BPM for Knowledge Workers

Inside Decision Intensive Processes (DIPs): Knowledge, Practice, Context, and Characteristics

By David Bromberg

Introduction

This is the second article in a series for BPTrends exploring decision-centric activities of the knowledge-based enterprise. Called Decision Intensive Processes (DIPs), we define them as:

**Repeated and repeatable business processes whose conduct and execution are heavily dependent upon knowledge workers in a variety of roles performing various decision making tasks that interconnect to drive critical organizational outcomes.**

DIPs include activities such as insurance underwriting, drug studies, and government security clearances. They are a subclass of business process within the BPM domain.

This article will further unravel the layers within DIPs by delving into the elusive concept of knowledge and its relationship to enterprise decision making. By doing so, we better understand the mechanisms by which DIPs operate, allowing us to successfully apply business process management principles to them.

We’ll first look at knowledge and decision making by describing how “practice” and “context” are front and center for knowledge workers. We’ll then discuss how individual decision making scales into organizational decision making by describing the characteristics of DIPs.

Synopsis of First Article – Structural Foundations of DIPs

In the previous article, we explored the structural foundation of DIPs. This foundation is grounded in the decision making activities of individual knowledge workers that must be coordinated to produce decisions that serve the enterprise.

Visually, a DIP is a table with multiple legs (see Figure 1). Each leg represents the decision making processes of knowledge workers. Enterprise decision making runs across the surface of the table top. Where legs meet table top, decisions made by knowledge workers are incorporated into the enterprise decision making process.

DIPs evolve naturally and intuitively as managers carve out specialized decision making tasks from existing business processes and assign them to knowledge workers with requisite skills. As tasks grow in number, decisions increasingly intertwine causing enterprise decision making to become more complex. The result is a value network where decisions made anywhere in the process can have profound impact at multiple other points.

Knowledge-based, decision-centric work uses an information processing framework. This framework incorporates a methodology that, regardless of expertise or industry, is used to reach decisions. With it, the knowledge worker actively gathers information as inputs; analyzes and interprets information; uses provided, gathered and generated information to reach decisions; communicates those decisions as a call to action; then acts on those recommendations. During the decision making process, the knowledge worker looks for the routine and obvious while remaining aware of and taking care to respond to specific and unique situational criteria.

In consideration of the above, decision making in the enterprise is more than just an outcome achieved by pattern matching or rule application. Decision making is a sophisticated, constantly
unfolding process that relies on knowledge. In order to structure and harness DIPs, we must understand and then build a practical working model for this thing we call knowledge.

The Knowledge Worker at Work – Practice and Context

The BPTrends editorial\(^5\) that launched this series stated that it is difficult to determine how the knowledge worker works due to the inherent difficulty in analyzing and automating knowledge. Having experienced this frustration, ten years ago I threw out the existing playbooks and walked down my own path, trying to understand knowledge-based work by talking with and observing experts as I built a technology that supported decision making practices\(^4\).

Perhaps my best early insight came from a doctor. We were talking about his medical practice as a car trip. He started by saying his medical field knowledge is his map. His job is to decide on a successful medical outcome – a destination on the map. The outcome requires a treatment plan, or his route, tailored to diagnosis and patient. Diagnosis, treatment and outcome are fueled by the patient information he listens for and observes. The vehicle is his skills, powered by years of training and experience. He needs to drive the route, worried only about where he is now and what he needs to do next. Everything happens in service to the diagnosis and treatment plan.

What I took away was insight into a complete package he called his practice. Moreover, I realized that everything he did was tied to a frame of reference, be it his medical field knowledge or the diagnosis and treatment of a patient. The word that best captured this framing is context.

Today I know that experts and other knowledge workers rely on practice and context\(^5\) to define their knowledge. I'll explain why.

Why Practice

The word practice has many meanings. To teachers and trainers, it is the learning means to a knowledge end. For doctors and lawyers, practice is their craft which demands they engage in behaviors that lead them to be, among other things, superior decision makers. This suggests there are processes that people apply to achieve excellence. Together this suggests to me that practice is process\(^6\).

The Importance of Context to Decision Making

We understand context is connected to word meaning. For the knowledge worker, context is more. It is the gateway to understanding knowledge.

To see why, consider the science of drug study design. A clinical scientist practices in a context of scientific inquiry. This context establishes purpose – to design a drug study establishing drug effectiveness that follows the standards of good scientific methodology.

