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UNDERSTANDING HUMAN COMPETENCE AT WORK: AN INTERPRETATIVE APPROACH

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In the prevalent rationalistic approaches, human competence at work is seen as constituted by a specific set of attributes, such as the knowledge and skills used in performing particular work. As an alternative to the rationalistic approaches, an interpretative approach, "phenomenography," is proposed and explored here. Findings suggest that the meaning work takes on for workers in their experience of it, rather than a specific set of attributes, constitutes competence. More specifically, the results demonstrate that the particular way of conceiving of work delimits certain attributes as essential and organizes them into a distinctive structure of competence at work.

Organizational actions such as producing cars, treating illnesses, transporting, and educating are always based on human competence. A fundamental managerial problem is to develop human competence at work in a way that enables an organization to remain viable. Today, developing competence is also becoming an increasingly important issue. Rapid technological change within areas such as microelectronics and communications in combination with growth in service and knowledge-based industries (Ekstedt, 1988; Eliasson, Fölster, Lindberg, Pousette, & Taymaz, 1990; Neef, 1998) has led to the need for an ongoing development of competence for competitive success (Kanter, 1983; Porter, 1990). Thus, from a managerial perspective, this need leads to a further demand for efficient ways to manage training and development in organizations. However, in order to manage training and development efficiently, managers need to understand *what constitutes human competence at work.* Without such an understanding, competence development cannot be managed effectively and, therefore, effectiveness in organizations cannot be achieved.

The aim of this study was to investigate what constitutes human competence at work. In this article, an interpretative approach is proposed as an alternative to the prevalent rationalistic approaches. In the rationalistic approaches, competence is seen as constituted by specific sets of attributes, such as the knowledge and skills used in performing particular work. Approaches to competence developed within the interpretative research tradition are reviewed to further clarify what constitutes competence. On the basis of that review, I propose an interpretative approach, "phenomenography," and report an empirical examination of that approach conducted through a competence analysis of engine optimizers at the Volvo Car Corporation in Sweden.

IDENTIFYING HUMAN COMPETENCE: A CLASSIC MANAGERIAL PROBLEM

Only recently has the concept of competence been used more systematically in management. Primarily, it is the concept's focus on the relation between person and work that researchers such as McClelland (1973), Boyatzis (1982), Kolb (1984), Morgan (1988), and Nordhaug (1993) have found attractive when identifying and describing essential human knowledge and skills at work. As Morgan (1988) argued, the concept of competence encourages scholars to think not only about knowledge itself, but also about the knowledge that is required in competent work performance. Hence, the expression "human competence at work" used in this study does not refer to all knowledge and skills, but to those people use when working.

Although the concept of competence has not been in frequent use until recently, the problem of identifying what constitutes competence at work is not new. Taylor (1911) was one of the first in modern times to address this problem. When working as an engineer, he noticed a large difference between the least and most competent workers' ways of accomplishing their work. To enable the identification of what constituted competence among the most competent workers, Taylor argued for leadership based on scientific principles from the rational-

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istic tradition. Drawing on those principles, he elaborated his well-known "time and motion studies." Taylor proposed that by using these studies, managers should be able to identify what constitutes workers' competence by classifying, tabulating and reducing it to rules, laws, and formulas. Using these descriptions of competence as a starting point, Taylor demonstrated that managers could set up systematic training and development activities that yielded improvements in workers' competence and consequently, increased effectiveness in organizations.

Current Rationalistic Approaches to Competence

Today, the dominant approaches used within management to identify competence do not consist of time and motion studies but of job analysis (Armstrong, 1991; Cascio, 1995; Ferris, Rowland, & Buckley, 1990; Gael, 1988). However, they are essentially based on the scientific principles of the rationalistic research tradition. Three main approaches can be distinguished: the worker-oriented, the work-oriented, and the multimethod-oriented (Sandberg, 1994; Veres, Locklear, & Sims, 1990).

Within the *worker-oriented approaches,* competence is primarily seen as constituted by attributes possessed by workers, typically represented as knowledge, skills, abilities (KSAs) and personal traits required for effective work performance (Veres et al., 1990: 87). For example, a commonly used worker-oriented approach is the job element method (Veres et al., 1990). The relevant attributes are captured through use of a group of job incumbents and supervisors. The attributes identified are organized into predefined categories, such as KSAs. The attributes are then rated to allow quantitative measurement of the correlation between success in accomplishing the work and possession of the designated attributes.

More recently, researchers have used the term *competencies* to further stress the importance of attending to worker attributes that are strictly work-related (Armstrong, 1991; Boyatzis, 1982; Kolb, 1984; McClelland, 1973; Morgan, 1988; Nordhaug, 1993; Woodruffe, 1990). For instance, Boyatzis (1982) described a job competency as "*an underlying characteristic of a person* in that it may be a motive, trait, skill, aspect of one's self-image or social role, or a body of knowledge he or she uses" (1982: 21; emphasis in original). Furthermore, Boyatzis argued that "because job competencies are *underlying characteristics,* they can be said to be generic" (1982: 21; emphasis added). The generic, context-independent nature of job competencies means that they can appear in many different work activities. For example, drawing on Boyatzis's approach, Spencer and Spencer (1993) investigated which competencies superior performers were using in more than 200 different jobs. Their findings show that superior performance at work is usually a result of specific sets of competencies combined in a particular way. However, the worker-oriented approaches have been criticized for producing descriptions of competence that are too general and abstract. For instance, Jacobs (1989) questioned Boyatzis's (1982) generic model of competence in management, which has been widely applied in Britain and the United States. In a study of more than 500 organizations in the United Kingdom that have used Boyatzis's method, Jacobs found that different managerial jobs required different competencies. From those findings, he concluded that the use of the Boyatzis method tended to produce descriptions of competence that are too generic and abstract and therefore of limited value as a basis for competence development.

In the *work-oriented approaches,* competence is also regarded as a specific set of attributes. However, although advocates of the worker-oriented approaches take the worker as the point of departure, advocates of the work-oriented approaches take the *work* as the point of departure (Fine, 1988; Flanagan, 1954). More specifically, they first identify activities that are central for accomplishing specific work and then transform those activities into personal attributes. By doing so, they are able to generate more concrete and detailed descriptions of what constitutes competence and, thus, largely overcome the problem of generating descriptions of competence that are too general. One basic criticism of the work-oriented approaches is that a list of work activities does not sufficiently indicate the attributes required to accomplish those activities efficiently (Raven, 1994).

