptual analysis involves applying two steps to each document:

1. List major words and/or phrases within these documents alphabetically, along with the number of times they occur.
2. Classify these words or phrases as representing instances in one of the seven elemental categories of the core competence revealed by the core competence framework, recording them into a Core Competence Breadth Table. Table 2 provides a simple example of such a Table and a more complete one is given Appendix 1. In this way, major words in the analyzed content are incorporated into the specifics of the core competencies for each company. The authors do recommend using content analysis software to do this categorization. By forcing incorporation of all of the most commonly occurring major words or phrases, documentary analysis provides a useful intellectual check against omitting important concepts delineated by the framework.

Table 2: Core Competence Breadth Table

Core Competence	Word/Phrase	Number of Occurrences
Core Phenomenon (Understanding)	Communication Network	150
General Phenomenon (Understanding)	Network	30
Product/Service Technology (Understanding)	Switching	20
	Transmission	25
Product/Service Sub-technology (Understanding)	Optical Switching	15
	Optical Transmission	10
Product Service Class (Understanding)	Optical Switches	12
	Optical Transmitters	10
Skill	Manufacturing Optical Switches	8
	Manufacturing Optical Transmitters	7
Integrated Skill	Providing Optical Networks	5

3. Adding rows to this table represents adding understandings or skills to the core competence, increasing its breadth. Keep in mind too that, as explained more fully below, the investigator should not include in the Core Competence Breadth Table words or phrases that represent specific customer segments, since this knowledge is not included within a core competence.

Eventually, this table can become quite large. However, its results will be consolidated during the guide's next step, summarizing the competence's breadth into a chart.

During the conceptual analysis and construction of the Core Competence Breadth Table, the authors recommend that each investigator on the team work alone. He or she should analyze the most general documentary materials first, such as business statements within annual reports as well as corporate factbooks. These describe the overall vision, customers, product capabilities, and products of the firms. Then the investigator should analyze documents with more detailed content about the firm's capabilities and operations, such as product catalogs or research laboratory reports.

The result of this conceptual analysis, a Core Competence Breadth Table, is only a preliminary depiction of instances within the seven elemental categories of the core competence. Therefore, some points about the core competence framework must be kept in mind. One is that the framework itself is an initial one, subject to revision. Investigators may find they need to add another competence element to the seven given here.

A second point is that investigators might also differ as to the operation within each of the seven elemental categories. For example, they might not agree as to whether the core phenomenon of a particular competence is something the firm creates or something that exists naturally, leading to a disagreement as to the competence's core phenomenon.

A third point is that investigators might find too many instances within a category to be realistically included within the competence; they might even disagree about which instances are included

within one. For example, they might find dozens of potentially applicable functional or technological skills and disagree on which skills are within the competence.

If any of these situations occur, then the investigative team addresses them using the next two steps in the guide, which involve collaboration among investigative team members and interviews with key corporate personnel. Using the examples just given, these could lead investigators to resolve or record the investigators' discrepancies as to the number of elemental categories within a core competence, the operation of the core phenomenon, or the key competence skills among the many people in the firm hold.

Step Two: Verify Core Competence Breadth and Dynamic

Once the breadth of a firm's core competence is determined, its individual understandings and skills recorded in the Core Competence Breadth Table (Table 2), can be summarized into a *Core Competence Chart*, as shown earlier in Figure 1. The idea here is for the members of the investigative team to finish the individual analysis they performed during Step One of the guide and then collaborate together, combining their competence breadth findings in order to depict the iterative interactions across them. For instance, through debate among team members, it is through the Core Competence Chart that potential general phenomena are shown to apply across product/service technologies and product classes. It is here that singular skills are shown to combine into an integrated one. It is also here that the technological understandings and skills of the competence are shown to reinforce each other. As debate among its members occurs, the investigative team verifies whether general phenomena, product/service technologies, product/service classes, singular skills, and even related disciplines really are ones applicable to this core competence.

In a Core Competence Chart, the columns and the box along the bottom represent the seven elements of a core competence. The individual bullets or items in the box along the bottom represent the individual technologies (whether of general or product/service type), related disciplines or phenomena, product/service classes, skills, and integrated skills. As such, the bulleted items are the equivalent of the rows within the Core Competence Breadth Table presented in Step One of this guide. Here, adding a bulleted item or a skill in the box along the bottom represents increasing the breadth of this core competence, and vice versa. If done well, this type of figure effectively represents the complexity of a firm's core competence yet provides a comprehensible means for understanding it.

