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Knowledge Management: A Tripartite Conceptual Framework for Career and Technical Teacher Educators

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Abstract

Researchers and practitioners consider knowledge management to be a strategic intervention that integrates organizational resources such as technologies and human resources. This conceptual paper focuses on the foundational contributions of economics, sociology, and psychology to knowledge management. Select theories from each foundational area are illustrated. Links are made to the research and practice of career and technical teacher educators. Suggestions for further research include examining the inter-connective links of these foundational areas as a means to help career and technical teacher educators identify the value they add to their broader organizational work contexts.

The Journal of Industrial Teacher Education (*JITE*) targets a readership inclusive of professionals in technology education, technical education, trade and industrial education, teacher education, industrial training, and military training. These professionals share common challenges – they work in settings in

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which they are asked to do more with less. They work in settings in which they are expected to continually improve. They search for ways to become more efficient and effective, and they understand that each year they will be held accountable for their performance. This preceding backdrop is intended to build an awareness of why this article on knowledge management is relevant to career and technical teacher educators. The essence of knowledge management is to leverage knowledge within work units and organizations, positively affect individual and organizational performance, and improve work outcomes. These are worthy goals for career and technical education (CTE) teacher educators. When the name of the game for many CTE teacher education programs is survival, becoming more efficient and effective can hopefully lead to gains in performance and competitive advantage.

Knowledge management has emerged as a corporate strategy for integrating technology applications and human resources in the pursuit of improved organizational performance. Knowledge management has addressed some key concerns of human resource development (HRD) and has also triggered new debates on HRD practices (Thomas, Kellog, & Erickson, 2001). The influence of knowledge management, like other business management strategies, has possibilities for affecting the work settings of representatives of the *JITE* readership. The positive possibilities of knowledge management include an emphasis on the value of knowledge within organizations – including school systems and universities (Serban & Luan, 2002). This article offers a useful conceptual framework that can help CTE teacher educators understand the foundational roots of knowledge management, and hopefully allow them to make useful connections between the theory and practice of it in their own work contexts.

Background and Rationale for the Study

A widely-accepted premise of knowledge management in the business world is that competitive advantage stems from the unique knowledge possessed by members of an organization. The advantage is attained and maintained if and when other competitors in the same

industry are unable to duplicate this unique knowledge. School settings and universities can also benefit from maximizing in-house knowledge that leads to enhanced effectiveness and efficiency and a competitive advantage over other educational providers. An example of a competitive advantage in CTE would be high levels of effectiveness and efficiency by a CTE program in aligning curricula with current industry standards. Another example would be capitalizing on expertise from across departments that would allow highly desirable integration of academic and technical content in teaching and learning transactions. The outcomes of both of these examples are presumed to be desirous and can positively affect the success of program graduates.

The emphasis on the expertise and experience of workers in the business management community has benefited primarily from three academic disciplines: economics, sociology, and psychology (Lee & Roth, 2007). Central to the debates among economists has been the organization – an economic organization, in particular. Sociologists have examined the complexities of the organization as a social entity and its relationship with the environment. Researchers in psychology have examined the actions of individuals and groups within organizations.

The literature on knowledge management may be described as a piecemeal approach, devoid of thorough explanations of the theoretical underpinnings of knowledge management. One of the reasons for this shortcoming is that knowledge management is in an early developmental stage. Second, knowledge management researchers have emerged from a variety of academic disciplines. Third, most of the existing knowledge management studies are project-based. That is, rather than focusing on theory building and systemic understanding of the application of knowledge management, many knowledge management studies attempt to seek a tactical, immediate solution to a specified problem. (For a more in-depth critique of knowledge management models, see Yang, Zheng, & Viere, 2004). Very few studies have examined knowledge management in the context of schools and/or universities.

Problem Statement

Common perceptions of knowledge management are somewhat simplistic, yet they tend to be rapidly spreading. The absence of a sound theoretical foundation may hamper the maturation of knowledge management as a research construct. Missing from the literature are attempts to link knowledge management to the work contexts of CTE teacher educators. CTE teacher educators work in a variety of colleges and/or schools within universities. The conceptual framework offered in this manuscript can provide CTE teacher educators with insights about knowledge management and how it might be used to help them strategically manage knowledge in their colleges and departments. Universities, similar to businesses and industries in the global economy, must seek out competitive advantages and calculate ways to do more with less.