Proponents of the *multimethod-oriented approaches* also stipulate that competence is constituted by a specific set of attributes. What distinguishes the multimethod approaches from the others is their more comprehensive approach to competence. More specifically, their advocates attempt to avoid the criticisms raised against the worker- and work-oriented approaches by drawing on both of those approaches. For example, Veres and colleagues (1990) adopted a multimethod-oriented approach to identify competence in the work of police lieutenants. Their description consisted of 46 worker attributes expressed in the form of KSAs that corresponded to 23 police activities. The work activities and the attributes were then quantified in percentage terms relating to police work.

To sum up, although the rationalistic approaches

differ in the ways they identify competence, they provide similar theories of competence at work: they all regard competence as an *attribute-based phenomenon.* More specifically, within the rationalistic approaches, human competence is described as constituted by a specific set of attributes that workers use to accomplish their work. Hence, those who perform their particular work more competently than others are regarded as possessing a superior set of attributes. Furthermore, attributes are primarily seen as context-independent. That is, a specific attribute, such as communication skills, is regarded as having a fixed meaning in itself; it is viewed as independent of context and thus as able to be adopted in a range of work activities.

A Critical Evaluation of the Rationalistic Approaches to Competence

Although the rationalistic approaches have continued to contribute to understanding of competence, their view of competence as a set of attributes has been criticized as problematic for identifying and describing competence at work. According to Attewell (1990), Norris (1991), and Sandberg (1991, 1994), the rationalistic "operationalizations" of attributes into quantitative measures often result in abstract and overly narrow and simplified descriptions that may not adequately represent the complexity of competence in work performance. Yukl (1994) came to a similar conclusion. He found that the abstract nature of the categories of competence used in most leadership studies tended to limit their utility. Moreover, the use of KSAs and other general models of competence within the rationalistic approaches tends to predefine what constitutes competence. As I argued in earlier work (Sandberg, 1994), such predefinitions of competence may confirm a researcher's own model of competence, rather than capture workers' competence. The strongest concern, however, is that the descriptions of competence produced by the rationalistic approaches are *indirect.* That is, the sets of KSAs or competencies do not illuminate what constitutes competence in accomplishing work. Rather, an identified set of attributes specifies central prerequisites for performing particular work competently. But such descriptions demonstrate neither whether the workers use these attributes, nor how they use them in accomplishing their work. For example, two workers may be identified as possessing identical attributes but may accomplish work differently, depending upon which attributes they use and how they use them.

Why direct descriptions of human competence are not forthcoming is not immediately apparent in the rationalistic theories and methods themselves. Instead, these reasons emerge when one examines assumptions underlying these theories at the metatheoretical level, ontological and epistemological assumptions in particular. In a general sense, the rationalistic researchers invoke a dualistic ontology, assuming that person and world are distinct entities, and an objectivistic epistemology, assuming the existence of an objective reality independent of and beyond the human mind (Bernstein, 1983; Husserl, 1970/1936; Rorty, 1979; Schön, 1983; Searle, 1992; Shotter, 1992; Winograd & Flores, 1986). The dualistic ontology underlies division of the phenomenon of competence into two separate entities, namely, worker and work. The objectivistic epistemology implies objective, knowable work that is beyond workers and leads to descriptions of work activities that are independent of the workers who accomplish them. Taking this objective, dualistic perspective, advocates of rationalistic approaches identify and describe human competence indirectly, viewing it as consisting of two independent entities—prerequisite worker attributes and work activities.

Interpretative Approaches to Competence

The interpretative research tradition may provide an alternative to the rationalistic approaches to competence. Weber (1964/1947) was the primary initiator of this tradition, but phenomenological sociologists such as Schutz (1945, 1953), Berger and Luckmann (1966), and Giddens (1984, 1993) developed it further. The main feature of the interpretative research tradition is its phenomenological base, the stipulation that person and world are inextricably related through persons' lived experience of the world (Berger & Luckmann, 1966; Husserl, 1970/1900–01; Schutz, 1945, 1953). Accordingly, competence is not seen as consisting of two separate entities; instead, worker and work form one entity through the lived experience of work. Competence is thus seen as constituted by the meaning the work takes on for the worker in his or her experience of it (Dall'Alba & Sandberg, 1996; Sandberg, 1994). The shift in the point of departure—from worker and work as two separate entities to the workers' lived experience of work—gives rise to an alternative way of understanding human competence at work.

A major finding that has emerged from interpretative studies of competence carried out in a range of different areas such as artificial intelligence (Dreyfus & Dreyfus, 1986), education (Schön, 1983), nursing (Benner, 1984), and ethnographic and ethnomethodological studies of competence within

sociology (Atkinson, 1988; Barley, 1996; Brown & Duguid, 1991; Fielding, 1988a, 1988b; Garfinkel, 1986; Kusterer, 1978; Livingston, 1987; Tyre & Von Hippel, 1997) is that attributes used in accomplishing work are not primarily context-free but are situational, or context-dependent. More specifically, the attributes used in particular work acquire their context-dependence through the workers' ways of experiencing that work. A central feature of the context-dependence of competence is its tacit dimension (Polany, 1967). Giddens noted the following: "[Work activities are] largely carried out in practical consciousness. Practical consciousness consists of all the things which actors know tacitly about how to 'go on' in the contexts of social life without being able to give them direct discursive expression" (1984: xxiii). When attributes are viewed as context-free, the tacit dimension of competence is overlooked (Brown & Duguid, 1991; Fielding, 1988a; Schön, 1983). Reviewing recent ethnographic studies of workplace practices, Brown and Duguid concluded "that the ways people actually work usually differ fundamentally from the ways organizations describe that work in manuals, training programs, organizational charts, and job descriptions" (1991: 40). Within education, Schön (1983) made a similar point in his criticism of universities and other institutions that educate professional workers. He argued that such institutions are principally based upon a rationalistic epistemology that "fosters selective inattention to practical competence and professional artistry" (1983: vii). He closely examined what professional workers such as architects, psychotherapists, engineers, planners, and managers actually do when they work. Schön discovered that when workers encounter their work, they frame and set the problem situations of the work through their experience of it. In other words, as workers frame their work, the attributes used in performing that work are not separate from their experience of it, but internally related to work through their way of framing the specific work situation.

Hence, if attributes acquire their context-dependent nature through workers' experience of their work, as suggested by the findings of interpretative studies, then people's ways of experiencing work are more fundamental to their competence than the attributes themselves. Although the reported interpretative studies further clarify what constitutes competence by highlighting the context-dependence of attributes, the studies do not demonstrate how these attributes are integrated into competent work performance. Nor do they explicitly capture the variations in competence that may occur within a group of workers. The interpretative studies of Dreyfus and Dreyfus (1986) and of Benner (1984) capture variations in competence in terms of different levels of competence acquisition. However, these authors did not describe variations in competence that may occur at any one level, among novices, advanced beginners, or experts, for example. In other words, they do not sufficiently explain why some people perform work more competently than others.