This kind of Chart is developed for a specific core competence as members of the investigative team debate and apply the seven elemental categories of the core competence framework. For instance, the first step is to verify the core phenomenon or phenomena (e.g., communication network), which is the entity(ies) which people within a firm *understand* most thoroughly, and not, as one might believe, what a firm can *do* best. (The skills grow out of and in turn influence the understandings and come later in this process). Verifying this means deciding if the core phenomenon(a) is something created by the firm holding the competence, something the customers' create, something that exists naturally, or something that people within the firm do (an activity). Next, disciplines related to the core phenomenon(a) must be isolated. Then the core phenomenon must be decomposed to see what items it has which can be used in other entities besides the core phenomenon (e.g., communication and networks). These are general phenomena and should be put into the column on the left.

Once the depiction of the core phenomena and their related disciplines is complete, the investigative team must make a decision. They must verify whether the competence's product/service technologies are activities necessary to create the core phenomenon, ones that can be done to it, activities that arise from the understanding of a core phenomenon that exists naturally, or are skills necessary to do the core phenomenon. In the case of the communication network core competence, these are activities, e.g., switching or multiplexing, that are necessary to create the core phenomenon of the communication network. Then, the investigator should place these product/service technologies in the column to the right of the core phenomenon.

Following this comes a very challenging step as the investigators determine the competence's product/service sub-technologies. As discussed in the core competence framework, these arise from

different combinations of general and product/service technologies. For instance, the product service sub-technology of optical transmission, which is understood within the core competence depicted in Figure 1, arises from the application of a single general phenomenon, light, to the single product/service technology of generic content transmission. Similarly, on a larger scale multiple general phenomena can be applied to one product/service technology. As mentioned earlier, this occurs in related to a core competence based upon the communication network when the general phenomenon of light is applied to all of the product/service technologies of networking such as switching and transmission, to create the powerful product/service sub-technology of optical networking.

This process should be continued as the investigative team verifies the product/service classes which emerge from the product/service technologies and sub-technologies. That is, there is some added element(s), often some form of hardware, whose presence takes a product/service technology and creates a class of products or services out of it. Again, if this added element can be used in other entities besides the core phenomenon, then it too is a general phenomenon and should be put in the far left column. An example occurs when the product technology of switching, the sub-technology of optical switching, the general phenomenon of light, and hardware are combined to form the product class of optical switches. The process of moving left and right out from the core phenomenon continues until the investigators believe that understandings all of the general phenomena, core phenomena, related disciplines and phenomena, product/service technologies and sub-technologies, and product/service classes have been depicted in their appropriate columns on the Core Competence Chart.

Next, the investigative team should, through debate, verify the skills arising from and supporting these understandings and depict them on the bottom of the core competence chart.

Two types of skills can be included within a core competence. The first is functional skills, which arise from understandings of product and service classes. An example is the skill of manufacturing optical switches. The second type is technological skills, which arise from understandings of general and product/service technologies. An example of a technical skill would be to do optical switching using the appropriate hardware. As discussed earlier, it is here that a useful distinction must be kept in mind: the difference between understanding a technology, such as the product/service technology of optical switching, and being able to perform it, which is expressed as a technological skill. In the first case people in the firm *know* about optical switching; in the second they can *do* it.

The final step for the investigative team is to determine any integrative skills, which are placed at the right of the core competence chart. These arise from combining individual functional and technological skills of the competence. An example would be the ability to provide complete communication networks to customers. This arises from integrating functional skills in engineering and manufacturing of product classes, e.g. switches and transmitters. It also arises from integrating technological skills in switching and transmission. When this entire iterative process—involving moving outward to the left and right and up and down from the core phenomenon—is complete, the figure is finished and the core competence has been succinctly described.

As the team constructs the Core Competence Chart, it is important to remember that any core competence involves *two* kinds of integrations. The first is of individual functional and/or technological skills into a multidimensional one, represented on the Chart by the arrows between the bottom and far right boxes. The second integration is of all the understandings within the competence with each other and with the individual and integrated skills, represented on the Chart by the arrows connecting all the boxes.

Investigators should remember too that representing the core competence in this kind of chart is a collaborative and imprecise act, so the process of thinking and debating together can be as valuable as the final chart. Also, it may be that the result of this debate may not be one definite chart for each competence, but instead several charts representing different perspectives. This can happen when trying to represent the action and supporting knowledge of a large group of people. It may be that collectively the multiple charts provide a more accurate depiction of the core competence than does a single chart.

In addition, it is the authors' experience that a firm's core competence exists at the business rather than at the corporate or divisional levels. Moreover, given each competence's complexity, each business

unit has relatively few core competencies, often only one or two. Remember that individual skills or understandings do not make a competence; instead multiple ones do when they are effectively integrated.

As a guide, illustrative examples of these charts for core competencies based upon the core phenomena of communication network, documents, and silicon are given in Appendices 2.1-2.3. These provide a fuller description of the Competencies depicted in columns 1-3 of Table 1.

