

# Balancing business process with business practice for organizational advantage

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## Abstract

**Purpose** – To provide an argument and a practical approach for achieving a balance between business process optimization and the use of human-centred business practices.

**Design/methodology/approach** – The concepts of business process and business practice are positioned in the academic literature with related concepts like tacit and explicit knowledge, routine work, codification and bounded rationality. Process and practice are compared and contrasted prior to the development of a model for their co-existence and interaction.

**Research limitations/implications** – This research builds on the separate research streams supporting business process management and business practice development. The argument for their co-existence still requires further field research to support the organizational advantages claimed.

**Practical implications** – A framework and approach are presented which can be applied directly as part of new field research or practical application.

**Originality/value** – This paper makes two original contributions. First, it anchors the modern concepts of business process and business practice to foundation concepts from the academic literature. Second, it provides a practical framework and approach for balancing business process and business practice, that can be practically applied by the reader.

**Keywords** Knowledge management, Process management

**Paper type** Research paper

## Introduction

The purpose of this paper is to champion the cause of John Seely Brown and Paul Duguid in their pleas to not lose sight of the inherent value of business practices formed from the tacit understanding of knowledge workers. Seely Brown and Duguid's (2000) short paper on "Balancing act: how to capture knowledge without killing it" introduces the challenge of balancing business processes with business practice. This paper aims to provide added weight to the argument by positioning it within the academic literature. A connection will be briefly built to foundational theories of "bounded rationality" (Simon, 1979) and "evolutionary theory of economic change" (Nelson and Winter, 1982) and the general tacit knowledge verses explicit knowledge discussion. Having established a foundational argument for a dual focus on both business process and business practice, the paper moves on to provide a practical framework for identifying and managing the balance between the two. The use of the framework is illustrated with case study examples.

## Foundation concepts

The concepts of codification, explicit knowledge, tacit knowledge, routine work, processes, and practices are not new, but still engender a degree of confusion through their different interpretations. It is crucial to distinguish "process" from "practice" if one is to attempt to operationalize these concepts. In this paper it is argued that "process" is strongly associated with concepts like "explicit knowledge", "routine" and "codification" while "practice" has similarly strong associations with "tacit knowledge", "heuristics" and "non-codification". Figure 1 provides a positioning of the business practice/business process argument in the literature by tracking three key themes through representative publications.

**Figure 1** Positioning within the literature

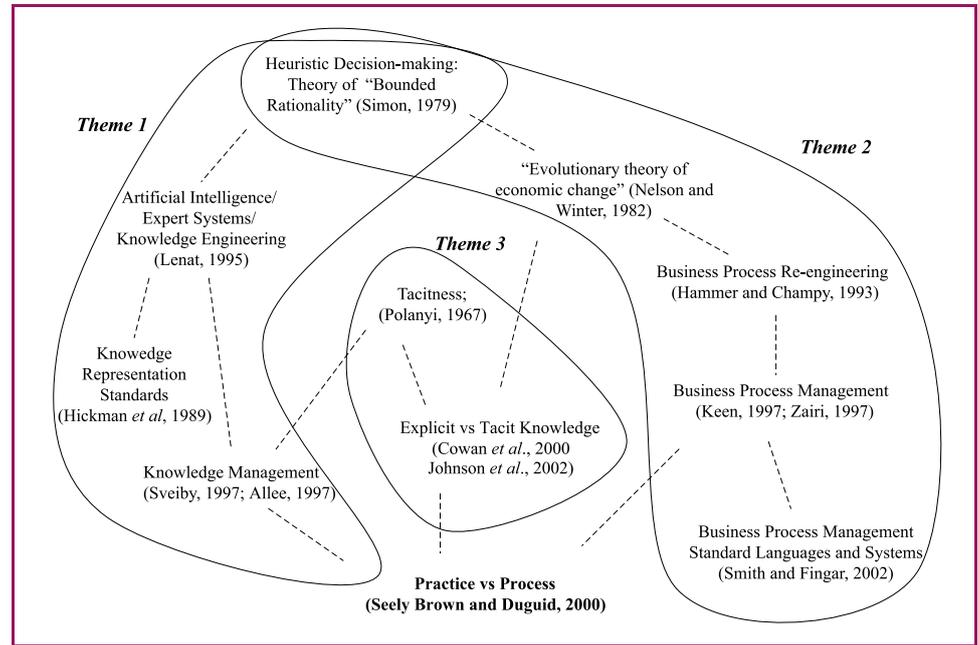


Figure 1 identifies three themes culminating in the practice/process dialogue. The three themes can be traced back to Simon's theory of "bounded rationality" (Simon, 1979). This theory identifies the limitations within which managers can employ rational decision-making techniques. Rational decision-making implies an ability to make explicit the "process" of decision-making. Outside the bounds of rationality managers will rely on intuition and emotion to guide their decision-making (Simon, 1987).