In practice, the scientist sub-divides the design task into categories such as disease state, drug characteristics, target population, and outcomes sought. Within categories, there is refinement into sub-categories.

As Figure 2 reveals, the relationship between categories line up as a table of contents; a mental map made up of a hierarchy of contexts (or ontology) which reflects the domain of the expert’s knowledge.

An ontology is more than a way to organize the world\(^7\) of the knowledge worker. Each category or sub-category (level) in the ontology has a context and purpose which it hands down to the level(s) subordinate to it. In this way, purpose is clarified and amplified at all levels within the task.

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\(\text{Figure 2: A Sample Drug Study Hierarchy}\)
Experienced knowledge workers readily admit to owning maps of their domain of knowledge. There are maps for criminal investigation, forensic audits, insurance underwriting, security clearance determination, and learning disability assessment to name a few.

For knowledge workers, the purpose carried in these maps shapes task conduct. It guides the knowledge worker through varied task activities and towards the outcome sought.

Most importantly, context shapes the nature of the decisions that need to be made. Put another way, context suggests the questions that need to be answered by the knowledge worker. Context, therefore, establishes a route on the map which keeps the knowledge worker pointed towards a destination.

**Information Fuels Decision Making**

Two people are talking. One of them asks the question, “What color were his eyes”? The answer is “blue”. How does the answer change if we know the two persons are friends talking about the eyes of “A person I just met” versus a detective asking about “The person who robbed you”?

For the police detective investigating a crime, “blue eyes” is important because it narrows the number of suspects. It is not that there is a change in meaning for the answer blue eyes – they are just blue eyes after all. It is that the answer has greater relevance and is much more meaningful information for the detective. For him, it has a purpose. In this description, suspect information meets crime context to fuel the investigative practice of seeking the perpetrator.

How else might the information/context dynamic play out?

Many processes call for a preliminary decision to determine the practice to follow. For example, the detective wants to know if the scene is an accident or a crime. Enough information needs to be gathered to make this decision. As a result, the appropriate investigative context is in play.

What happens from here? The knowledge worker purposefully seeks out and/or incorporates information that is or may be relevant to the task. Meaningless information (noise) is eliminated. How does this occur? It’s the categories of the task ontology which filter incoming information. Relevant information is taken in and categorized according to purpose.

Next, as information is slotted into its categories it is being clustered. Clustered information is related through the context and purpose provided by the category. This clustering of information inside categories is central to decision making. Some call it “connecting the dots”.

Lastly, some information may provide value for more than one category. For instance, if a weapon was used in a crime, this and related information could be used to make a case that the act was pre-meditated. Information on weapon type could be relevant within the intent context.

**The Engine of Decision Making**

We have a map. We have fuel. Still, something is missing. What is needed is an engine to power decision making. What are the requirements for this engine? It must propel decision making forward, run reliably for any size or type of decision task, handle any amount of information, adjust to the skills and techniques of any knowledge worker, and be agnostic to context.

I’ve previously claimed the knowledge worker is both a consumer and producer of information who utilizes an information processing methodology (see Figure 3) regardless of domain of expertise. This information processing methodology is the engine that powers decision making.

**Catalyzing Decisions**

The information processing engine operates as follows:

**Switch On:** Information processing begins with an initiating event: for the detective, a crime; for the doctor, a patient presenting symptoms.
Gather Information: Knowledge workers consume information that is provided or purposefully sought. This information is actively filtered and clustered according to context (see Information Fuels Decision Making above).

Analyze and Interpret: Knowledge workers churn through information, consuming and producing it as they go. Waves of information are produced by analytical methods and techniques applied by the knowledge worker. Analytical methods work on information clusters (categories) with the results of each wave filtered and slotted back into appropriate categories.

Context is critical to interpretation. Information “meaning” depends on membership in categories and the layering of purpose within the hierarchy. Interpretation also leads knowledge workers to create new categories as they go so as to add more purpose and meaning to information. Interpretation is enhanced by tracing information across multiple categories to reveal connections between contexts. For instance, the detective follows information common to categories such as motive and opportunity to weave a narrative on intent and/or pre-meditation.

If necessary, and if time allows, analysis and interpretation is repeated, perhaps with more methods or with freshly gathered or produced information.