Step Three: Enhance Understanding of Competence Dynamic and Elements

Once a core competence chart has been completed, interviews with the intellectual leaders of the corporation, whether executives leading large divisions or individual scientists and engineers, can enhance the results of the first two steps of this core competence discovery guide. In each firm, the investigators should interview, either individually or as a team, from twelve to fifteen of these leaders. At least two criteria can be used to identify the interviewees: their intellectual diversity and their reputation within the firm for being knowledgeable and thoughtful concerning the firm's intellectual strengths. The respondents' education and work backgrounds can include a variety of disciplines such as physics, computer science, and information science. They can also include a variety of professional practices, such as computer engineering, finance, marketing, strategic management, product management, public relations, manufacturing, customer service, and research and development.

As was true in document analysis, it is possible to use "outside" interviewees not employed by the firm, such as trade publication journalists or industry analysts. The advantage of this is the potential objectivity of these experts as to the firm's core competencies. The disadvantage could be the lack of insider understanding held by the firm's own personnel.

The purpose of the interviews with corporate professionals and managers is to present them with the results from steps one and two and to elicit their reaction to these results. A sample Core Competence Interview Instrument for this is given in Appendix 3. Also, the Instrument's questions elicit depictions of the specific corporate products and services arising from a Core Competence. Finally, the instrument's questions are designed to determine what the respondents think will be happening in the future to their firms' core competencies. The interviews usually last between one to two hours.

The need to enhance the findings of content analysis through interviews has been strongly verified by previous research using this three-step guide (Edgar 2000). During this study, one interviewee stressed that the conceptual analysis of publicly available documents did not penetrate completely to the real core phenomenon of his firm's competence. He said that is probably because the firm wants to present tangible products and services to customers rather than drawing attention to its underlying strengths making those products and services possible. It was only the interviews with internal people which allowed the real core phenomenon to emerge.

In general, this kind of interview is semi-structured, meaning that it asks for very specific responses in some questions and then allows the interviewees great flexibility in their responses based upon the specific answers they have given. Also, these interviews follow what is known as a "tree and branch" approach, in which the interviewer(s) models the interview like a tree. "The trunk is the core topic; the branches, the main questions. You plan the questions to explore each branch with more or less the same degree of depth" (Rubin & Rubin, p. 159). The idea is to learn about all the questions but to maintain balance in coverage across the questions. Ideally, these interviews are guided, thorough conversations with knowledgeable, internal people regarding the firm's core competencies.

Context of the Core Competence

Structure of Knowledge and Practice

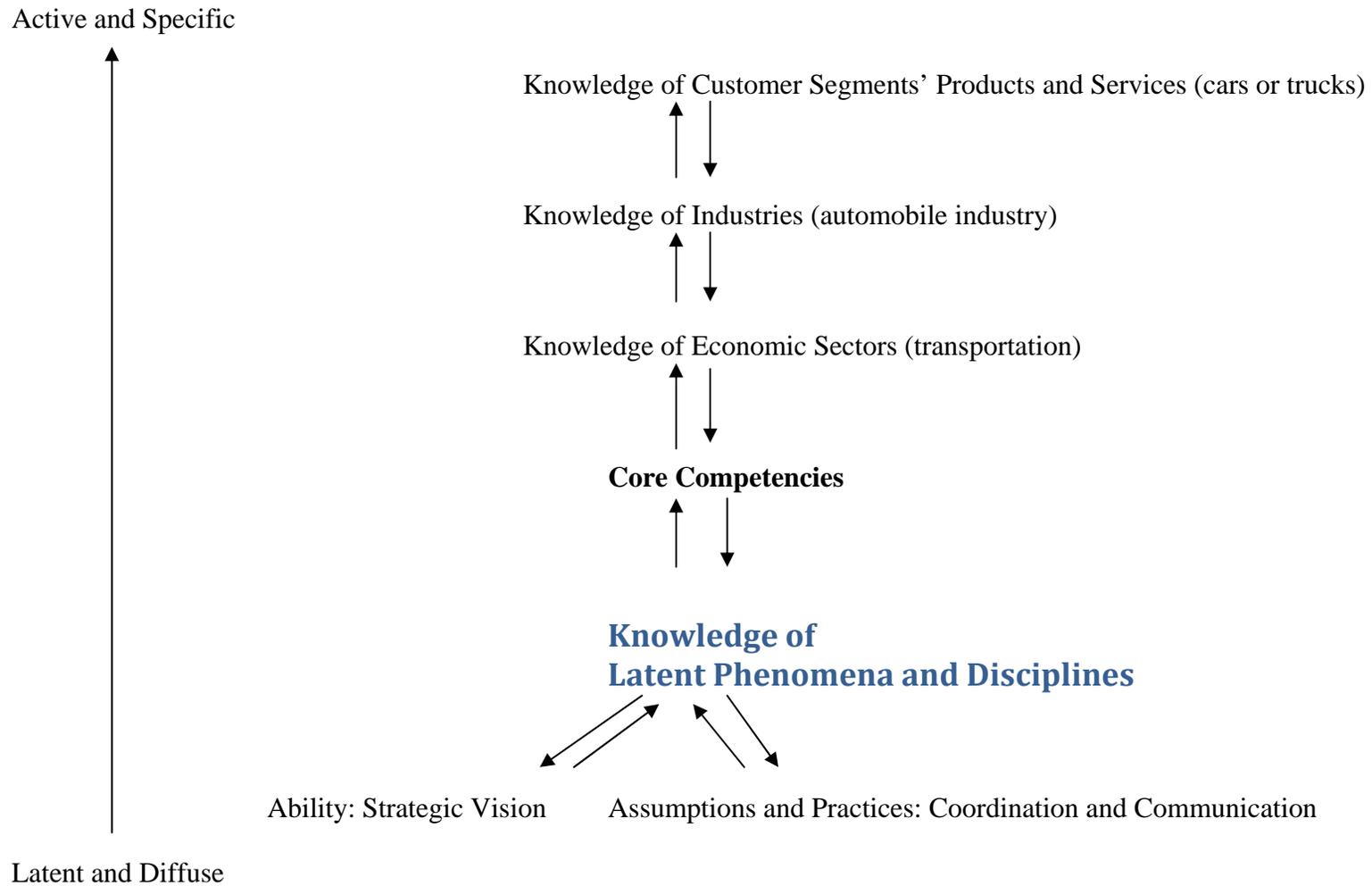
Once they are discovered, core competencies can be applied powerfully to provide new lines of products and services. Nevertheless, these competencies are only one type of organizational knowledge that must be utilized if a corporation is to be competitive. Previous research employing the three-step guide presented here (Edgar 2000, Edgar & Lockwood 2008), particularly the interviews with fifteen