The first theme traces Simon's work through to the field of artificial intelligence and knowledge based systems. Within this field the CYC project, in development since 1984, is aimed at developing a system for storing commonsense knowledge and stands out as the most ambitious attempt to codify knowledge (Lenat, 1995). Identifying standard means for codifying knowledge evolved during the late 1980s supported by the European ESPRIT collaborative research program (Hickman *et al.*, 1989), though these efforts have stagnated in favor of addressing knowledge from a more holistic perspective, i.e. knowledge management (KM). The KM pioneers viewed knowledge from an organizational perspective, in many cases making the argument for sharing tacit knowledge through socialization techniques, e.g. communities of practice, rather than blindly attempting to codify tacit knowledge within large knowledge bases for sharing (Sveiby, 1997; Allee, 1997; Lesser and Prusak, 1999).

The second theme could be called the business process theme. Nelson and Winter (1982), in their work on the evolutionary theory of economic change, refer to Simon's work in speaking of routine as the distinctive package of economic capabilities and coordinating functions that a firm possesses and can deploy in a repeatable fashion. For Nelson and Winter this includes the heuristic problem solving patterns of say a firm's R&D department. The linkage between Nelson and Winter's "routine" and the business process reengineering (BPR) phenomenon is more implied than explicit, with BPR promoting a focus on processes or routines that are core to businesses, removing all others that are deemed to be non-value-adding (Hammer and Champy, 1993). This position evolved to a finer articulation of classes of business processes, e.g. identity or core processes, priority, mandatory or background processes (Keen, 1997). The terms "business process" and now "business process management" (BPM) have been loosely used to identify with just about every activity that a firm participates in. Zairi's (1997) examination of the literature has found that

BPM is far from pervasive and is no more than structural changes, the use of systems such as EN ISO 9000 and the management of individual projects. Key features identified with a process were its predictable and definable inputs; a linear, logical sequence; a clearly definable set of activities; and a predictable and desired outcome.

The concept of process infers something that is definable, describable and repeatable. In the context of BPM, we must tighten the specification to the extent that the process must be describable in a standardized business process language and computationally executed to provide the expected outputs in a repeatable fashion. This tighter specification of process will similarly require a tightening of the associated terms of explicit knowledge, codification and routine. An important contribution of the recent BPM initiatives is the creation of standard languages to describe a business process in computer executable form, e.g. BPML, BPEL[1]. Languages like BPML provide a link between the typical process designer's flow charts, process maps, and executable computer code (Smith and Fingar, 2002).

The third theme encompasses the dialog around tacit, explicit and codified knowledge, which could arguably be seen as a pre-cursor to the KM theme, but has been identified for individual treatment here. Cowan *et al.* (2000) put forward an economist's skeptical argument that very little knowledge is inherently tacit and that its codification is simply an argument of a cost/benefit analysis. In proposing this argument, the authors engage in a discussion around articulation and codification, which converges on a view that that what can be articulated, can be codified for economic benefit. Johnson *et al.* counter Cowan *et al.* specifically on the impracticality of the proposition on a number of fronts. The example of the art of bicycling is used as an example of how attempts at both articulation and codification of the practice of bicycle riding would rarely be useful to the novice rider, even if it were economically viable (Johnson *et al.*, 2002). Of course these economic arguments ignore the very real sociological issues present. Polanyi considered human knowledge from the premise that "we know more than we can tell" (Polanyi, 1967, p. 4) with the natural extension that "we tell more than we can write down" (Snowden, 2002). Snowden adds the further heuristics that "knowledge can only be volunteered; it cannot be conscripted" and "we only know what we know when we need to know it" for managing knowledge, in contrast to the pure economic argument. Looking back to the BPM context, we could extend the analogy further to "we can write down more than we can write in BPML". Put succinctly, "we know far more than we can effectively automate", the gap arguably being attributable to business practice.

Clearly some license has been taken in defining a business practice as the gap between what a human might know and use and what knowledge can be effectively converted for execution within a BPM system. A conventional use of the term "business practice" might refer to a medical or legal practice that would encompass both the tacit understandings and experiences of the staff within the practice as well as the business processes that the firm conducts. The more limited usage of the term here is justified by the emphasis the term connotes around a distinctive expertise developed around extensive work experiences.

In summary, the current argument for balancing business process with business practice can be traced back to Simon's theory of bounded rationality. In this paper we are interested in "business processes" in the context of BPM and therefore its definition is restricted to processes that can effectively be translated into a pre-defined business process language. Business practice is conveniently defined as the complement, i.e. those business activities that fall outside the scope of a business process. The remainder of the paper is devoted to the more practical aspects of balancing business process with business practice for organizational advantage.

## Business process management

Since the emergence of business process re-engineering we have seen two other influential, IT focused, "waves". The first of these was the emergence of "off-the shelf" ERP systems such as SAP, Peoplesoft, Oracle. The initial driver for ERP adoption was the need to rapidly standardize and support those largely non-differentiating business processes such as finance, human resources, maintenance and the like. The second "wave" was e-business;

with the essential driver being the desire to leverage low cost internet-based technologies to streamline the way business organizations did business with each other. Despite the romance and the promise of radical new business models and the aspirations of the ERP vendors to fulfill the promise, the reality is that the business benefits have mostly materialized as a consequence of less romantic, business process improvement initiatives. Lower costs, reduced cycle times, more satisfied customers have come from incremental improvements to the way organizations are conducting their businesses.