A basis for examining knowledge management

Several researchers purport that knowledge management has emerged because organizations have struggled to cope with rapidly changing markets (Chatzkel, 2003; Drucker, 2002; Nelson & Winter, 1982; Nonaka & Takeuchi, 1995; Saint-Onge, 2003; Wiig, 2000). Drucker (2002) investigates the historical background of knowledge management and the so-called knowledge work or knowledge economy. Although Drucker does not offer a definition of knowledge management, he argues that in knowledge-based organizations the organization needs knowledge workers more than they need the organization. In order for an economic organization to increase productivity, therefore, it has to provide proper and continuous learning and training programs for workers and to allow them to make decisions on their own area.

Wiig (2000) asserts that knowledge management serves to foster and promote intelligent behaviors. He views organizational learning as a means to successfully accomplish goals by learning from experiences, research, and observations. Although his descriptive framework lays out strategies of knowledge management, it fails to illustrate how these strategies and dimensions of knowledge and

knowledge management can be cohesively integrated at the levels of the individual and the organization. Stated another way, his conceptual framework does not fully elaborate the critical issue between individual learning and organizational learning: whether organizational learning is the accumulation of individual learning outcomes or whether both are qualitatively different in nature. This fragmentation of Wiig's framework is not an isolated case; rather, it is a common problem in knowledge management literature.

Chatzkel (2003) asserts that knowledge management deals with the flow of knowledge, not the stock of knowledge. He explains that intellectual capital is likely to be costly and wasteful if the organization is unable to access, share, or capture value from knowledge. In this regard, nurturing, leveraging, and sharing knowledge in an organization is an action-based organizational strategy. Similarly, Saint-Onge (2003) claims that knowledge management should build the capabilities and the relationships that constitute the intangible assets so that those assets enhance the performance of the organization. These perspectives indicate that social relationships between organizational members are critical preconditions for successfully implementing knowledge management. On a related note, Shim and Roth (2008) explain the barriers that exist in universities for the sharing of knowledge between faculty members. They highlight how CTE teacher educators probably face additional challenges for knowledge sharing because of the lab-based contexts and other unique characteristics of CTE teacher education programs.

Some researchers focus on how knowledge is created and transferred between people in an organization. Nonaka and Takeuchi (1995), for instance, focus on how knowledge is created at the individual level by stressing the notion of tacit knowledge. They attempt to account for how tacit and explicit knowledge is transformed in a team setting. This perspective on knowledge management posits that albeit knowledge management benefits from the development and use of information technology, people are the key factors that actually converge, create, and share knowledge and information. These views stress the significance of cognitive processes in an organization.

Nelson and Winter (1982) view knowledge, based on a tacit knowledge perspective, as an organizational competency. They focus on the process of knowledge that may enhance organizational ability to learn and adapt. This perspective emphasizes inter-organizational relationships and collaborative networks in creating and transferring knowledge.

This section of this conceptual paper highlights select themes of the knowledge management literature. Prominent themes of knowledge management literature suggest that its purposes are to attain and sustain organizational competence and to develop competitive knowledge workers for organizational survival in a competitive market. In other words, knowledge management can be viewed as: (a) an emerging strategy to generate competitive resources so that an organization can survive in market competition, (b) an organizational process to create and share knowledge and information – a strategic, intangible asset of an organization, and (c) an organizational and an individual activity with which cognitive and behavioral changes are engaged. In this respect, comprehending the whole picture of knowledge management requires understanding three principle dimensions: economic environment, organizational dynamics or relationships, and individual or collective cognitive process. The following section examines the intellectual property of knowledge management, based on three academic disciplines: economics, sociology, and psychology.

Three Pillars of Knowledge Management

Shaping an inter-disciplinary approach may serve to mold an enduring theoretical framework of knowledge management as well as to provide insights for practice for CTE teacher educators. Researchers and practitioners from the diverse academic orientations of economics, sociology, and psychology have examined the essence of knowledge management and its benefits for the individual and the organization.