Reach Decisions: We’ve all witnessed the moment of decision with pronouncements of “I’m ready to make my decision” or its opposite “I haven’t decided yet”. Once the knowledge worker believes sufficient information is in place, or time constraints kick in, decisions are made.

Decisions are more layered and nuanced than we realize. I’ve classified four different types:

- **Conclusions** are the vital decisions of the practice and task: a disease is diagnosed; crime perpetrator and motive are determined. Note that conclusions have an on/off component to them, i.e., the patient could be fine, no crime was committed.

- **Recommendations** are actions to be taken based on conclusions. They reflect decisions on an outcome sought and can include other tasks that require further decision making.

The next two decision types precede and support conclusions and recommendations. They provide knowledge workers with markers that build the case towards their final decisions:

- **Judgments** are “micro-conclusions” made during the performance of a task. Judgments are shaped by the information clusters based on category purpose. For instance, a detective looks at clusters inside financial and personal motives and decides that neither, only one, or both motives are valid to the crime and investigation. To note, judgments can correspond to any category at any level of the hierarchy.

- **Opinions** fall into the realm of intuition, emotion and motivation pertaining to task and practice. These are the “This does not make sense” or “This does not feel right” moments in decision making. This “soft information” can be important to decisions made. For example, a government security clearance includes a “whole person analysis”. If a background check uncovers minor financial difficulties, a holistic view of the person allows the adjudicator to indicate those problems should not deny clearance.

Communicate: Findings are communicated to signal and justify (if approval is required) decisions made or to call others to action. So a doctor informs a patient of the treatment plan; a detective writes an investigative report. The communication effort depends on the professional, situational, and legal formality required set against the needs of the target audience for explanation and time available.

Move into Action: Decisions lead to action (unless the decision is to not act). After all, decisions are made to achieve an outcome that is in the interests of the various participants. Of course, actions can also require sophisticated decision making practices of their own.

Track Results: Each decision and subsequent actions are an opportunity to learn from success and failure. By matching up actual outcome with outcome sought, adjustments can be made to domain knowledge and situational performance.
From Individual to Enterprise Decision Making

We now have a working model for knowledge as it applies to knowledge workers. Key to this model is practice, context, and information processing which together drive decision making. Assuming the enterprise values excellence in DIP conduct (because it contributes to the top and bottom line) then enterprise decision making behaviors should mirror the best individual practices. Let’s see how the principles of the working model for individual decision making scale when shared among many decision makers.

The Enterprise at Work - The Characteristics of DIPs

In describing a working model for decision making, we’ve focused on how the knowledge worker, or a leg in our DIP table (see Figure 1), goes about the practice of making decisions. Now the focus turns to the whole table and how the parts work together to produce enterprise decisions.

For those familiar with the challenges of implementing business processes, the remainder of this discussion should hold few surprises. However, by having a better description of the nature of those challenges, we are better prepared to address them.

A Detailed DIP Example

I’ll use the example below to illustrate the six characteristics that shape DIP execution: multiple tasks, multiple roles, practice-driven, multiple levels, interdependence, and organic.

Business insurance underwriting is a DIP. It is initiated when a business contacts an insurance broker to identify the type of insurance needed to cover a potential peril. The process is formally launched when the broker submits a request for a quote to insurance companies who underwrite the desired coverage.

An insurance company auditor reviews the application for information completeness and reliability. With information validated, an actuary performs an analysis of potential risks to the insurance company (odds of a payout, average payouts for this peril, impact of payout on financial reserves, and the overall exposure to this type of coverage).

Provided these analyses prove favorable, an underwriter produces a policy (contract) with decisions on premium (cost), attachments (terms) and risks covered (conditions). Approval of the agreed upon policy often rests with a supervisor or oversight committee. Upon approval, the policy is executed.

Multiple Roles: Many Contributors to Decision Making

Within a DIP, many knowledge workers work together to produce a decision connected to each other by a context and purpose (e.g., underwriting insurance). Every knowledge worker makes a contribution according to role (e.g., broker, auditor, actuary, underwriter, supervisor). Role is usually associated with a type and level of expertise.

Role gives us perspective on the purpose of the work to be performed and the skills required or demanded of the knowledge worker. As a result, each role represents a purpose-driven practice in service to the DIP purpose.