corporate managers and professionals spanning four large corporations, revealed a structure of six levels of knowledge and practice within which a firm's core competencies operate. The result is not only a clear depiction of what core competencies are, as described in the Core Competence framework, but also what they are *not*. Keeping this structure in mind can guide managers as they direct the development and use of organizational knowledge. The structure is shown in Figure 2.

In the Figure, as the levels become higher, knowledge is held by relatively fewer people within the organization, and it is more likely to be applicable to providing specific products or services. Conversely, as the levels become deeper, knowledge becomes relatively more widely held within the organization and tends to be in latent form, potentially supporting products and services yet to be developed.

The Figure also reveals that core competencies, depicted in bold, are intermediate types of organizational knowledge, located in the middle of the structure. Grounded in a thorough understanding of core phenomena, they are concrete enough to enable the provision of classes of products and services, yet they are not so specific as to involve the knowledge related to a particular product or customer. (For a more complete discussion of the relationship between a firm's core competencies and its strategic environment, please see Edgar & Lockwood, 2009.)

Figure 2. Structure of Knowledge and Practice



Below Core Competencies: Skill Sets, Assumptions, and Collaborative Practices

During previous research the interviews of corporate professionals revealed an important question: Though core competencies are clearly essential for corporate competitiveness, what knowledge can be extended to create core competencies in the first place? As a group, the respondents indicated strongly that it is a series of capabilities, intellectual assumptions (often known as culture), and practices, which are extendable and so create an atmosphere within the firm conducive to the development of core competencies. More specifically, below the core competencies there seem to be two levels within the knowledge structure, as shown at the bottom of Figure 2. Both are levels which the firm must manage in order to change its core competencies as needed, and they are also ones which strongly influence how the core competencies are applied.

Interviewees reported that at the base of the intellectual structure exists a strategic capability present among the firms' top leadership. This is the ability to create and carry out a strategic vision of the customer benefits they want the firm to create and of the particular products and services the leaders want the firm to provide at one point in time in order to carry out that vision. Complementing this are the diffusely held intellectual assumptions, or culture, within the firm that intense, disciplined, comprehensive communication across the firm is necessary to carry out this vision. The overriding concern among the firms that consistently created new competencies was that appropriate people have input into their development, regardless of their location or rank in the firm. This intense practice of communication goes both ways: managers must facilitate the communication and the employees must be receptive to that communication. In addition, there must be a practice of discipline in the way products and services are introduced and refined, so that products and services are very tightly controlled as to their location, consistency, and development.

Arising from vision, coordination, and communication, the second level of knowledge and practice consists of two forms of latent knowledge that are available to be substantiated into a core competence. The first is knowledge concerning phenomena that are conceptually related to a potential core competence. A good example within one firm studied is its people's expertise in extremely miniature electronic components, which can be applied to communication networking technologies like switching or transmission.

Moreover, complementing this focused knowledge of specific phenomena is broader knowledge of underlying intellectual disciplines. For a core competence based upon the communication network, these included physical science disciplines --such as physics or chemistry--information science disciplines--such as communication or computer science--or even social science disciplines--such as anthropology or psychology. As a firm's core competence coalesces, these could easily become related disciplines supporting understanding of the competence's communication network core phenomenon.