Since this study is a conceptual piece based on a literature review of knowledge management, in this section previous studies are reviewed that have dealt with the intellectual property of

knowledge management. First, since knowledge management focuses on internal resources for economic growth, it can be closely associated with economic theories. Although most universities that house CTE teacher education programs are non-profit organizations, they certainly are competing for students and scarce resources in the turmoil of difficult economic conditions.

Economists have long attempted to understand and explain what factors influence economic growth at various levels: individual, organization, and nation. Neo-classical economists such as Schultz (1971) and Becker (1975) postulate that economic growth is dependent on the quality of the workforce and technological innovation. They emphasize the contributions of human factors to economic growth. They consider factors such as a well-trained, quality workforce and the accumulation of workers' skills and experiences by applying the value of human capital in their economic equations. The premise of their theory, human capital theory, is that human capital has economic value and can be quantified and measured. The economic value of the workforce is acknowledged through these measures, and through these measures an organization recognizes the need to invest in training its workforce. Since their inception, CTE programs have contributed to this investment of training the nation's workforce, and Threton (2007) outlines how federal legislation has guided the direction of vocational education, and more lately CTE, as a response to the economic climate of the country.

A second strand of literature for investigating the construct of knowledge management is sociology. Several researchers have used sociological methods to examine economic organizations, work relationships, and other economy-related social events in capitalist society, or the market economy. In this regard, social network analysis may be used to reveal the complexity of social relations in an organization. Social network theory offers rigid ground for depicting and understanding personal relationships, commitment, communication, and value-adding mechanisms in association with knowledge management. Based upon the analysis of knowledge-intensive organizations, Adler (2001) claims that as knowledge becomes increasingly important, high-trust institutional formation is

an effective way to deal with knowledge-based capital. However, Adler appears to overlook the dynamics of interpersonal relations between organizational members. Knowledge, in his view, is seen as an asset that has already been formulated, not created by people through transferring and sharing.

Psychology provides a third foundational approach to understanding knowledge management. Psychology, especially industrial and organizational psychology, has long contributed to the analysis of management processes, managing people and organizations, and explaining socio-cognitive processes (mental models at individual and collective levels) (Gertler & Wolfe, 2002). Studies in industrial-organizational psychology bring to the forefront the importance of the cognition process (e.g., learning) and the emergence of individual competence as an organizational asset. Historically, CTE programs have collaborated with business and industry to make sure that their graduates added value as organizational assets. Studies that pertain to knowledge creation and transfer emphasize this enhancement of individual competence (Burke & Hutchins, 2008; Delamare Le Deist & Winterton, 2005) and these studies have contributed to understanding the multifaceted nature of knowledge management as a management strategy. Based on a psychological perspective, links have been established among the analytical units of individual, team, and organizational learning. Organizational competencies are created by cognitive processes at individual and organization levels, fostering the emergence of the notion of organizational learning.

In summarizing the preceding foundational elements of knowledge management, minimal common ground exists for analyzing and interpreting the nature of knowledge management among these academic orientations. Depending on the interests and backgrounds of academic principles, the research orientation of knowledge management varies considerably. Finding an intersection among them in terms of research agenda, theoretical emphasis, method, and unit of analysis is challenging. However, an interdisciplinary approach might be most beneficial for helping CTE professionals understand the basics of knowledge management. Hence, in the following section, discussions are offered that explore

the complex nature and foundational elements of knowledge management.

Knowledge Management and Foundational Links to Economics

In the so-called knowledge-based economy, organizations in both private and public sectors have shifted their survival tactics from traditional physical resources to the intangible assets possessed by their employees. The premise of this strategic shift is that knowledge has become a determinant of economic growth. Many economists, neo-classical economists in particular, posit that investment in human capital ensures economic growth and productivity improvement. This notion penetrates the realms of CTE and HRD. (For a thorough description of neoclassical economics and its relationship to HRD see Wang & Holton, 2005). Knowledge has been illustrated in various ways or described as types of capital such as human capital, intellectual capital, social capital, and structural capital. The implication is that knowledge is an intangible economic asset that an organization and its members may possess.