Phenomenography as an Interpretative Approach to Competence

Building upon previous interpretative research on competence, in earlier research (Sandberg, 1994) I explored how attributes are integrated into work performance and outlined the possible variation in workers' competence. In that study, phenomenography was adopted as an interpretative approach to competence. This approach was originally developed by an educational research group in Sweden in the seventies (Marton, Dahlgren, Svensson, & Säljö, 1977) to describe the qualitatively different ways in which aspects of reality are experienced (Marton, 1981). Overviews of the development and use of this approach are offered by Dall'Alba and Hasselgren (1996), Marton (1981), Marton, Hounsell, and Entwistle (1984), Marton and Wenestam (1984), Ramsden (1988), and Marton and Booth (1997). As in other approaches within the interpretative research tradition, the primary focus of phenomenography is on the meaning structure of lived experience—that is, the meaning an aspect of reality takes on for the people studied. In the phenomenographic approach, the term *conception* is used to refer to people's ways of experiencing or making sense of their world. In the present study, a conception signifies the indissoluble relation between what is conceived (the conceived meaning of reality) and how it is conceived (the conceiving acts in which the conceived meaning appears).

METHODS

Selecting Participants and Collecting Data

A phenomenographic approach to competence was adopted during an empirical study in the department of engine optimization at the Volvo Car Corporation in Sweden. The task of an all-male group of approximately 50 engineers was to develop engines for new models of cars. To obtain data that captured the greatest possible variation in competence within this group, I selected 20 opti-

mizers, following Glaser and Strauss's (1967) notion of theoretical sampling in terms of theoretical relevance. More specifically, maximum variation in formal education and length of time in optimization work were criteria for selection. The selection of 20 optimizers was based on previous phenomenographic studies (more than 50 doctoral theses and between 500 and 1,000 research reports [Alexandersson, 1994]), in which the variation of a phenomenon reached saturation at around 20 research participants, after which no new conceptions emerged. In this study, the variation in competence began to repeat itself after about 15 optimizers.

In exploring what constituted competence in engine optimization by taking engineers' conceptions of their work as the point of departure, I used observation and interviews. The aim of the observation and interviews was to capture the possible variation in conceptions of engine optimization in a rich and comprehensive way. First, I tried to establish what Apel (1972) called a community of interpretation. According to Apel, the production of valid knowledge presupposes an understanding between researcher and research participants about what they are doing. First of all, I arranged a seminar with the optimizers in which I explained that my aim was to understand their lived experience of engine optimization. I then spent approximately one week in their department, observing and talking with the optimizers about their work. I also attended internal seminars about their work, such as the introduction program for new employees. Finally, on beginning each interview with a worker, I reminded him that my purpose was to discuss his experience of engine optimization.

The interviews took place in the department of engine optimization and lasted between two and three hours. Two principal questions were put to the selected optimizers: "What does optimization work mean for you?" and "What is a competent optimizer for you?" These questions were elaborated and substantiated with follow-up questions. For example, questions such as "What do you mean by that?", "Can you explain that further?", and "Can you give an example?" were posed so that the workers were required to elaborate and demonstrate what their statements meant in practical situations. This dialectical process continued until we made no further progress. The interviews were audiotaped and transcribed word-for-word. In all, the transcriptions amounted to some 700 pages of single-spaced text.

Analyzing Data

My aim in the subsequent analysis was to search for variation in the optimizers' conceptions of engine optimization and to make explicit the basic meaning structure of these conceptions. The analysis was carried out in an ongoing iterative process in which I alternated between *what* the optimizers conceived of as work and *how* they conceived of that work. The starting point was acquiring a general grasp of the optimizers' conceptions of engine optimization. I did this by reading each transcript several times. After I had grasped each optimizer's conception generally, I sorted the optimizers into groups according to their conceptions. Second, I read all the transcripts again, to systematically search for *what* each optimizer conceived of as engine optimization. The main focus here was not on the particular statements in themselves, as in most forms of content analysis. Instead, the primary focus was on the meaning of a particular statement in relation to the context of the surrounding statements and the transcript as a whole. When I had analyzed what each optimizer conceived of as engine optimization, I shifted the analysis from single optimizers and compared the conceived optimization work across optimizers. First, I compared the individuals within each group from the first phase of the analysis. Second, I compared them between groups. This process resulted in some optimizers being moved from one group to another.

Third, I analyzed all the transcripts again, but now in terms of *how* each optimizer conceived of engine optimization. The primary focus in this phase of the analysis was on how the optimizers delimited and organized what they conceived as engine optimization. After I had analyzed each transcript, I compared the optimizers with each other, first within and then between groups. Again, this process led to some regrouping.

Finally, I analyzed all the transcripts once again, simultaneously focusing on what each optimizer conceived of as the work in relation to how they conceived of that work. I then cross-checked my interpretations of each conception. I did so by reading through the transcripts expressing a particular conception while testing whether an alternative interpretation held. I performed this cross-checking until I believed I had found the most faithful interpretation of each optimizer's way of conceiving of engine optimization. This cross-checking also led to clearer and more precise formulations of the conceptions. I eventually reached a point where, despite further cross-checking, each conception of engine optimization remained stable. The analysis

resulted in three groups of optimizers expressing qualitatively different conceptions of engine optimization. Six optimizers expressed conception 1; ten, conception 2; and four, conception 3.

Validity and Reliability Criteria

As noted, phenomenology was my point of departure in this research. In the phenomenological view, person and world are inextricably related through a person's lived experience of the world. This notion applies not only to workers' competence, but also to a researcher's interpretation of that competence. Therefore, to justify my interpretations, I used three criteria: *communicative and pragmatic validity* (Kvale, 1989, 1996) and *reliability as interpretative awareness* (Sandberg, 1994, 1995). Establishing communicative validity involves an ongoing dialogue in which alternative knowledge claims are debated throughout the research process (Kvale, 1989). Pragmatic validity involves testing the knowledge produced in action (Kvale, 1989). Striving for pragmatic validity increases the likelihood of capturing knowledge in action rather than what Argyris and Schön (1978) called "espoused theories." Reliability as interpretative awareness means acknowledging that researchers cannot escape from their interpretations but must explicitly deal with them throughout the research process. In this study, phenomenological reduction was used as a strategy for achieving interpretative awareness. Adopting phenomenological reduction means striving to withhold theories and prejudices about the research object (Giorgi, 1990; Ihde, 1977). The main ways in which I tried to meet the above criteria are elaborated below.