Core Competencies

The third layer up in this knowledge structure comprises the core competencies themselves—in which latent, diffusely held organizational knowledge is transformed into its more active, specifically applicable form. This happens in the layer below, as the knowledge of related phenomena and underlying disciplines enable fundamental understandings of one or more core phenomena. These provide the foundation for applied understandings of product technologies and product classes, which in turn enable technological and functional skills, i.e. the abilities to do things. All of these different kinds of knowledge, located within the core competence, remain latent until these skills are applied to operate the technologies or provide the product classes. Once this skill performance occurs the latent intellectual potential of the core competence becomes realized. It is through this transition from latent to active knowledge that core competencies are extended to support knowledge applicable to multiple sectors, industries, and segments.

Above Core Competencies: Knowledge of Customer Segments, Industries, and Sectors

In the knowledge structure depicted in Figure 2, the fourth layer up involves employees' knowledge concerning entire economic sectors, such as transportation, which can encompass one or more industries, like those based upon automobiles or airplanes. Incorporating knowledge of arising from the core competence, this can be applied to serve multiple industries operating within the sector. For example, when enabled by a core competence based upon the core phenomenon of the communication network, understandings of the video-conferencing needs within the transportation sector can be applied to serve the customers of different transportation industries.

The fifth layer involves people's knowledge of entire industries. This could include the video-conferencing needs served by the automobile industry as a whole, spanning for example customer segments requiring not only industrial trucks but also luxury sedans or sports cars.

At the top of the structure, at the most active, specifically applicable level is the knowledge people within a firm have concerning the individual products and services required by specific customer segments, which are served by groups of firms located within industries. An example for a communication network core competence could be knowledge people within a firm have concerning video-conferencing products required by the segment of automobile firms that manufacture industrial trucks.

Application Spiral

Based upon these six layers of knowledge and practice depicted in Figure 2, respondents indicated that a tiered approach is often followed to achieve organizational success. For example, moving up the Figure from bottom to top, one of the firms studied has strong vision and practices tight control and coordination. These led to deep latent knowledge of underlying disciplines within the broad areas of physical and communication science, which supported an understanding of the related phenomenon of integrated circuits. As integrated circuits came to be used in networking, this led to a core competence based upon the communication network, which in turn enabled people within the firm to produce the product class of servers.

In their early years of use, servers had been used for relatively simple tasks such as retrieving and delivering files. As microprocessors used in servers gained power, servers have come to be used as switches, the equivalent of Private Branch Exchanges (PBXs), at a fraction of the PBX's cost. Furthermore, since the server, unlike the PBX, has an architecture open to new applications, it can add new ones, such as voice recognition. This understanding has led people in this firm to develop knowledge arising from core competence that could be applied to specific server products for various sectors, industries, and customer segments. One of the corporate managers from this firm aptly named this intellectual progression "application spiral."

This complex progression of knowledge application reveals how core competencies contribute to the competitive success of their host firms: they are necessary but not sufficient. Located in the middle of the intellectual structure, they are created by latent, diffusely held corporate knowledge and practice but in turn they do enable the application of knowledge applicable to specific industries and customers.

Conclusion

This paper has presented a framework describing core competencies, a relatively inexpensive yet thorough guide to discovering them, and a brief description of their contribution to the structure of organizational knowledge. It should prove useful to corporate managers and professionals interested in strengthening their core competencies and in applying them more effectively. We welcome questions on and suggested revisions to the framework, the guide, and the description. Collectively, we believe it is possible to understand and identify these knowledge resources so vital to competitive success.