This section discusses how resource-based theory has contributed to the development of knowledge management. Resource-based theory originated from the concept of economic rent theory. Resource-based theory regards an organization as a collective entity that contains capabilities. In classical economics, analysis focuses on three main factors of production – land, labor, and capital – which have a unique type of income – rent, wages, and interest, respectively. Classical economists use these factors to examine the difference between income earned by the factors and cost of producing those factors. Neo-classical economists utilize this concept of (economic) rent to distinguish the difference in investment between the production cost and the opportunity cost. In other words, the judgment on investment is made when return on investment is secured within an industry. By identifying and analyzing market competition and other external forces that might affect income or return on investment, an organization determines

how much and where the allocation of organizational resources should be allocated.

Resource-based theory examines the resources and competencies of an organization that enable it to induce a higher return of investment and a sustainable market advantage. From a resource-based theory perspective, the various ways that an organization acquires and allocates organizational resources account for the origin of economic rent. According to the theory, identifying and utilizing resources that are valuable, rare, and difficult to duplicate is an important strategy for sustaining organizational growth and securing profits. An organization can gain a higher return of investment if it has better, if not the best, resources available and they are in unique forms that protect them from being duplicated by competitors. In this regard, knowledge created and possessed by internal members of an organization is seen as a key resource for gaining competitive advantage over competitors in an industry (Barney, 1991). Resource-based theory provides interesting food for thought when applied to the contexts of CTE teacher educators. It can lead one to ask, in what ways do our faculty members, students, and other stakeholders provide a competitive advantage compared to other programs and institutions to which we benchmark?

Traditional strategy models, such as Porter's (1987) five forces model, focus on the external competitive environment of an organization. Most of the strategy models do not attempt to look inside the organization. In contrast, resource-based theory highlights the need for a fit between the external context (the market) that an organization faces and its internal capabilities. One of the fundamental assumptions of resource-based theory is that the internal resources and capabilities of an organization are more critical to shaping strategies than the external environment. Although resource-based theory recognizes that organizational strategies might be dictated by external factors, it claims that the unique internal resources and capabilities of an organization provide the basis for strategy. Organizational strategies are expected to identify and harness core competencies of an organization. Most universities, and the colleges and departments within them, engage in strategic planning processes to identify core competencies.

Resource-based theory can help CTE teacher educators understand the relevance of knowledge management along these lines: (1) core knowledge that cannot be duplicated by other programs deemed as competitors can be critical to the success and survival of a CTE teacher education program; (2) knowledge and skills embedded within program members can be vital resources for increasing innovation and productivity; and (3) strategies should be implemented and institutionalized to sustain program growth.

A caveat of the resource-based theory is that it overlooks the social context of resource decisions. All organizations have unique histories, norms, and social networks that can influence knowledge sharing. Most CTE teacher education programs are steeped in histories that featured more faculty members, higher student enrollments, and greater access to state and Federal funding.

Knowledge Management and Foundational Links to Sociology

The internal movement of knowledge is a challenging problem for most organizations (Brown & Duguid, 1998). Organizational innovation is the social process within an organization that occurs within and between groups of people. Management strategy for performance improvement and structural change requires integrated actions at multiple layers in an organization. This issue is a central theme of social network analysis.

Social network analysis provides a systemic means of assessing informal networks by mapping and analyzing relationships among people, teams, and organizations. It offers a means of determining the way in which work is or is not occurring in the informal networks. Social network analysis can reveal information flow and provide a basis for understanding how the actors in an organization share and create knowledge. This conceptual article attempts to briefly delineate the nature of social network analysis to help develop a conceptual framework of knowledge management. (For a comprehensive examination of social network analysis, see Storberg-Walker & Gubbins, 2007).

A central premise of social network analysis is that empirical data or indications derived from mathematical methods can be used to build up theory in order to explain social relations and interactions (Dubin, 1976). Scott (2000) suggests that social network analysis was first introduced by J. L. Moreno, a psychiatrist using “sociometry” in the 1930s. Social network analysis mainly employs mathematical methods to analyze the characteristics of a system and the patterns of relationships. Methods commonly used in social network analysis are observation, questionnaires, and examination of records. Through this process, social network theory surfaces the informal structures of the organization (Wasserman & Faust, 1994).