In collecting data, communicative validity was achieved by: (1) establishing a community of interpretation to ensure an initial understanding between the optimizers and me about their work and my research, (2) using only two principal open-ended interview questions to encourage the optimizers to identify and describe to me what they themselves conceived of as central in engine optimization, and (3) dialectically using follow-up questions during the interviews to help me further ensure that I understood the optimizers' ways of conceiving of engine optimization. When obtaining data, pragmatic validity was achieved by: (1) observing the optimizers at work and comparing what I had observed with what they said in the interviews, (2) asking follow-up questions that required the optimizers to demonstrate what statements meant in practice, and (3) observing the optimizers' reactions to particular interpretations of their statements. Reliability as interpretative awareness was achieved when obtaining data by being oriented to the ways in which the optimizers were conceiving of their work throughout the observation and interview phase. More specifically, (1) I primarily asked what and how questions in order to encourage the optimizers to focus on describing what engine optimization meant for them, (2) initially strived to treat all the optimizers' statements about their work as equally important, and (3) asked extensive follow-up questions that required the optimizers to elaborate on and be more specific about what they meant by their statements.

In the analysis, communicative validity was achieved by making interpretations of the optimizers' statements about their work that were consistent with both the immediate context of surrounding statements and with the transcript as a whole. Also, the identified conceptions were presented to the optimizers on two occasions, initially to the 20 study participants and then to all 50 optimizers in the department. On both occasions, the optimizers confirmed that the identified conceptions were valid. Reliability as interpretative awareness was achieved in a similar way in the analysis as in the interview phase. Throughout the analysis, I focused on the ways the optimizers conceived of engine optimization. I tried to maintain such a focus by: (1) both trying to hold back my own preunderstandings of competence and continuously checking if my interpretations were grounded in the optimizers' descriptions of their work, (2) initially treating all the statements made by the optimizers as equally important in my interpretations, and (3) checking my interpretation of each optimizer's conception by reading through transcripts expressing one particular conception using a qualitatively different conception.

Besides achieving the above criteria, the results were replicated in two ways. First, I chose a random sample of ten transcripts, three for conception 1, five for conception 2, and two for conception 3. An independent researcher coded the selected transcripts against the conceptions, achieving agreement of 90 percent with my categorizations. Second, my presentation of the results to the optimizers led to a request from Volvo for a model for competence development based on the conceptions I had identified. To elaborate such a model, Theman (1995) replicated the study using 7 additional optimizers from the group of 50, selected according to the criteria of the original study. The selection of 7 more individuals was primarily motivated by the requirement for a deeper and more detailed description. Theman's study confirmed the three identified conceptions of engine optimization in the reported study. The distribution of the

optimizers across the conceptions was the following: 2 in conception 1; 3 in conception 2; and 2 in conception 3.

RESULTS

Competence in Engine Optimization

As noted above, optimizers develop car engines for new models of cars. They develop these engines by optimizing a range of qualities such as driveability, fuel consumption, emissions, and engine power (performance) according to particular requirements. These qualities are optimized by adjusting different parameters within the electronic monitoring systems in such a way that an engine works smoothly. An "approved" car (one that meets the Volvo Corporation's requirements) should be able to be driven by almost any driver, under almost any conditions. Also, a number of requirements from authorities need to be met, such as limiting exhaust to a given amount. However, the large variation in markets for the company's products, which include warm, cold, humid, and dry places and places at high and low altitudes, makes it impossible for the optimizers to test the qualities of an engine in all potential driving situations. They are therefore never certain of having succeeded in achieving the optimum. In addition, engine optimization is characterized by continuous technological development. In particular, the developmental pace within electronics has accelerated in recent years, leading to continuous change in optimization work. Given these conditions, how can engine optimizers refine an engine according to the stipulated requirements? In my interpretation, three qualitatively different conceptions of engine optimization emerged from the optimizers' descriptions. These were engine optimization as (1) optimizing separate qualities, (2) optimizing interacting qualities, and (3) optimizing from the customers' perspective.

Within each conception, it is possible to distinguish several essential attributes of competence. More specifically, each conception is characterized by a specific structure of attributes that appear as the optimizers accomplish their work. Thus, a particular way of conceiving of the work delimits certain attributes as essential and organizes them into a distinctive structure of competence in engine optimization. Hence, the workers conceptions of the work constitute their competence in engine optimization. The way each conception and its key attributes form a distinctive structure of competence in engine optimization is summarized in Table 1 and elaborated below. The numbers in the table express the frequency with which the attributes were expressed by the optimizers for each conception.[1]

Conception 1: Optimizing Separate Qualities

The most characteristic feature of this conception is that the individuals expressing it delimit and organize the optimization work in terms of a number of separate steps focusing on the relation between the monitoring parameters and each single quality of an engine. Within each step, they test various adjustments of the parameters to optimize a single engine quality, such as driveability or fuel consumption, according to stipulated requirements. The optimizers optimize one single quality at a time until all qualities meet the requirements. The following discussion between the interviewer (I) and an optimizer (O), which developed out of the key question "What is a competent optimizer for you?" illustrates this view:[2]

I: What do you use these [measurement results] for?

O7: You get measurement results about how much hydrocarbon and NOX (nitrous oxide) and CO (carbon monoxide) the engine leaves and fuel consumption. You do a whole series of tests and it [the measurement] will change a little bit. Then you take a mean value for it and the result should be under a particular value and when it does that, it's okay.

I: What do you do when you have reached it?

O7: Well, then one says it's okay and begins to concentrate on other qualities.

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[1] What matters concerning the reliability of results within the interpretative approach adopted in this study is not the frequency of statements about the attributes. Instead, the crucial reliability question concerns the conception as a whole and the way in which essential attributes are related to each other. As I described in the Methods section, the interpretative approach used in this study does not focus on the statements themselves, as is common in most forms of content analysis. Rather, a statement has a particular meaning in relation to the context of the surrounding statements and the transcript as a whole.

In this study, reliability was achieved in terms of interpretative awareness and the coding of selected transcripts against a conception and its attributes by an independent researcher achieving agreement of 90 percent. The reliability of the statements was checked in the sense that the independent researcher did not find statements that were inconsistent with the conceptions or their attributes.

[2] In the quotations, the number following "O" indicates the particular optimizer who was speaking.