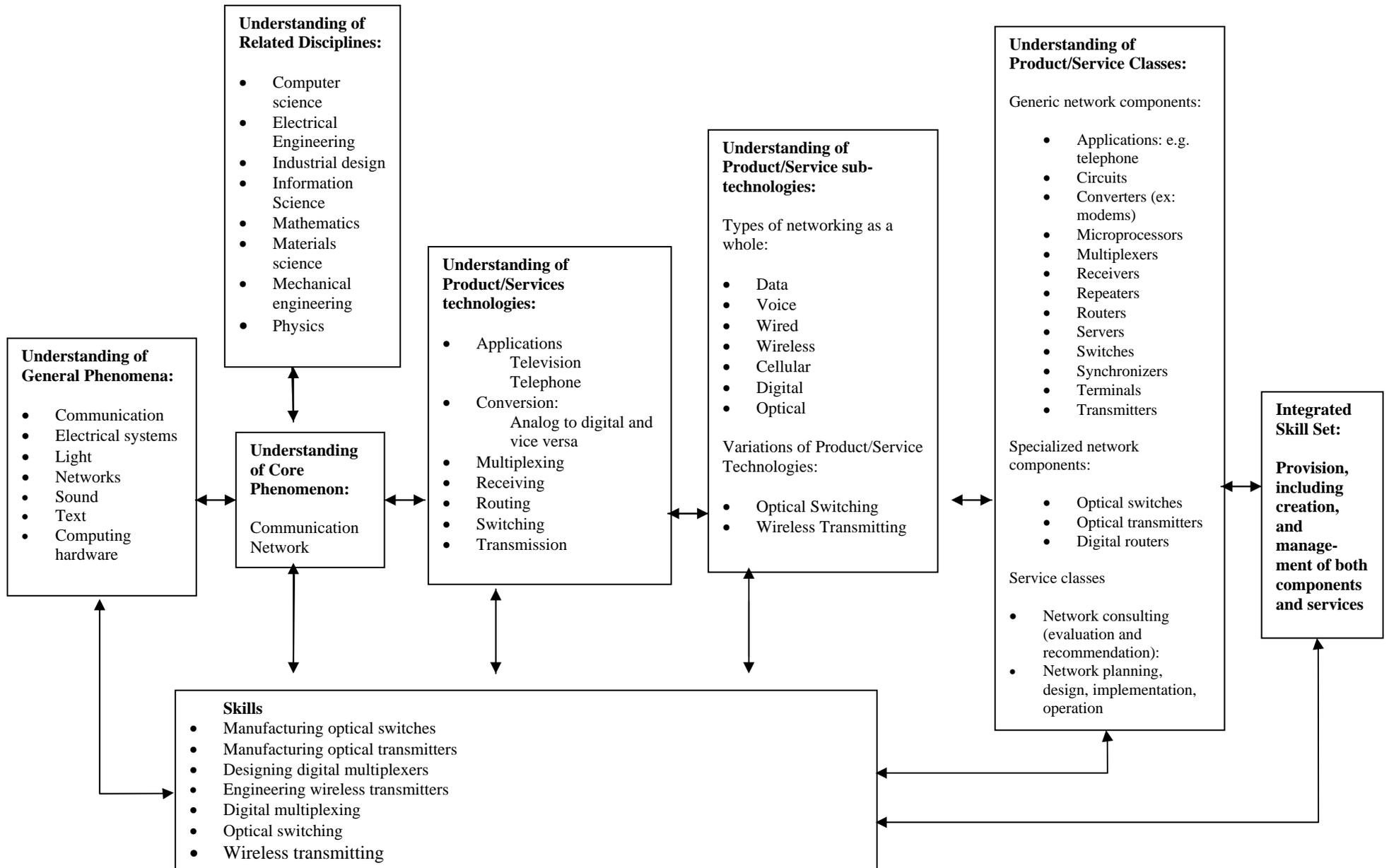
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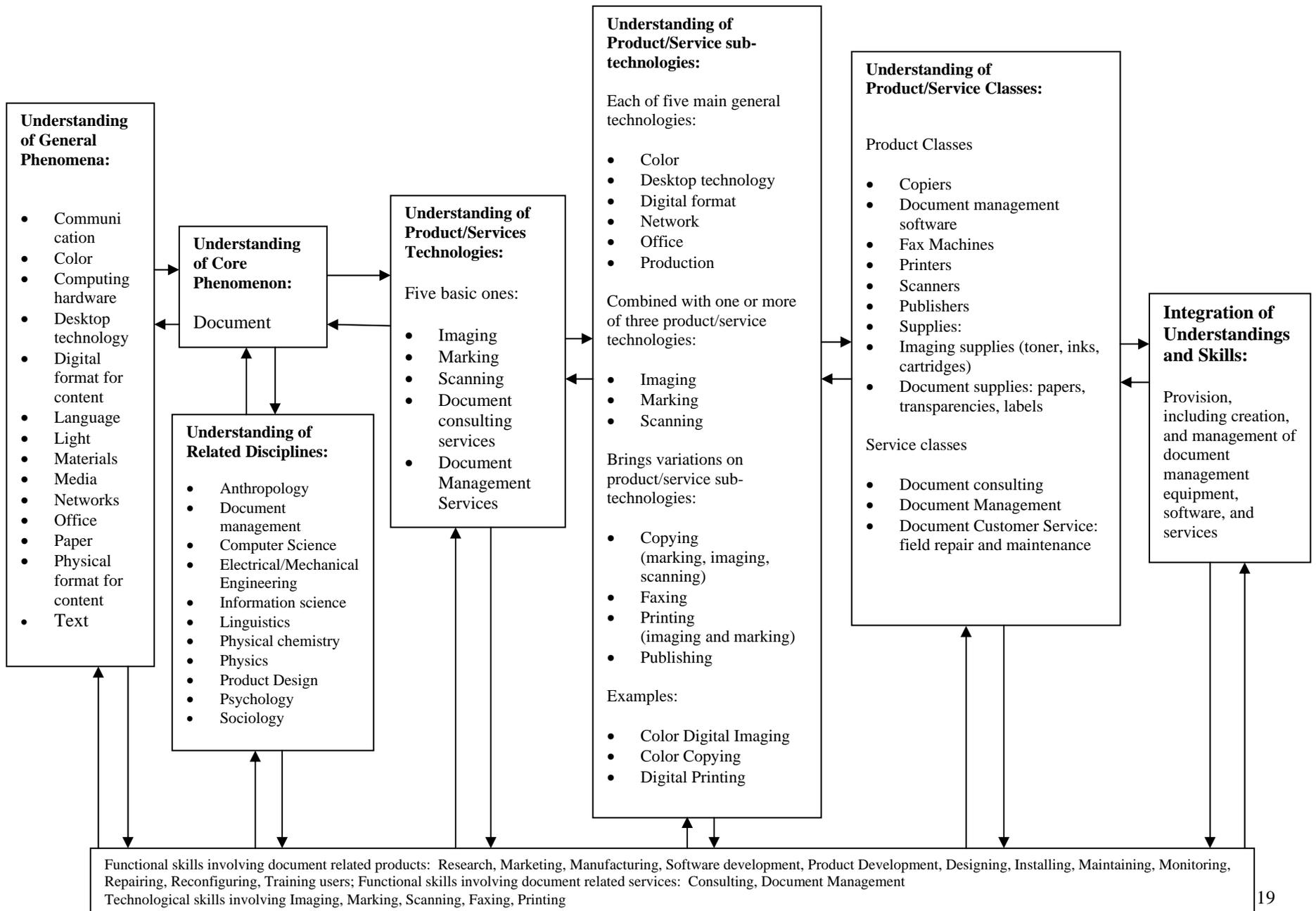
Appendix 1: Core Competence Breadth Table