However, what the e-business wave has achieved is a realization that an organization's business processes do not stop at the front door. They need to extend out to their suppliers, customers and alliance partners. From the IT perspective this also means extending internal systems to be externally facing, with the consequent difficulties in mixing and matching with the plethora of different vendor products that trading partners might use. The IT industry's response to this challenge has been the formation of the business process management initiative (BPMI) with a mission to "standardise the management of business processes that span multiple applications, corporate departments and business partners, behind the firewall and over the internet" (see [www.BPMI.org](http://www.BPMI.org)). With over 125 industry members, BPMI is looking at a means to separate the management of business processes from the software that support and implement them. The core undertaking has been the development of a common business process modeling language (BPML), which can enable business processes to be described and managed independently from the software used to implement and support them. The analogy has been drawn to the SQL data base query language which today allows common queries to be described in the standard SQL language, but executed against any relational data base system.

BPM is still in its infancy, as are the products that support it. There are eight identified basic functions that would comprise a business process management system ([www.BPMI.org](http://www.BPMI.org)):

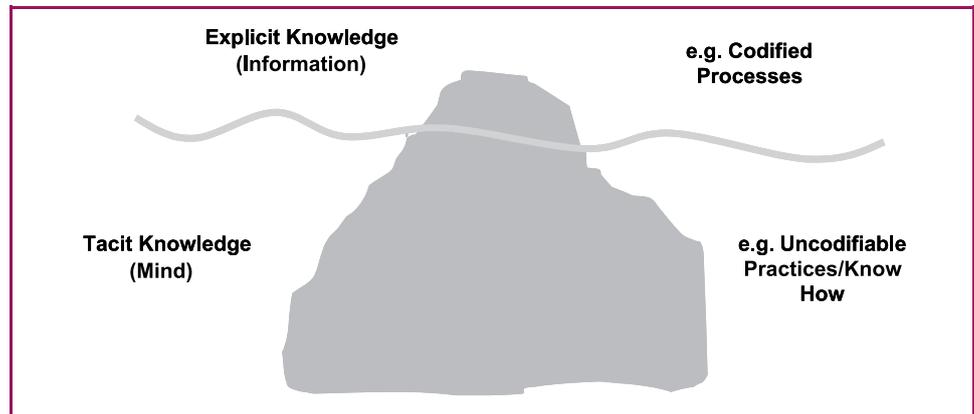
- (1) *Process discovery*: finding out how things are actually done.
- (2) *Process design*: modeling, simulating and redesigning a process.
- (3) *Process deployment*: distributing the process to all participants.
- (4) *Process execution*: ensuring the process is carried out by all.
- (5) *Process maintenance*: resolving exceptions, adaptations.
- (6) *Process interaction*: allowance for human interaction with the process.
- (7) *Process optimization*: process improvement.
- (8) *Process analysis*: measuring performance and devising improvement strategies.

### Business practice

A business practice is seen as a frequently repeated act, habit or custom performed to a recognized level of skill. It is often thought of as the uncoded "know-how" resulting from human experience, improvisation and innovation.

One of the key benefits attributed to KM has been the ability to share best practices across large organizations. While there are clearly some great success stories to tell around how knowledge has been leveraged around the sharing of practices across large organizations, there are a far greater number of stories around how elusive the benefits can be from attempts to share best practices. Different contexts, the "not invented here" syndrome, "our business is different" have all been offered as barriers to achieving success. The reality is that unless you are operating under a franchised business model, then there will be real differences across the businesses. Seely Brown (2001) has gone as far as to claim that the proportion of business practices that can be formally codified in process form is really only the tip of the iceberg, and that the vast majority of "knowledge" encompassed in a successful practice is uncoded and held tacitly in the minds of the staff performing the task (Figure 2).

**Figure 2** The explicit/tacit process/practice divide



The challenge lies in judging whether a “practice” is truly transportable across the different business environments; and this ability appears to be largely held in the collective judgment of expert practitioners who have a view across the different business domains. Hence the important role that communities of practice or expert networks play in facilitating the effective sharing of best practices.

### Business process versus business practice

Business processes and business process re-engineering gained much prominence and some notoriety in the early 1990s as companies were challenged to break out of their traditional indoctrinated ways of doing business. A typical re-engineering process would start with a “mapping” of current business processes and then an intense assessment of which non-value adding processes could be “obliterated”. With the increased challenges of globalization, and commoditization, re-engineering is now re-emerging in the form of BPM (Smith and Fingar, 2002). The drive for BPM is coming from organizations wanting to engage in inter-enterprise collaboration, instigating a demand for a common way to implement inter-enterprise business processes that is independent of the technology used to support them. Fundamental to the BPM concept is a standard business process modeling language (BPML), which is designed to enable companies to jointly develop business processes with their partners and collaborators, without the need to enforce a common technology platform, e.g. SAP, PeopleSoft, Oracle (see [www.BPMI.org](http://www.BPMI.org)).