TABLE 1
The Constitution of Three Distinctive Structures of Competence through Variation in Ways of Conceiving of Engine Optimization[a]

		Key Attributes of Competence					
Conception	**Main Focus**	**Ability to Analyze and Interpret**	**Ability to Optimize Accurately**	**Knowledge of the Engine**	**Knowledge of the Monitoring Systems**	**Ability to Self-Teach**	**Ability to Cooperate With Others**
(1) Optimizing separate qualities	Relation between monitoring parameter and single engine quality	Analyze and interpret how one or several monitoring parameters have influenced the quality	Be accurate and methodical in the optimization	Understand how the qualities of the engine react to changes in the parameter	Understand which monitoring parameters have an influence on a specific quality of the engine and how they do so		
		19	20	15	16		
(2) Optimizing interacting qualities	Relations between the qualities of the engine		Optimize the qualities of the engine in the right order and be accurate	See links between the qualities of the engine	Understand and develop monitoring systems (to reach a desired interaction among the engine qualities)	Interest in engines and self-teaching (about links between engine qualities)	Cooperate with the other people involved and communicate to them on how the engine ought to be optimized
			37	48	41	28	23
(3) Optimizing from the customers' perspective	Relation between optimized engine and customers' experience of driving			Practical sense of the engine	Understand and develop monitoring systems (to achieve customers' requirements)	Interest in engines and self-teaching (about customers' requirements)	Cooperate and have relevant contacts
				26	15	13	10

[a] Numbers are the frequencies with which the attributes were expressed.

The focus of the conception 1 optimizers on the relation between monitoring parameters and a single engine quality implies that all their key attributes are centered around that relation, forming a distinctive structure of competence in engine optimization. The ability *to analyze and interpret how one or several monitoring parameters have influenced engine quality* is one of the most fundamental attributes of this conception. It is through this attribute that these workers evaluate each optimization. They build up their understanding of analyzing and interpreting the particular optimization through the attribute of *being accurate and methodical.* When addressing a specific quality, these individuals change one monitoring parameter at a time, analyze the influence it had on the current quality, note it, choose a new parameter and change it, investigate the influence on the quality, and so on. Analyzing and interpreting also implies the attribute of *understanding how the qualities of an engine react to changes in the parameter.* This is the kind of knowledge that the optimizers build up around the qualities of an engine so that they can judge which parameter should be adjusted and by how much in order to reach the desired requirement. This attribute is closely connected to the attribute of *understanding which monitoring parameters have an influence on a specific quality of an engine and how they do so.* Together, these two latter attributes form two poles of the focused relation between the parameter and engine quality. This basis allows for the optimizers to analyze and interpret the results from the tests and then adjust the relevant parameter so that the optimum value of

the quality in question will be reached in each separate optimization step.

Conception 2: Optimizing Interacting Qualities

In contrast to the workers described above, the individuals who hold conception 2 do not delimit and organize engine optimization into separate steps but see it as several interacting steps in which every engine quality is optimized in relation to every other. Delimiting and organizing the optimization work as interacting steps shifts the focus from the relations between monitoring parameters and single engine qualities to the relations among the qualities of the engine. These optimizers take all optimizing steps into consideration at each single step, thinking "If I optimize a specific quality, what will happen to the remaining engine qualities that will subsequently be optimized?" Hence, for these optimizers, the primary aim in each step is to optimize a single quality so that it will interact with the remaining qualities to ultimately produce an approved engine:

I: But if we say it like this, what is a competent engine optimizer for you?

O10: It's someone who has an idea about . . . someone who can see into this crystal ball, in this engine's future, yeah, into the future of my work. The further you are able to understand the future, the better I think it is. We have to make modifications to certain things to be able to achieve other things later on. So to be able to understand how . . . a certain optimization influences other qualities. It's not so simple that if I optimize X, then all other qualities are independent, because they aren't. The link between these qualities, I think, is important and you learn them through experience. That's what I'm talking about, being able to understand things, understand the links, because if you understand the links you can more easily look into the future and judge what will happen.

This change in focus implies that the attributes within this conception emerge from the relations between the qualities of the engine, again forming a distinctive structure of competence in engine optimization. As the qualities of the engine interact with each other, the optimizers must understand in which order and how accurately the qualities should be optimized in each situation. Therefore the attribute of *optimizing the qualities of the engine in the right order and being accurate* is of fundamental importance for these optimizers. It is of interest to note that accuracy means different things to the optimizers expressing this conception and to those expressing the former conception. Those in the first group described take one thing at a time, recording measurements and so on, to achieve a desired optimum for a certain quality in a specific step. Those in the second group attempt to optimize a quality as accurately as possible within a specific step, without negatively influencing the remaining qualities. It is through the attribute of *seeing links among the qualities of the engine* that these optimizers are able to establish the right order of steps and to judge the degree of accuracy within the optimization.

Like the optimizers expressing conception 1, the optimizers in the second group also point out the attribute of *understanding and developing monitoring systems* as central in the optimization work. However, although knowledge of monitoring systems means being able to influence a single engine quality in a desired way for the first group, for the second group it means being able to reach the desired interaction among the qualities of an engine. To develop new monitoring functions but, above all, to build up knowledge about the links among qualities of the engine, the attribute of *interest in engines and self-teaching* appears. However, the task is not only to learn for oneself. It is also a matter of communicating with others. Here, the attribute of *co-operating with the other people involved and communicating to them how the engine ought to be optimized* appears as central. These optimizers not only develop their own knowledge, but also include other optimizers in the learning process, so a shared understanding is built up about the ongoing work. By their doing so, others involved in the optimization become more motivated and efficient in their work.

Conception 3: Optimizing from the Customers' Perspective

As in the previous conception, optimizers who express this conception take account of all steps at each single optimization step. However, these individuals focus on the relation between an optimized engine and the customers' experience of driving. Wherever these workers are optimizing an engine, be it in the testing room or on the road, they drive the car as an ordinary customer would. As illustrated by this response to a follow-up to the key question, "What is a competent optimizer for you?", the optimizers relate the single optimization situation to the approved car and, in so doing, they try to incorporate the customers' requirements at each step of the process:

O2: The reality is in fact that you should be like, yeah like any one of the customers. You should be able to take a young boy's perspective on a car, and an older person, how he wants to experience the car. Then if your car works, hopefully in both ways, then they'll both be satisfied. This is what I think is the role of the optimizer, it's to be able to drive a car as you think people want to experience the car.

The attributes appearing within this conception are all centered around the relation between specific qualities of the engine and customers' requirements, forming a third distinctive structure of competence. The most essential attribute for these optimizers is a *practical sense of the engine.* It is through this attribute that they are able to evaluate the interaction between qualities of the engine from the customers' perspective. The attribute consists of knowledge of customers' requirements for a good car. At the same time, these workers also need to understand how optimizing a particular quality influences the end result. Of greatest importance is knowledge of the relation between the customers' requirements and the optimization of particular qualities in producing the end product; these engineers might sum up their view like this: "If I change this particular quality, then the other engine qualities will react in this way but, above all, the customers will experience it like this."