Understanding social interactions within an organization can help to reveal the process and structure of knowledge transfer and sharing between and among individual members of the organization (Lee, 2000). Contractor and Monge (2002) explain that psychological, sociological, and communication approaches to investigating the networks provide a venue to conceptualize knowledge management. These approaches examine where knowledge is created and how knowledge networks are linked and maintained. According to Contractor and Monge, the study of knowledge networks focuses on communication linkages between individual members and various types of aggregates of individuals. These aggregates include knowledge retrieval from human and non-human agents, allocation of information and knowledge, trust and authority relations, formal alliances, and so on. Social network analysis may be posited as an in-process measure as well as a multi-level approach that has potential for contributing to an evolving conceptual framework of knowledge management.

Knowledge Management and Foundational Links to Psychology

This literature review confirms that learning is an important component of improving the competencies of individual employees and the organization. Wiig (2000) claims that knowledge management as an organizational innovation can be built up and successfully implemented through explicit and formalized

knowledge. Psychology, industrial and organizational psychology in particular, has long contributed to the development of theories vis-à-vis organizational behavior and cognitive processes of the individual in the workforce. In knowledge management literature, a common tenet is that learning is a keystone for achieving organizational goals. Several topics could be explored in this section that relate to learning in the workplace, such as learning how to learn, informal and incidental learning, self-directed learning, and learning transfer, among others. However for the sake of example, this section will flesh out relationships between knowledge management and psychology by elaborating on organizational learning. (For a comprehensive examination of learning and organizations see Watkins & Marsick, 2003).

Several researchers have developed conceptual models depicting how workers learn in organizations, and their work can be associated with behavioral psychology. Argyris and Schön (1978), for instance, argue that many organizations have difficulty learning and seldom question the foundation of their own problems. According to them, organizations lack abilities to connect understanding and action, and tend to be resistant to change. Argyris and Schön postulate that learning is an iterative process guided by organizational vision and strategy. In this iterative process organizations continually attempt to become competent in taking action while simultaneously reflecting on the action for the sake of learning.

Another psychological influence on knowledge management stems from models of information processing (Huber, 1991). Huber cites four learning-related processes in organizational learning: knowledge acquisition, information distribution, information interpretation, and organizational memory. According to Huber, learning-related activities at an individual level trigger events that move people and organizations to higher levels of a cognitive system. Similarly, other researchers claim that over time an organization accumulates knowledge generated by individual members (through their learning) who share the mental model of the organization (Levitt & March, 1988; March, 1991). They assert that organizational learning creates competitive advantage in terms of management innovation so that organizations can manage

sustainable growth. However, organizational learning differs from individual learning in several respects. First, organizational learning occurs through shared insights, knowledge, and mental models. Second, individual learning builds on past knowledge and experience, and memory and sense-making processes. Scholars who contend that organizations learn assert that organizations are seen as learning by encoding inferences from history into routines that guide behavior.

It can be argued that organizational learning is an integrative path that links two different dimensions: individual and organization. Furthermore, this kind of effort may also help to translate knowledge management theories into practice. Organizational learning is multifaceted and it requires considering two main dimensions, individual and organization, and the converging process of the two (Seemann, DeLong, Stucky, & Guthrie, 2000). Linking knowledge management with organizational learning is useful as it connects the various actors in the organization: the individual, groups of people, and the organization as a whole. Several researchers have focused on these linkages of individual, organization, and knowledge management. For example, Grobmeier (2007) positioned the individual as the linking point for knowledge management and the learning organization. Zheng (2005) examined factors associated with organizational culture and their influence on knowledge management.

Discussion, Summary and Implications for Future Research

This conceptual paper examined the foundational bases of knowledge management, how it has emerged as a research construct and area of practice, and how the individual and collective actions of workers in organizations are related to knowledge management. The authors have emphasized the multifaceted nature of knowledge management so that CTE professionals may be better able to grasp its foundational roots. Knowledge management involves behaviors, relationships, and other phenomena that are grounded in economics (e.g., resource-based theory), sociology (e.g., social network

analysis), and psychology (e.g., organizational learning theory). This tri-part analysis is aligned with Storberg-Walker's (2005) description of how people and processes function in organizations as forms of capital: "individual knowledge, skills and attitudes (e.g., human capital); social relationships (e.g., social capital); and organizational systems (e.g., structural capital)" (p. 329). She notes that the manner in which the relationships among these three components are understood and mediated can affect how value is created in organizations.