Business practices are often not explicit, but couched tacitly in the minds of the employees that conduct them. Etienne Wenger (1999) in his research on “communities of practice”, uses an example of health claim processing. One might believe that these processes could be easily codified; yet the uncoded tacit understanding of the different claims processors substantially separates good and bad performance. While the written procedures for health claim processing were designed for individuals, the reality was that claims processors had to form themselves into a tight social “community of practice” to effectively deal with the contradictions, gaps and ambiguities that inevitably exist in written procedures. Wenger’s work is strongly supported by John Seely Brown and Paul Duguid (2000) in their plea for not ignoring business practice in the rush to automate processes. Johnson (2002) argues for distinguishing tacit from explicit knowledge and devising strategies to manage them independently. Johnson aligns explicit knowledge with intellectual property and knowledge stocks and tacit knowledge with interactive or facilitated knowledge processes or knowledge work. For every re-engineering success story there appeared to be many more failed attempts. There are many opinions about why re-engineering efforts fail; from a lack of appreciation organizational culture, power and structures (Cao *et al.*, 2001) to simply poor integration or implementation (Al-Mashari *et al.*, 2001). A common experience in the rush to obliterate non-value adding processes, was the oversight of the subtle uncoded activities

that skilled and experienced employees perform, i.e. the people factor was often overlooked (White, 1996).

Clearly practice and process need to co-exist. In most business processes, as we start to analyze them more closely, we typically find more “art” or tacitly held practices than we had anticipated. However the economic push for lower costs, faster response, quicker product launches will inevitably mean a growing need to codify and automate more “practices” through a greater focus on activities like BPM. However, KM practices will be required to both achieve a common understanding of the intent behind codified processes, and to generate ideas and innovations required for continuous business process improvement.

### Rules for co-existence

To summarize, the differences between process and practice are characterized Table I.

The important point in trying to achieve an appropriate balance between process and practice is to know what tacit knowledge are the best candidates for trying to make explicit and which areas to not even try. Significant guidance can be gained from the artificial intelligence/expert systems discipline in this regard. A key learning being that knowledge acquisition and representation can be particularly difficult and complex. Some attempts have been made to develop a standard method for knowledge acquisition and representation. Perhaps the best known of these is the knowledge acquisition documentation and structuring (KADS) methodology for developing knowledge based systems (Hickman *et al.*, 1989), initially launched as a European Co-operative Research project (ESPRIT). KADS could be viewed as the knowledge equivalent of BPM. Eventually the complexity of the different models required in KADS to be effective, worked against its larger scale adoption, and little is seen of it now. More recently, Papavassiliou and Mentzas (2003) have explored a modeling approach to the integration of knowledge management into weakly structured business processes.

Expert systems are arguably the most sophisticated means for capturing tacit knowledge and making it explicit. Yet the majority of successful expert systems that have been deployed over the past 20 years, have been in well defined and constrained areas like fault diagnosis, credit assessments, schedule checking, and process control, and have largely failed in areas requiring some creative thinking like business planning, schedule creation, and new product development. In summary, there are definitely limits to the extent to which one can practically make tacit knowledge explicit. These limits are both in terms of our ability to accurately represent the knowledge in explicit form and practical limits on the “knowledge engineering” time it would take to achieve such a representation, if indeed it were possible.

Most business processes found within organizations are simply documented in “rules and procedures” manuals that are distributed with an expectation that they will be consistently understood and applied. For anything other than simple routine tasks this is a dangerous assumption. First, for complex processes the business process designer has the challenge of accurately representing his or her tacit understanding of the business process intent in explicit written form. Secondly, those expected to perform the process will internalize their

<b>Table I</b> Process vs practice	
<i>Process</i>	<i>Practice</i>
The way tasks are organized	The way tasks are done
Routine	Spontaneous
Orchestrated	Improvised
Assumes predictable environment	Responds to a changing unpredictable environment
Relies on explicit knowledge	Relies on tacit knowledge
Linear	Network or web-like

