

# Big Data, Knowledge, and Business Intelligence

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## INTRODUCTION

After developing the scholarly foundation of the existing disciplines, this paper will look specifically at how selected concepts relate across the fields, particularly to what we know about big data. Although not as developed a discipline, big data does have recognizable elements from its own and other literatures. This article will establish the links between fields and demonstrate opportunities for sharing and learning between the different disciplines, both old and new.

## BACKGROUND

The field of knowledge management (KM) and its related discipline, intellectual capital (IC) have both contributed considerably to our understanding of the value of intangible assets of the firm. The general concept that intangibles are something worthwhile goes back at least to Schumpeter's (1934) work on innovation and has since included contributions from other high-profile writers such as Drucker, with his knowledge workers (1991). The idea that proper management of such intangibles might lead to competitive advantage was explored by scholars such as Nelson and Winter (1982) in their evolutionary theory of growth. Such competitive advantage fits well with the resource-based theory of the firm (Wernerfelt, 1984), specifically identifying knowledge as a potential key resource. As a result, we have the

knowledge-based theory of the firm (Teece, 1998; Grant, 1996) and its suggestion that knowledge is not only a potentially important differentiator but perhaps the only differentiator for firms looking for sustainable competitive advantage.

In pushing the field forward, the KM and IC disciplines have always carefully defined the nature of their study, perhaps because of the obvious need to clarify and distinguish knowledge assets or intellectual capital from the more widely known but explicitly formal intellectual property terminology. Patents, copyrights, and other intellectual property are valuable intangible assets, but intellectual capital extends our recognition of value to additional, less well-defined intangibles such as know-how and expertise (knowledge). As a result, a clear distinction exists in the field between data, information, and knowledge. Formally, data are observations, information is data in context, and knowledge is information subjected to experience, reflection, or some similar analysis (Zack, 1999b). Within the field, knowledge is often referred to as know-how, effectively a sort of learning based on experience, learning, or insight. Such a perspective flows naturally out of the more general DIKW (data, information, knowledge, wisdom) hierarchy suggested by Ackoff (1989).

Growth in knowledge of this sort can come about in different ways. Nonaka and Takeuchi (1995) borrowed the concept of tacit knowledge from the sociology literature (Polanyi, 1967), identifying and explaining tacit and explicit knowledge in a business context. Tacit knowledge

is more personal, harder to express, and more difficult to codify within organizational information technology (IT) systems. Explicit knowledge, on the other hand, is easier to express, easier to share, and easier to store in IT structures. Nonaka & Takeuchi also developed the SECI or ba framework categorizing how knowledge grows, by tacit to explicit, tacit to tacit, explicit to tacit, or explicit to explicit transfer. The explicit to tacit process is of particular interest as it concerns the conversion of more structured intangible assets into personal tacit insights. From there, it is only a short step to the idea of creating new knowledge from data and information, foreshadowing how non-knowledge intangible assets can also create value. The overall objective of KM is to better understand how knowledge can be more effectively developed and employed by means of combination, sharing, learning, or similar means (Zack, 1999a; Grant, 1996).

Since these early insights, knowledge management as a field has focused more on the circumstances surrounding knowledge development as well as appropriate tools. Beyond the tacit/explicit distinction, other circumstantial variables relating to knowledge development include other aspects of the knowledge itself as well as organizational conditions. Knowledge aspects include characteristics such as complexity and stickiness (McEvily & Chakravarthy, 2002; Zander & Kogut, 1995; Kogut & Zander, 1992). These essentially assess how complicated the knowledge might be (and difficult to fully understand) and how sticky or tied to the originating firm. Organizational aspects include characteristics like absorptive capacity (Cohen & Levinthal, 1990) and social capital (Nahapiet & Ghoshal, 1998). Absorptive capacity refers to the learning capabilities of the firm and its people while social capital refers to the number and strength of personal ties throughout the entity. As a consequence of the differing conditions, organizations pursue different KM approaches (Choi & Lee, 2003; Schulz & Jobe, 2001; Boisot, 1995) ranging from tacit-to-tacit techniques such as communities of practice or

storytelling to more explicit-oriented tools such as IT-driven knowledge markets (Matson, Patiath, & Shavers, 2003; Thomas, Kellogg, & Erickson, 2001; Brown & Duguid, 1991).

The related field of intellectual capital addresses many of the same basic concepts but from the standpoint of metrics, categorization, and strategic development of the assets. Growing out of scholar and practitioner interest in better accounting for fuzzy, intangible assets, IC typically looks to describe the knowledge assets of the firm according to the categories human capital, structural capital, and relational capital (Bontis, 1999; Edvinsson & Malone, 1997; Stewart, 1997). Human capital refers to individual, job-specific knowledge, structural capital to more long-term knowledge persisting in the organization (culture, systems), and relational capital to knowledge about relationships with those external to the firm.

A further extension adds in the idea of actionable intelligence. In many ways relatable to Ackoff's "wisdom" in the DIKW hierarchy mentioned earlier, intelligence refers to analysis of the knowledge (as well as the pre-knowledge data and information) in order to develop and execute strategies and tactics. Much like KM and IC, competitive intelligence grew out of practice as much as scholarship, especially early on (Prescott & Miller, 2001; Gilad & Herring, 1996; Fuld, 1994). Also similarly, the field often focuses on sources of knowledge, information, and data, as well as techniques for obtaining them (Fleisher & Bensoussan, 2002; McGonagle & Vella, 2002). Where matters start to diverge is in the analytic processes often applied to competitor knowledge and information, especially as competitive intelligence operations mature (Wright, Picton, & Callow, 2002; Raouch & Santi, 2001). Consequently, we do have some theory and practice related to the usefulness of all intangibles (data, information, and knowledge), not just knowledge, and the extension of creating actionable insights or intelligence, not just additional knowledge. Those fields looking for "intelligence" (competitive intelligence, marketing intelligence, business intelligence) have clear

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