If roles are connected by DIP purpose, they are bound together by information. Every role generally relies on the principles of the information processing framework. The knowledge worker, in role, must be ready to accept inputs, process information, and communicate findings (i.e., decisions and accompanying information) dynamically with the support of other knowledge workers in their respective roles in a manner that drives enterprise decision making forward to a successful conclusion (e.g., policy production).

Multiple Tasks: Establishing Context and Timing for the Work

To manage complexity and gain efficiencies, we noted that a DIP is parsed into specialized tasks performed by the knowledge worker in a role. Each task is subordinated to the process amplifying task purpose. In the above underwriting example, the audit is an insurance information audit, not a forensic or tax audit. Tasks are bound by purpose, timing and actions;
i.e., what needs to be done, when it starts, what goes in, what comes out, and when it is completed.

The role/task combination becomes the field of knowledge which in turn sets the map or ontology. Purpose, as carried in the categories of the ontology, establishes task conduct, decision making requirements, and the information that best serves the task. This makes knowledge workers specialists, if not by role definition then by nature of task(s) performed.

Tasks are linked through a critical path that is comprised of informational milestones. These milestones are the necessary and sufficient information that signifies that a task has ended or that another can begin. Once again, information is the fuel for the process, propelling it through its various milestones (e.g., audit results and actuarial review\(^1\)) and key decisions that signal completion (e.g., a policy). Tasks are coordinated in a manner that best serves the nature of the critical path, the roles involved, and the requirements for successful outcomes.

For insurance underwriting, this translates into one task (e.g., policy production) under the auspices of one role (e.g., the underwriter) charged with making the best possible decisions (e.g., premium, attachments, and terms) and subsequently taking the appropriate actions (e.g., negotiation of premium, attachments, conditions) based on the best available information coming from multiple sources (e.g., customer, broker, auditor, actuary) and subject to approval (e.g., supervisor, oversight committee). The process must be compressed into the shortest possible time frame due to competitive requirements and customer demand.

**Practice Driven: Good Decisions Require Good Information Flow**

When reading the insurance industry DIP example above, did you interpret it as a group of knowledge workers, in various roles, performing individual decision making practices linked together in service to a larger underwriting process? Could you not have interpreted it as the company performing its underwriting practice?

We previously posited that practice is process. Isn’t a Decision Intensive Process a practice?\(^1\)

Consider the similarities: information still fuels everything; context is still critical; the information processing methodology remains relevant. What are the differences? There is more of everything and it is all bigger. Ontology categories have become tasks making the DIP map roughly equal to the sum of its task maps. More people have contributory roles. More information is produced and available to be consumed\(^1\). Decisions that were once judgments (mini-conclusions) inside the individual practice become conclusions for a task. Overall, the small-scale individual practice has been magnified into the large-scale practice of the enterprise.

The decision making model is fractal – with one exception. Whereas information flows freely without resistance inside the virtual world of the individual, such is not the case in a DIP. When information must be physically delivered, its timeliness and purpose are at risk. Layer in performance pressures due to time-to-completion constraints and the major challenge inside the DIP environment becomes quite clear. That challenge is the management of information flow.

**Successful execution of a DIP depends on the right information reaching the right person, at the right time, in the right context.** As a result, the communication activity in information processing escalates in importance. As noted, communication must be sensitive to the pressures of the task, the ability of the audience to interpret the communication, and time constraints. This demands a deeper understanding of the dependencies between originating task and target task.

**Multiple Levels: Vertical Implications of DIPs**

DIPs do not work in a corporate vacuum. They exist to serve strategic corporate goals and objectives that establish parameters for DIP execution. One need that must constantly be addressed, at least in the for-profit arena, are yearly revenue and profit targets. In our insurance industry example, financial performance is related to the premiums earned/loss payout ratio for the different types of insurance offered.

This is one reason that insurance companies maintain a tool called the “Book of Business”. It aggregates premiums, payouts, and ongoing exposures to track current and estimate future
financial results. This tool has another use. Insurance regulations set minimum standards for performance ratios to assure the financial viability of the company so that when losses do occur, it can meet its obligations.

Operationally, the underwriting process incorporates an actuarial review. Critical information regarding each policy written is sent “up” to the actuary who applies it to the book of business. Overexposure to a peril leads to one of two events: 1) management responds strategically by changing the book of business mix or covering exposures through reinsurance (i.e., insuring the insurer); 2) the underwriter responds at execution by changing premiums, attachments and/or conditions if that would offer a fit to the book of business, or declining coverage. A final note on this example is the oversight committee is in place to assure the alignment of all these factors.