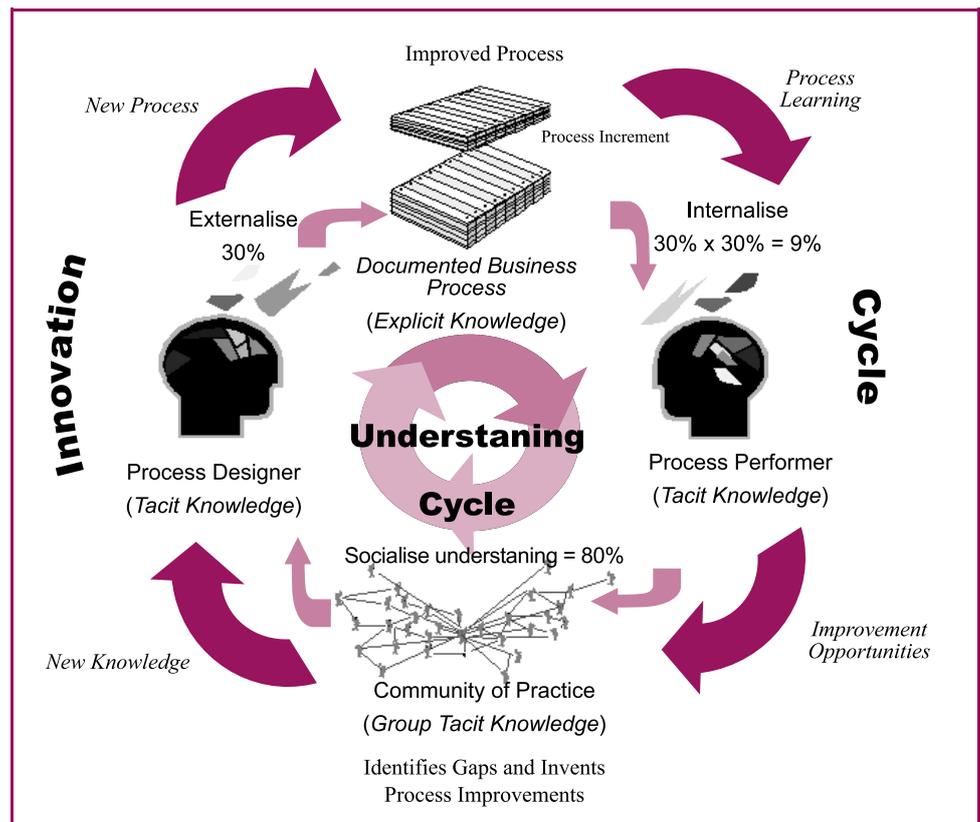
Source: Seely et al. (2000)

understanding of the written process, with significant scope for this understanding to be quite different than the intent of the designer. This is where KM practices can assist in developing a common understanding of the business process intent by connecting designers and performers of the business process. This socialization process will eventually evolve into a common business practice around the business process.

Figure 3 shows two cycles of process/practice interaction. The inner cycle is the “shared understanding” cycle. It starts with the process designer documenting the business process (tacit to explicit knowledge conversion). For a complex process one could argue that the document might represent less than 30 percent of what the designer actually understands about the process. The process performer is then expected to internalize this knowledge from the document (explicit to tacit conversion) that likewise for a complex process, might be a 30 percent efficient process. Therefore the degree of common understanding between process designer and process performer could be less than 10 percent[2]. To improve the level of common understanding, socialization (tacit to tacit knowledge transfer) processes are required. The research literature strongly supports the value of networks in facilitating the sharing of tacit knowledge (Augier and Vendelo, 1999; Hansen, 1999; Powell, 1998; Lesser and Prusak, 1999). Common vehicles for these socialization processes within organizations are communities of practice, i.e. cross-organizational groups who form naturally around a common interest or cause (see Wenger, 1999).

The outer cycle is the innovation cycle. The improvement cycle for business processes is triggered by a gap between current and desired performance. Ideas for improvements need to be solicited, tested and agreed on for implementation. Again the community of practice is an excellent vehicle for socializing improvement ideas and innovations.

**Figure 3** Process/practice interaction



The following example is used to illustrate how process and practice inter-relate:

Mary works for a government welfare agency involved with aged care. Because of her long experience with assessing candidates for government assistance for their nursing home care, she is asked to write the new manual to assist field case-workers apply a consistent process in assessing candidates for care. In preparing the manual, Mary struggles with trying to articulate all the factors she would personally apply in her assessments. However, she perseveres and distributes her draft manual for initial use. In reviewing how the case-workers interpret her procedures in use, she is somewhat surprised at the variety of interpretations they have taken. She quickly appreciates that it is not possible to capture in writing her full intent. To help develop a common understanding of the procedures with her case-workers she decides to form an informal community of practice around the aged care assessment processes. The group meets monthly to discuss their experiences with the assessment processes and agree on a common best "practice" interpretation of the documented "rules".

Over time, the community grows and distributes across all the department offices state-wide. Group meetings start to become a forum for discussing improvement ideas. Ideas discussed at a local office forum are shared with the core community, who decides whether or not to include the suggested improvements into the process manual.

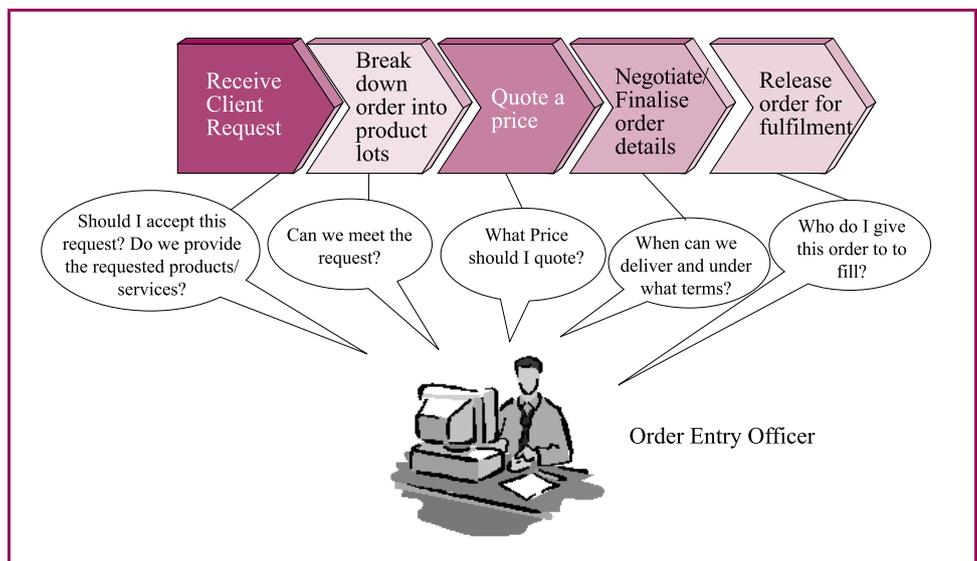
As new case workers come into the department they are provided with the assessment "process" manual to help guide their assessment work. More importantly they are also introduced to the aged care assessment community of practice, from which they will gain the important "practice" knowledge required to effectively perform their duties.