Although the attribute of *understanding and developing monitoring systems* is also essential for these optimizers, its meaning differs from that given by those who expressed the first and second conceptions. The third group wants to allow for all the situations in which customers drive a car by adjusting suitable parameters and by developing new operations within the monitoring system that are better suited to meeting a particular customer requirement. Also, the attributes of *interest in engines and self-teaching* and *cooperating and having relevant contacts* appear to be as central for these optimizers as they are for those expressing the second conception. However, in contrast to the second group, whose self-teaching involves increasing their knowledge about relationships among engine qualities, the optimizers in the third group build up knowledge about the relation between customers' wishes and approved engines. Therefore, collaboration with the department for complete vehicle testing, which tests the cars from the customers' viewpoint, is of particular importance for these optimizers. Here, the relation to the attribute a *practical sense of the engine* becomes clear. The most important transformation is the knowledge about the relation between the character of the engine and the customers' requirements.

A Hierarchy of Competence in Engine Optimization

As was described in the previous section, the optimizers' conceptions of work constitute their competence at work. More specifically, the different ways of conceiving optimization work constitute three distinctive forms of competence in engine optimization. However, the conceptions do not only constitute and give rise to variation in competence, but also to a hierarchy of competence. More specifically, a hierarchy of competence in engine optimization is established in terms of an increasing comprehensiveness of conceptions. In the first conception, optimizing separate qualities, the work is delimited as several separate steps, with the relation between single parameters and single engine qualities the focus. In the second conception, optimizing interacting qualities, the work is expanded so that it includes not only separate steps, but also the relations among the qualities of an engine. In the third conception, optimizing from the customers' perspective, the work is expanded still further so that it not only consists of separate steps and the interaction among qualities, but also of the relation between the optimized engine and customers' requirements.

The hierarchy of competence in terms of an increasing comprehensiveness of conceptions is still more evident through the attributes within each conception of engine optimization. For instance, the attribute *knowledge of the engine* was expressed by all the optimizers as essential to engine optimization. However, the meaning of the above attribute varies depending on the conception it appears in. In the first conception, optimizing separate qualities, knowledge of the engine means understanding how the qualities of an engine react to changes in monitoring parameters. The second conception, optimizing interacting qualities, also includes an understanding of how the various qualities react to different influences from the parameters. However, this knowledge of the engine is inadequate for the second conception. In order to optimize interacting qualities, it is also necessary to see links between engine qualities. And in the third conception, optimizing from the customers' perspective, understanding how the qualities of an engine interact is important but insufficient. Of greater importance is a practical sense of the engine, as the focus for these optimizers is the relation between engine qualities and customer requirements. Hence, the hierarchy of competence has the following character: the first conception is the least comprehensive, the second is more comprehensive than the first, and the third conception is the most comprehensive.

The finding that the third conception is the most comprehensive suggests that the individuals holding that conception are the most competent and that those holding the first conception are the least competent with regard to engine optimization. Some empirical evidence supported this proposal, in that optimizers who expressed more comprehensive conceptions also expressed less comprehensive conceptions, while the reverse did not occur. This became particularly clear when the optimizers were asked to review their peers. Optimizers expressing the most comprehensive conception were judged to be the most competent by the other optimizers interviewed. However, when I asked the optimizers expressing the first and second conceptions what distinguished their colleagues expressing the third conception, they all indicated that those colleagues had more of the attributes typical of their own conceptions. For example, an optimizer expressing the first conception believed his colleague, who expressed conception 3, had more of the attribute of being accurate and methodical in the optimization work than he himself had:

O7: But then there are people who have the same amount of knowledge as XX [a colleague expressing the third conception] but despite that don't reach a desirable result. I don't know why that is.

I: Don't you have any ideas about that? What do you mean when you say that some of the optimizers have the same amount of knowledge as XX?

O7: There are a number of optimizers who have been here for a long time but despite that they have to carry out ten tests in order to reach the same result that XX maybe will see from one or two tests.

I: So you mean the fact that they have many years of experience doesn't mean everything?

O7: No.

I: But what do you think it depends on then?

O7: A great sense of being methodical and systematic in the work. You change one thing at a time and you don't change ten things because then you don't know which one was the cause of the change or the result of the change.

The same pattern is also evident among the optimizers who expressed the second conception, optimizing interacting qualities. When they attempted to describe the most competent optimizers, they asserted that these optimizers had more of the attributes typifying their own conception, optimizing interacting qualities. For example, an optimizer expressing the second conception believed his colleague expressing conception 3 had more of the attribute of seeing links among the qualities of the engine than he himself had:

O14: You know here how accurately you have to adjust the parameters. . . . You have to have those rules of thumb to be able to judge where to make the thrust [direct efforts] because we are always under time pressure, and it's those small tricks [seeing links between qualities of the engine].

I: But how have you acquired those small tricks?

O14: You have to listen, and XY [a colleague expressing the third conception] is that type of person, because he's an old hand . . . you discuss with him.

I: Does he have even more tricks then?

O14: Yes, he has a great many tricks, it's obvious, well tricks, he has knowledge, he knows how it works.

I: But tricks, does it mean that you know what to do?

O14: Yes, yes, it isn't really anything strange, but it, strange or strange, but it isn't any kind of cheating, but it's like that.

The optimizers who expressed the more comprehensive conceptions, however, were able to point out that there were less comprehensive conceptions of engine optimization and were also able to articulate the less comprehensive conceptions accurately. For instance, one optimizer who expressed the second conception described optimizers expressing the first conception as less competent:

O19: You can say that this is the whole project . . . there is also a time axis. So it's very easy to just work with this issue [a quality of the engine] here [at present] and not realize the links between other qualities that are here [in the future]. Then you work in isolation and don't see what will happen here [in the future]. . . . It's difficult for the "technician" to avoid falling into the trap and . . . to prioritize.

One possible explanation for the observation that optimizers who expressed more comprehensive conceptions also expressed less comprehensive conceptions accurately, but that the reverse did not occur, is that the conceptions are not separate but hierarchically related to each other. This means that those with a more comprehensive conception can move to a less comprehensive conception in a given situation. For instance, if a specific situation requires the first conception, optimizing separate qualities, workers expressing the second or third conception can temporarily shift their focus in

their work performance. However, it is important to note that this shift takes place within the more comprehensive conception. Therefore, if the optimization situation requires the third conception, optimizing from the customers' perspective, optimizers expressing the first or second conception would not be able to make such a shift. This is because the third conception is not included in the first and second conceptions of engine optimization, but goes beyond them.