Career and technical teacher educators (and other CTE professionals) can benefit by using a multifaceted approach to examining knowledge management in their work contexts. Economics, and in particular resource-based theory, can help CTE teacher educators understand how their collective knowledge needs to be valued by the larger university and external stakeholders. These resources should include knowledge and skills of faculty and students that are difficult to duplicate by other programs within and outside of the university. The work outcomes of CTE teacher educators should be aligned with the strategic planning goals of the university and with the goals of external constituents (such as CTE professional organizations). The value added of CTE teacher education programs to the broader strategic planning processes of the university can help these programs survive during periods of retrenchment. Many CTE teacher education programs have struggled with survival for several decades. The problems that Daugherty (2005) outlines for technology teacher education programs are common to other CTE teacher education programs: "shortages of entering pre-service teachers, program closures, and shortages of funding to support substantial programmatic adaptations" (p. 41). Of course, CTE teacher education programs are not the only programs that are facing challenges. Grossman (2008) notes the jurisdictional challenges to university-based teacher education programs in general. She describes how university based teacher educators "are facing a sharp attack on their ability and their right to control the preparation of teachers" (p. 11).

Another foundational area of knowledge management, sociology, can help CTE teacher educators better understand how

collaboration can enhance their learning and the learning of their students. More effective social contexts are needed that can enhance knowledge sharing among CTE teacher educators and their constituents. With regard to public school contexts, Lieberman and Pointer Mace (2008) explain how teacher learning takes place through experience and with practice. “They learn through practice (learning as doing), through meaning (learning as intentional), through community (learning as participating and being with others), and through identity (learning as changing who we are)” (p. 227). These authors encourage the creation of networks of teacher communities to enhance knowledge sharing. Similar recommendations can be made for creating teacher educator communities as a means to break down the structural barriers to knowledge sharing within universities (Shim & Roth, 2008).

Successful collaboration often requires innovation and risk taking. Hill (2006), for example, considers the implications of technology teacher educators establishing systemic collaborative relationships with engineering faculty and engineering professional associations as part of a curricular shift to engineering design. He notes how this type of curricular shift would certainly affect the preparation of prospective technology teachers and the work contexts of technology education teacher educators. Hill’s examination of this curricular shift highlights the possible reverberations to resurrect a field of practice (technology education) that is grounded in rich (and oftentimes constraining) traditions.

Kearney, Self, Bailey, Harris, Halcomb, Hill, and Shimp (2007) describe an innovative collaborative effort between a college of education and a government agency. The authors stress the importance of changing the way that universities traditionally operate in order to succeed in this type of multi-year partnership. The authors cite the challenges of crafting innovative partnerships with entities that are used to the turbulence of a global economy and have little patience for slow moving bureaucracies (e.g., practically any university). “Contemporary educational initiatives must be fluid and visionary to meet the needs of a rapidly changing workforce, global demands and increased time compression and the need to maximize scarce resources” (p. 88). Knowledge management can help CTE

teacher educators identify the value that they can add to the goals and vision of partnerships.

Finally, this study emphasized psychology as the third component of a conceptual framework for knowledge management. This study found that most knowledge management scholars, regardless of their academic discipline, view the competencies of individual workers as the quintessential assets for ensuring sustainable growth of an organization. This belief endorses the notion that organizational learning is a key organizational strategy that can lead to competitive advantage. This paper concludes that organizational learning, one of the strategic means of knowledge management, can also play a key role in linking CTE teacher educators to the diverse organizational actors of individuals, teams, and technologies in university settings. These seem to be natural links for CTE teacher educators, who have historically been involved in augmenting human performance through technologies and teamwork.

Future research on knowledge management, as Foss and Volker (2005) note, should take into account individual actors in an organization who possess and can leverage knowledge. In this regard, researchers who focus on CTE might consider exploring how technical education students and graduates, career and technical educators, and CTE teacher educators create and share new knowledge in their respective work contexts. Finally, it is hoped that this conceptual paper has helped CTE teacher educators and other readers of *JITE* understand foundational elements of knowledge management. Theoretical contributions associated with knowledge management should consider the underpinnings of the inquiry, what is known about it, and inadequacies of the existing literature associated with it. Positioning the research of knowledge management within the realms of economics, sociology and psychology provides a framework with a well established lineage, and hopefully a useful conceptual framework upon which CTE teacher educators can link their research and practice.

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