### A framework for balancing process with practice

The framework details how to manage the business practice/business process balance at the application level. When we look closely at defined business processes, we will see many instances where human intervention is required. At times this intervention may be replaced by an automated response. In other instances it may not be cost effective or even possible to do so. In any case, once we have human interaction taking place we need to respect the different roles that humans can take in the overall business process as defined. We can draw guidance from here the human factors discipline, which has invented "task analysis" techniques for designing effective interfaces between knowledge based human tasks and programmed process tasks (Diaper, 1989). While these techniques are perhaps too involved for the casual user, the principles for carefully managing the interface should be adhered to.

As an example, let's take a look at a typical order entry process (Figure 4).

**Figure 4** Framework example



The business process can be mapped as shown. Key decisions can also be identified from each of the processes. Depending on the industry you are in, the level of human intervention will change from virtually none, to intimately involved in the whole process. The order entry officer will either be simply performing clerical tasks that might easily be automated, or playing the role of a business manager, negotiating each order on an individual basis. For example, Amazon.com has demonstrated that the order entry process can nearly be totally automated for commodities like books. However, for companies who create a unique product with every job, like a construction company, the order entry process and staff are viewed as critical to the business. Major cost savings are available for those businesses that can reduce the level of human intervention. We therefore see firms trying to standardize their offerings with defined pricing models and delivery mechanisms. On the other hand, customers are now becoming more demanding and are looking for more personalized attention, for which they are often willing to play a premium. Ultimately we need to understand the nature of the decisions that the order entry officer needs to make.

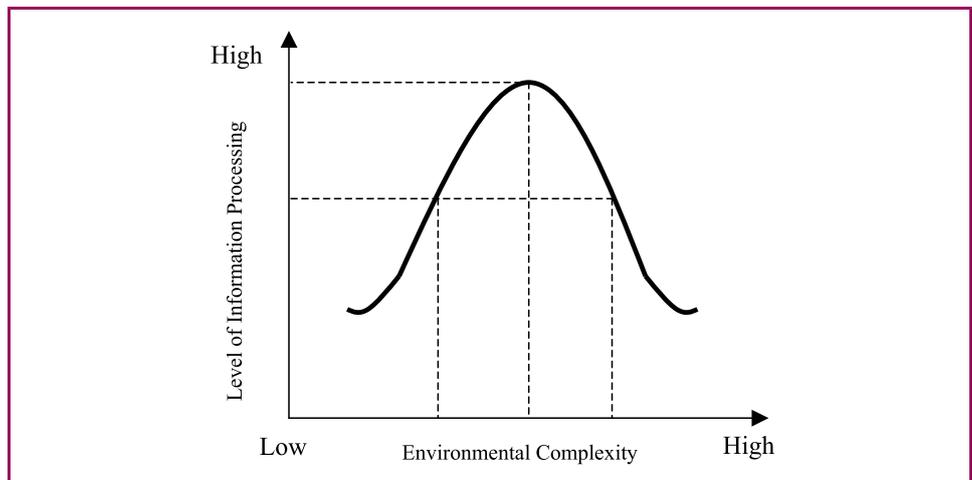
Schroeder and Benbasat (1975) provide the characterization from their experiments with decision-makers across environments of varying complexity (Figure 5). The experiments demonstrate that there exists a point where further information is of diminishing value in supporting a decision when the environment is complex. For example, using the order entry example, if your company was in the business of making aircraft and a request came in to build the first space shuttle to fly to Mars, the decision to accept the order or not will be largely judgmental. We therefore need a framework that takes into account the complexity of the decision at hand. In essence, this is determining where the “bounds of rationality” lie. Decision complexity can then be used to determine what the appropriate mix should be of business process response and business practice response (Figure 6).

The process proposed is summarized in Figure 7.

Using the above framework implies a requirement to explicitly identify and categorize decisions that need to be made. It also implies a more systematic and disciplined approach to decision-making, something that does not come naturally. The need for more systematic decision support processes are strongly supported by the findings of Kahneman *et al.* (1982) in their studies on bias in human decision making. Their studies clearly demonstrated how decisions based on “gut feel” can be unintentionally impacted by human bias, leading to clearly erroneous decisions.