Possible Sources of Variation in Conceptions of Engine Optimization

A question of interest is the extent to which the variation in conceptions is related to the optimizers' formal educations and/or length of work experience in the department of engine optimization. Table 2 shows the education and experience of the optimizers holding the three conceptions of competence.

It is difficult to see strong links between formal education and the three conceptions of engine optimization. As can be seen in Table 2, optimizers with master of engineering degrees and high school engineering diplomas are represented in every conception. Work experience does bear some relationship to the variation in conceptions, but not a strong one. The optimizers expressing the first or second conception cannot be distinguished in terms of length of experience in the optimization department, but all those who expressed the third conception had more than 11 years of experience in the department. One possible explanation for this relationship is that competence increases with the time spent doing the same type of work. In the case of optimization work, it may take at least 11 years to reach the third conception. This explanation, however, is highly questionable. If this were the case, optimizers with the shortest work experience would express the first conception, and those expressing the second conception would have more work experience than those expressing the first. This is clearly not the case. As we can see from Table 2, the length of work experience varies from between 1 and 12 years in both the first and the second groups, and there is little difference in mean years in the department between the two. A closely related explanation is that the workers who did not achieve the third conception after 10 years were removed from optimization work. However, this does not seem to be the case, since optimizers who have 12 years experience are represented in both the first and the second conceptions.

DISCUSSION

Toward a New Understanding of Competence

In contrast to the prevailing rationalistic approaches to the study of competence, this study is based on an interpretative approach, namely phenomenography. The empirical findings and the approach adopted provide a new understanding of, and a new method for, identifying and describing what constitutes human competence at work. The most central finding generated by the phenomenographic approach is that human competence is not primarily a specific set of attributes. Instead, workers' knowledge, skills, and other attributes used in accomplishing work are preceded by and based upon their conceptions of work. More specifically, the findings suggest that the basic meaning structure of workers' conceptions of their work constitutes human competence. It is the workers' ways of conceiving work that make up, form, and organize their knowledge and skills into distinctive competence in performing their work. Hence, the findings suggest that a worker's particular conception of

TABLE 2
Education, Experience, and Conceptions of Engine Optimization

Characteristic	Conceptions of Engine Optimization		
	(1) Optimizing Separate Qualities	(2) Optimizing Interacting Qualities	(3) Optimizing from the Customers' Perspective
Formal education			
Master of engineering degree[a]	1	6	1
High school engineering diploma	5	4	3
Length of experience in optimization department[b]			
Range	0–12	0–12	11–18
Mean	4.8	5.5	13.8

[a] This is a university degree.
[b] In years.

work defines what competence she or he develops and uses in performing that work.

A number of other previously concealed aspects of competence are highlighted by the findings that workers' ways of conceiving of their work constitute competence. First, attributes do not have fixed meanings, but rather, acquire meanings through the specific way that work is conceived. For instance, the empirical results demonstrated that the meaning of the attribute knowledge of the engine varied depending on the particular conception in which it appeared. In the first conception, optimizing separate qualities, knowledge of the engine meant understanding how the qualities of an engine reacted to changes in parameters. In the second conception, optimizing interacting qualities, knowledge of the engine meant seeing links among the qualities of an engine and, finally, in the third conception, optimizing from the customers' perspective, knowledge of the engine meant a practical sense of an engine. Hence, workers' ways of conceiving of their work create and shape the context from which the attributes acquire their specific meaning for competent work performance.

Second, the conceptions of work stipulate not only the meaning of the attributes, but also which particular attributes are developed and maintained in accomplishing work. For instance, being accurate and methodical only appeared as a separate attribute in the first conception. Similarly, carrying out the optimization in the right order and being accurate only appeared as a separate attribute in the second conception, and a practical sense of the engine only appeared in the third conception. Thus, depending on the conception of work, a specific set of knowledge, skills, and other attributes is developed and maintained in work performance.

Third, workers' conceptions of work not only give rise to distinctively different forms of competence but also to a hierarchy of competence at work. The hierarchy of competence was empirically demonstrated by an increasing comprehensiveness of conceptions of engine optimization. More specifically, conception 3 included three forms of competence, conception 2 included two forms, and conception 1 included one form of competence in engine optimization. This hierarchy suggests that those optimizers expressing conception 3 are the most competent, and those expressing conception 1 are the least competent. This suggestion was empirically confirmed by the fact that those optimizers who expressed the more comprehensive conceptions were able to operate according to the less comprehensive conceptions, but the reverse did not seem to be the case.

Finally, the findings provide an alternative understanding not only of what constitutes competence, but also of how competence is developed. Departing from the rationalistic approaches, in which competence development is regarded as attribute acquisition, the findings of this study suggest change in conceptions of work as a more basic form of competence development. This is because the results show that workers' ways of conceiving of work stipulate which attributes they develop and what meaning these attributes take on in work performance. More specifically, the results suggest two basic forms of competence development: (1) changing the present conception to a different conception of work and (2) developing and deepening present ways of conceiving of work.

Moreover, the results also challenge the traditional view of competence development as a step-by-step process from novice to expert status (e.g., Benner, 1984; Dreyfus & Dreyfus, 1986). Clearly, when a worker has no work experience, he or she is a novice. After some time, the novice acquires the status of advanced beginner, and other stages follow later. However, my findings suggest that a move from one level to another in the novice-to-expert hierarchy does not necessarily mean a shift from one conception to another. An optimizer expressing the conception, optimizing separate qualities, may progress from novice to advanced beginner without changing the way he conceives the work. Hence, a change in conceptions of work appears to be more fundamental to developing competence than the linear progression from novice to expert that has traditionally been proposed. In conclusion, the proposed understanding of competence presented here provides an alternative answer to the question of why some perform better than others. The variation in performance is not first and foremost related to a specific set of attributes possessed by those who are regarded as the most competent. Instead, why some people perform particular work better than others is related to variation in ways of conceiving of that work.

Implications for Competence Development

The understanding that the conception of work constitutes competence has major implications for managing competence development in organizations. The most basic implication concerns how to identify and describe competence as a starting point for training and development activities. The findings of the present study suggest a major shift in how managers might identify and describe competence at work, a shift from attributes to workers' conceptions of their work. Taking workers' conceptions as one's point of departure makes it possible

to more fully describe how attributes are formed, developed, and organized into distinctive structures of competence in work performance. Hence, using such descriptions as a starting point may increase managers' chances of achieving the desired development of the competence in question.

Moreover, seeing changing conceptions of work as the most fundamental form of developing competence has major implications for designing and conducting training and development activities. In the rationalistic approaches, the primary aim of competence development is to transfer important attributes, such as knowledge and skills, to workers who do not possess them (Dall'Alba & Sandberg, 1996). Depending on the attributes, various activities such as classroom teaching, on-the-job training, and job rotation are used. However, if managers take attributes as the point of departure, they are unable to encourage development of a particular conception of work. Moreover, transferring attributes may encourage less desirable conceptions of work, through simply reinforcing those ways of conceiving of the work in question.