The insurance industry, by necessity, incorporates a vertical information flow that aligns strategic, tactical and operational layers of the organization. As always, the key to this alignment is the flow of information into the appropriate context and its timing.

**Interdependence: Tasks Influence Each Other**

As the insurance example and prior discussion suggests, DIP tasks are interdependent. A decision or information produced in the performance of a task can influence actions, decisions, or practices performed elsewhere within the DIP. Here are three dependencies of note within DIPs:

- **Critical Dependencies** are the Go/No/Go decisions that can bring the entire process to a hard stop. They work against thresholds or criteria that flag the stop. For instance, the auditor or actuary could indicate that conditions do not warrant writing the coverage. Most DIPs have a handful of these critical dependencies.

- **Action Dependencies** are decisions or information that dictates conduct for tasks that follow. In our example, the broker and customer select the coverage to be quoted which in turn determines the underwriting practice to be performed. There are likely to be multiple action dependencies in a DIP.

- **Practice Dependencies** are decisions or information produced in one task that contribute to the decision making practice in other contexts. For instance, audit and actuarial information is used by the underwriter when producing a policy. Practice dependencies are critical to the interpretation of information across contexts, i.e., in connecting the dots. All information within a DIP has the potential for a practice dependency.

For effective implementation of action and practice dependencies, tasks must be visible and transparent. Visibility is awareness of task, purpose, timing and outcomes (i.e., decisions) among knowledge workers within the process. Transparency opens task detail to inquiry and use by other knowledge workers. Visibility and transparency together allow knowledge workers to determine dependencies and their implications for each of their tasks.

During execution, knowledge workers must have a reliable method for communication and they must agree on the purpose of the information and the meaning of any calls to action. Here are three modes for communicating information:

- **Simplified Communication** (e.g., data stream). Information is transferred with little if any context, relying on the audience to provide meaning and to know the action to take.

- **Basic Communication** (e.g., charts, business forms, software). Information has some context but leaves room for interpretation of meaning and action by the audience.

- **Directed Communication** (e.g., dialog, visual presentation, narrative). Information is explained in its context accompanied by a strong and distinct effort to shape action. It tries to leave little room for interpretation by the audience.

Coordination of dependencies through these modes of communication is critical to the effective functioning of the DIP. Under these conditions the decision value network can thrive.
**Organic: DIPs Evolve**

DIPs evolve in response to the pressures of the business environment. Externally, those pressures include legal/regulatory, shareholder demands, and competition. Internally, pressures include ongoing specialization of tasks, lessons learned in practice, and the introduction of new products or services.

DIPs must be structured so as to be agile and change, expand or scale to meet these pressures.

**Summary of Characteristics of DIPs**

Table 1 below summarizes the six characteristics of DIPs. Note that there are three themes that are common to all characteristics – context, communication, and coordination.

<table>
<thead>
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<th>Characteristic</th>
<th>Nature of Characteristic</th>
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| **Multiple Roles** | • Knowledge workers are information processors  
• In a DIP, they perform decision making tasks in a role  
• Roles are connected together by DIP context and purpose  
• Roles confer purpose and perspective to work to be performed  
• Information binds roles together |
| **Multiple Tasks** | • DIPs are a series of specialized decision making tasks  
• Draw purpose from role/task combination within the DIP  
• Tasks linked through a critical path of informational milestones  
• Milestones are information signifying task beginning and ending |
| **Practice-Driven** | • Individual decision making practices power the DIP  
• The DIP is a practice in its own right  
• Processing of information draws on DIP and task context  
• Communication of information escalates in importance  
• Need the right information to reach the right person, at the right time, in the right context |
| **Multiple Levels** | • DIPs touch strategic, tactical, and operational levels of the enterprise  
• Information must be communicated down and up corporate ladder  
• Key to aligning organization is information flow into context and timing |
| **Interdependence** | • Dependencies exist between DIP tasks  
• Critical dependencies are decisions causing hard stops (Go/No Go)  
• Action dependencies are decisions influencing task conduct  
• Practice dependency is data that is meaningful in multiple contexts |
| **Organic** | • DIPs are fluid and therefore constantly evolving  
• Must change when new information or knowledge is introduced  
• Must grow to include more roles and tasks |

Table 1: The Six Characteristics of DIPs

**Article Summary**

This article is the second in a series to explore *Decision Intensive Processes* from inside-out and bottom-up; i.e., from the perspective of knowledge workers and how their decisions connect up into the enterprise. To do so we sought to establish a working model for knowledge. We started by exploring decision making as a practice. In decision making, context is expressed as a map of a domain of expertise organized as a hierarchy of categories, a.k.a., an ontology. Categories provide purpose to task conduct and shapes decisions that are made.