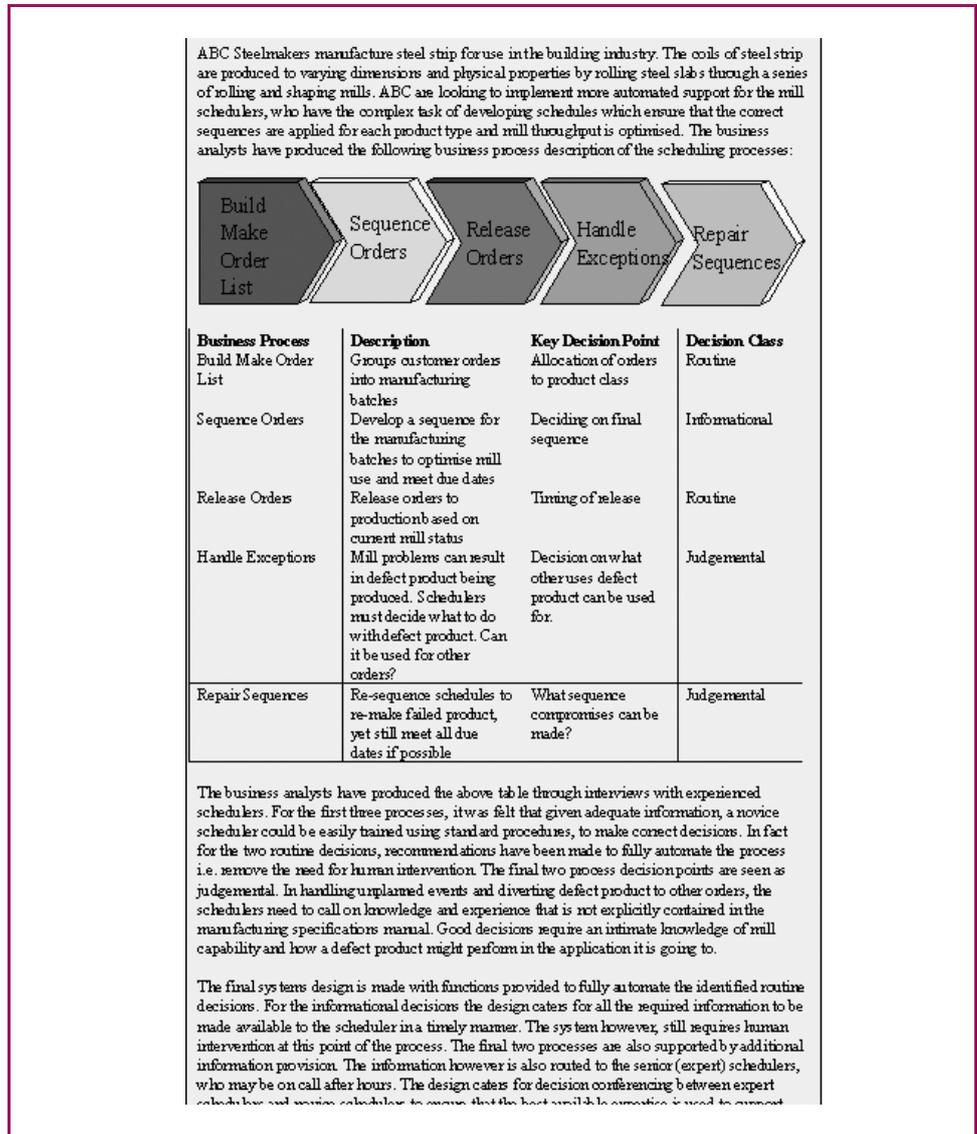
Additional investment in time will be required to characterize decisions as routine, informational or judgmental and supporting them appropriately. This will be justified through time saved in not debating decisions that should be routine, or avoiding poor outcomes from more complex decisions, as a result of not involving appropriately expert staff (Figure 8).

**Figure 5** Decision complexity





**Figure 8** Case study



### Summary

We have seen major progress made in the formalization of work into manageable business processes. BPR has had some undoubted success but also a fair share of failures. We have learnt some hard lessons about the limits to which one can effectively codify, or make explicit, the tacit knowledge of expert practitioners. The KM discipline has provided us with a multitude of techniques for “managing” largely knowledge based, business practices. The challenge has been to determine how we can facilitate the delicate balance between business process and business practice to ensure that they are appropriately balanced for optimal performance. For business processes to be effectively deployed, they must be surrounded by a healthy dose of business practice. A two-cycle model of interaction between process and practice was described. An inner cycle showed how a common understanding between process designer and process performer could only be achieved through their socialization, typically through informal communities of practice. The outer cycle showed the key role communities of practice also played in progressing ideas for process innovations and improvements.

Moreover, an analytic framework has been provided to assist in achieving an appropriate process/practice balance for maximum organizational advantage. This framework articulates decisions at the application level. It provides a method for determining decision complexity and then indicates the business process or business practice based techniques recommended for supporting these decisions.