Conceptual Competence Category	Word or Phrase	Number of Occurrences
Core Phenomenon (Understandings)	Communication Network	41
General Phenomena (Understandings)	Data	41
	Network	7
	Video	32
	Voice	37
Product/Service Technology (Understandings)	Hubs	8
	Multiplexing	4
	Switching	2
Product/Service Sub-technology (Understandings)	Inverse multiplexing	2
	High speed networking	2
Product/Service Class (Understandings)	Faxes	10
	Phone	13
	Routers	9
Skills	Design	2
	Install	4
	Market	4
Integrated Skill	Provide Network	10

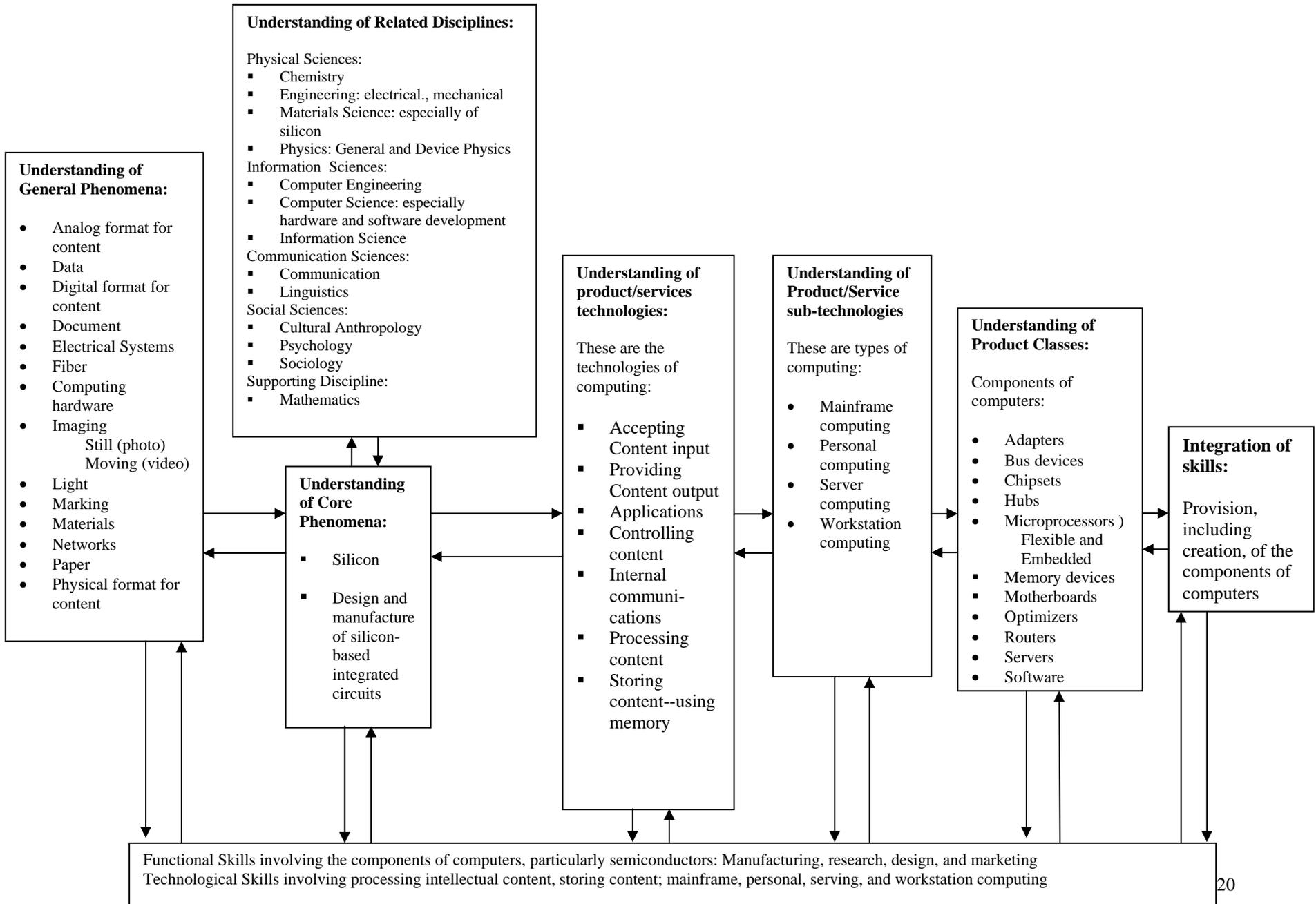
Appendix 2.1 Communication Network Core Competence