Information is consumed to fuel decision making. Categories act as filters to organize and cluster information by giving it meaning and relevance. An information processing methodology propels decision making forward. There are four types of decisions: conclusions as critical decisions; recommendations as calls to action; judgments as mini-conclusions within task; and opinions as intuitions, motivations, and emotions. In general, decision making is highly dependent on the way information clusters within the categories.
We then looked at how this model of individual decision making translates into the enterprise by describing the six characteristics of DIPs (see Table 1 above). On the highest level, we found what we expected to find: DIPs are guided by corporate goals and executed by knowledge workers who perform a number of interdependent tasks, each according to a role, to make decisions in an ever-evolving decision value network that relies on effective communication. In practice, we discovered that the proposed decision making model is fractal – it scales to the size of the DIP with smaller decision making practices found inside larger versions.

By looking at decision making as both process and outcome, we change our perceptions of knowledge-based work requirements. The challenge remains to take BPM principles and techniques and find a way to significantly improve support for complex knowledge-based, decision-centric activities to the benefit of both the knowledge worker and the enterprise.

**Looking Ahead**

Currently planned for the next article is an analysis of the challenges and opportunities of DIPs in light of operational realities and potential technical intervention. From there, I will look at how BPMS and other technologies can best support various aspects of DIPs.

**References and Notes**

1 In the first article, I indicated that the title of this article would be Supporting the Practice: the Importance of Context in Decision Intensive Processes. I stand corrected – by myself.


4 I was looking to move beyond the expert system paradigm as it failed to live up to its potential so I was searching for a fresh technological approach to supporting expertise.

5 The literature I reviewed refers sparingly to the conceptual abstraction of context as an expert skill. More often the literature speaks of categorization. Even then, categorization is just one of many skills that the expert possesses with limited exploration of its importance. I say it is a critical and definitive skill of expertise.

6 Moving forward, practice and process will be used interchangeably.

7 Ibid note 4.

8 Categorization of information may also help in retention and recall of details.

9 Listing of analytical techniques and skills is beyond this scope but includes mathematical and statistical methods, business rules, etc. Also just like every car manufacturer has tweaks for engine performance, knowledge workers use methods to tweak their own performance.

10 A newly created category aligns with other points made in this paper as follows: 1) It establishes a perspective on the situation that did not previously exist for the knowledge worker, i.e., it represents situational uniqueness; 2) It reflects change in the ontology which is “learning”. As a result, the knowledge worker is more experienced and better prepared for the next time this combination of factors arises. Practice grows!

11 No one expects the doctor to provide an extensive formal or written explanation during an emergency. Communication may consist of barked instructions or non-verbal signals.

12 I question the search for excellence by corporations as we watch knowledge-based work outsourced based on cost savings. The loss of experience may one day come back to bite corporations as they treat knowledge-based processes as if they were manufacturing processes.


14 Some tasks within DIPs can be performed by systems. However in decision making, a human should be in the loop to review and evaluate any outputs from those systems.

15 To clarify, actuarial analysis follows the audit start. However, actuarial analysis can begin upon sufficient availability of information that has been audited for its purpose. So parts of the two tasks can continue to be performed in parallel.
That process is practice is seen when particular tasks resemble activities of the information processing methodology. So the auditor gathers and verifies information as the actuary applies analytical techniques to produce information. All information is available to be consumed by the underwriter for purpose of the policy production task which is where the decisions are made.

The information overload train is now boarding.

Some of the post 9/11 analysis suggests the lack of information sharing (i.e., practice dependencies) between agencies led to the inability to “connect the dots” on the hijackers.

Author
David Bromberg is the founder and president of Acappella Software Inc. He can be reached via e-mail at dbromberg@acappellasoftware.com or by phone at 914 939-4507. Information about Acappella Software can be found at www.acappellasoftware.com.