The present findings suggest some guiding principles that may facilitate the development of competence through changing conceptions of work. The most fundamental guiding principle is to take workers' conceptions of their work as the point of departure. Doing this does not mean that development activities such as classroom teaching, apprenticeship, on-the-job training, and job rotation should be abandoned, but rather, that they need to be designed and conducted in a way that actively promotes changes in workers' conceptions of their work. For instance, to enable an optimizer whose conception is optimizing interacting qualities to achieve the conception of optimizing from the customers' perspective, the basis of development activities should be the optimizers' present conception. If he does not reflect on his present way of conceiving the work, such an optimizer will be unlikely to achieve the targeted, more comprehensive conception. If, instead, the targeted conception is the point of departure, the only development likely to take place is a transformation of attributes of the targeted way into the present way of conceiving the work. The worker would then continue to accomplish optimization in much the same way as he had done previously.

Another central guiding principle is to organize particular encounters between workers and their work as developmental triggers. These encounters can be seen as directed "reflective practicum" situations, which Schön (1987: 18) suggested for schools. The aim of presenting a challenge in the form of a work problem is to stimulate a worker to reflect on his present conception; here, questions would include these: Why is it not possible to accomplish the encountered optimization situation in an appropriate way? and What is inappropriate in my present competence in accomplishing it? The encounter must also be organized in such a way that when an optimizer begins to realize the limitations of his present conception, the desired conception is revealed as an alternative. However, a shift from one conception to another is unlikely to take place through a single encounter between an optimizer and an organized optimization situation. Even if optimizers change their ways of conceiving of an optimization situation and begin to conceive it according to the desired conception, they may revert to their former conception when encountering a new situation. Therefore, the development of competence is more likely to proceed as a chain of changes in conceiving different work situations rather than as a single, major change. Moreover, in order to reinforce and refine a certain competence, it is necessary to organize several encounters between the workers and the work that highlight the attributes of the newly achieved conception in different situations.

Finally, it may appear paradoxical that although I recommend that managers understand competence as workers' conceptions of work, I criticize advocates of rationalistic approaches for predefining competence as a set of attributes. However, I do not question the need to predefine competence itself. Predefining a research object is unavoidable because basic assumptions of ontology and epistemology underlie any research approach. Instead, my concern is that by defining competence in advance as a set of attributes, researchers overlook workers' conceptions of work, which, according to my findings, define what competence workers develop and use in performing their work. Predefining competence in terms of conceptions of work enables a fuller description of competence and, thus, a better likelihood of achieving the desired competence development.

Limitations and Suggestions for Further Research

The interpretative theory and method developed here can be used to identify and describe competence at work in terms of workers' conceptions of their work. That is, by taking workers' conceptions as the point of departure, it is possible to identify and describe what constitutes competence in various work and professions such as management, engineering, accounting, medicine, policing, teaching, and finance. But can the conceptions of engine optimization described here also be generalized to

other work? The findings of this study and of other interpretative studies on competence, such as the works of Barley (1996), Benner (1986), and Schön (1983), suggest that competence is context-dependent. Even if apparently similar conceptions could be identified in other work, they would express a different competence in that work. For example, conceiving of managerial work in terms of optimizing separate qualities might mean dealing with emerging issues separately and sequentially. Whether or not conceptions identified in one work context are applicable to another is ultimately an empirical question. Therefore, further empirical studies similar to the present one are needed to explore the possibilities of generalizing identified conceptions to other types of work. Being able to identify similar conceptions in different types of work could also be a way to further enrich understanding of competence at work more generally.

Another issue is the extent to which the identified conceptions reflect the entire variation of competence in engine optimization among the group studied. Since not all 50 optimizers employed at the Volvo Car Corporation participated, there is no guarantee that all conceptions of engine optimization were described, although Theman's (1995) study also indicated that no additional conceptions existed. Moreover, it should also be acknowledged that additional research might illuminate further aspects of what constitutes competence in engine optimization.

My primary tool for obtaining empirical data about workers' conceptions of work was interviews based on observations of work. However, other ways of obtaining data, such as making video recordings and collecting what workers say when they "talk aloud" about what they are doing when they accomplish their work, would provide more detail about how competence is constituted through workers' ways of conceiving of their work. Obtaining such data could be of particular importance in assessing work in which the physical body plays an important role, such as various crafts.

Another question that needs further attention concerns the possible sources of variation in conceptions. In the present study, the sources of variation were investigated in terms of formal education and length of work experience, but no clear links emerged between those sources and the three conceptions identified. However, other sources, such as the type of work experience particular workers have gained, may provide insights. The need for further research also relates to competence development as changing conceptions. In particular, there is a need for research that highlights how changes in conceptions take place and how such changes can be facilitated in organizations to enhance competence at work.

A focus on workers' conceptions of work for developing competence has many further implications for a range of managerial activities, including recruiting, staffing, appraising employee performance, and managing careers, pay systems, and motivational strategies for improving performance. All these activities can facilitate or constrain the competence that is developed and maintained in organizations. The results suggest that such managerial activities should be designed and conducted in a way that actively promotes changes in workers' conceptions of their work. Moreover, since how workplaces are organized also has an impact on the competence that is developed and maintained at work, implications for the organization of work need to be addressed.

Conclusion

In the introduction to this article, I pointed to the issue of what constitutes human competence at work as a fundamental managerial problem. It was argued that understanding what constitutes competence is crucial to managing competence development effectively in organizations. The aim of this study was to investigate what constitutes human competence at work. An interpretative approach, phenomenography, was adopted as an alternative to the prevalent rationalistic approaches. The study makes two contributions: (1) presenting a new understanding of competence at work and (2) suggesting a method for identifying and describing such competence. These contributions are achieved by identifying and describing competence in a particular context—automobile engine optimization. The most central implication emerging from the findings of this study is that conceptions, rather than attributes, should be the point of departure both for efforts to identify and describe competence and for efforts to develop competence in various jobs and professions. For identifying and describing competence, this shift makes it possible to capture how certain attributes are delimited as essential and organized into a distinctive structure of competence at work. For developing competence, such a shift makes it possible to actively promote the development of a particular conception of work and its specific attributes. It is my hope that the findings and the approach adopted here will prove useful as an interpretative understanding of, and method for, identifying and describing what constitutes human competence at work. Hopefully, such descriptions of competence will provide an alternative approach to managing competence development in organizations.

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