Appendix 2.2: Document Core Competence



Appendix 2.3 Silicon Core Competence



Appendix 3

Sample Core Competence Interview Instrument

This is a generic example of a questionnaire that can be used in interviews with corporate professionals and managers. Its approach is to elicit reaction to the organizational competencies of their firms as the competencies were revealed by the first content analysis of key documents, developing organizational competence charts, and patent analysis. Ideally, this will lead to revisions in understanding of the organizational competence. These revisions can then be incorporated into organizational competence breadth tables, charts, and depth summaries.

From our study of the literature on core competencies, the intellectual strengths of companies, as well as annual reports, and product overviews and catalogs your company provides describing its activities, we have divided a firm's core competencies into seven elements. Five of them involve an intellectual understanding of different topics and two of them involve actual skills, the ability to do something, based upon the understandings of the first five elements. The basic idea is that understandings of some general phenomena lead a firm to a thorough understanding of a core phenomenon, which leads to the firm's understanding of product or service technologies and sub-technologies, which leads to the firm's understanding of classes of products and services. This understanding of classes of products and services in turn leads to certain skills and these skills are ultimately integrated into a combined skill. (Please see accompanying Organizational Competence Chart). More specifically:

- Core phenomenon: the thing which a company understands most thoroughly and out of which emerges the rest of its core competency. Example: the communication network.
- General phenomena: capabilities that can be used across many products and services and even many areas of life. Examples: communication, networks.
- Product/services technologies: basic capabilities upon which classes of products and services are based. These emerge from the core phenomenon. Examples: Switching, transmitting.
- Product/services sub-technologies: specific variations of product/service technologies, such as specific types, components, or capabilities of them. Examples: Optical switching, wireless transmitting.
- Product/Service classes: types of products and services made possible by a firm's understanding of its product/service technologies (and with that, of its product/service sub-technologies). Examples: optical switches, wireless transmitters.
- Skills: abilities to do activities caused by an understanding of product/service classes or product/service technologies. Examples: manufacture optical switches, install wireless transmitters; perform optical switching or wireless transmission.
- Integration of skills: a combined skill, one the firm has because it has two or more skills. Example: the skill above, when combined with others, leads to the integrated skill of the provision, including creation, of communication networks as whole entities.

Please see the chart on the next page, representing what seems to be your firm's core competence in the provision including creation of communication networks as whole entities. (The next page could then present the organizational competence chart shown in Figure 1 or Appendix 3).

Specifically, communication networks and their components appear to be provided to these general groups of customers:

- Long distance
- Local
- Internet
- Wireless
- Small business
- Medium-sized corporations
- Large corporations
- Non-profit organizations

Based upon your examination of the chart on the next page, please consider your answers to following questions. I will contact you soon for your responses:

1. To what extent do you agree or disagree that these seven categories are the elements of your firm's core competence? Would you add or remove any? Particularly, to what extent do you agree or disagree concerning the specific core phenomenon, product/service technologies and sub-technologies, product/service classes, and skills? Would you add any or remove any?
2. What is likely to change in these categories over the next few years? What will be the dominant core phenomenon, product/service technologies and sub-technologies, product/services classes, and skills over the next five years?
3. What specific product and services arise from this core competence? Which customer segments do they serve? As the core competence changes over the next few years, how will these product and services change? How will the customer segments they serve change?