## Notes

1. The two main contenders are BPML (see [www.BPMI.org](http://www.BPMI.org)) and BPEL4WS (see [www.oasis-open.org](http://www.oasis-open.org)).
2. These percentages are based on the author's experiences in the field.

## References

- Allee, V. (1997), *The Knowledge Evolution: Expanding Organizational Intelligence*, Butterworth-Heinemann, Oxford.
- Al-Mashari, M., Irani, Z. and Zairi, M. (2001), "Business process reengineering: a survey of international experience", *Business Process Management*, Vol. 7 No. 5, pp. 437-55.
- Augier, M. and Vendelo, M.T. (1999), "Networks, cognition and management of tacit knowledge", *Journal of Knowledge Management*, Vol. 3 No. 4, pp. 252-61.
- Cao, G., Clarke, S. and Lehaney, B. (2001), "A critique of BPR from a holistic perspective", *Business Process Management*, Vol. 7 No. 4, pp. 332-9.
- Cowan, R., David, P. and Foray, D. (2000), "The explicit economics of knowledge codification and tacitness", *Industrial and Corporate Change*, Vol. 9 No. 2, pp. 211-53.
- Diaper, D. (1989), "Task analysis for knowledge descriptions (TAKD): the method and an example", *Task Analysis for Human-Computer Interaction*, Ellis Horwood, New York, NY, pp. 108-59.
- Hammer, M. and Champy, J. (1993), *Reengineering the Corporation: A Manifesto for Business Revolution*, HarperCollins, New York, NY.
- Hansen, M.T. (1999), "The search-transfer problem: the role of weak ties in sharing knowledge across organizational subunits", *Administrative Science Quarterly*, Vol. 44 No. 1, pp. 82-111.
- Hickman, F., Killin, J., Land, L., Mulhall, T., Porter, D. and Taylor, R. (1989), *Analysis for Knowledge-Based Systems: A Practical Introduction to the KADS Methodology*, Ellis Horwood, Chichester.
- Johnson, B., Lorenz, E. and Lundvall, B-Å (2002), "Why all the fuss about codified and tacit knowledge?", *Industrial and Corporate Change*, Vol. 11 No. 2, pp. 245-62.
- Johnson, W. (2002), "Leveraging intellectual capital through product and process management of human capital", *Journal of Intellectual Capital*, Vol. 3 No. 4, pp. 415-29.
- Kahneman, D., Slovic, P. and Tversky, A. (1982), *Judgement under Uncertainty: Heuristics and Biases*, Cambridge University Press, Cambridge.
- Keen, P. (1997), *The Process Edge: Creating Value Where it Counts*, Harvard Business School Press, Boston, MA.
- Lenat, D. (1995), "CYC: a large-scale investment in knowledge infrastructure", *Communications of the ACM*, Vol. 38 No. 11, pp. 33-8.
- Lesser, E. and Prusak, L. (1999), *Communities of Practice, Social Capital and Organisational Knowledge*, IBM Institute of Knowledge Management, Boston, MA.
- Nelson, R. and Winter, S. (1982), *An Evolutionary Theory of Economic Change*, Harvard University Press, Boston, MA.
- Papavassiliou, G. and Mentzas, G. (2003), "Knowledge modeling in weakly-structured business processes", *Journal of Knowledge Management*, Vol. 7 No. 2, pp. 18-33.
- Polanyi, M. (1967), *The Tacit Dimension*, Doubleday, New York, NY.
- Powell, W.W. (1998), "Learning from collaboration: knowledge and networks in biotechnology and pharmaceutical industries", *California Management Review*, Vol. 40 No. 3, pp. 228-40.

- Schroeder, R. and Benbasat, I. (1975), "An experimental evaluation of the relationship of uncertainty in the environment to information used by decision makers", *Decision Sciences*, Vol. 6 No. 3, pp. 556-67.
- Seely Brown, J. (2001), "Sharing knowledge across the organisation: knowledge dynamics and emerging corporate landscape for the age", *CSC CIO Forum*, August.
- Seely Brown, J. and Duguid, P. (2000), "Balancing act: how to capture knowledge without killing it", *Harvard Business Review*, May-June, pp. 3-7.
- Simon, H.A. (1979), "Rational decision making in business organizations", *The American Economic Review*, Vol. 69 No. 4, pp. 493-513.
- Simon, H.A. (1987), "Making management decisions: the role of intuition and emotion", *The Academy of Management Executive*, Vol. 1, pp. 57-64.
- Smith, H. and Fingar, P. (2002), *Business Process Management: The Third Wave*, Meghan-Kiffer Press, Tampa, FL.
- Snowden, D. (2002), "Complex acts of knowing: paradox and descriptive self-awareness", *Journal of Knowledge Management*, Vol. 6 No. 2, pp. 100-11.
- Sveiby, K. (1997), *The New Organizational Wealth: Managing and Measuring Knowledge-Based Assets*, Berrett-Koehler, San Francisco, CA.
- Wenger, E. (1999), *Communities of Practice*, Cambridge University Press, Cambridge.
- White, J. (1996), "Re-engineering gurus take steps to remodel their stalling vehicles", *Wall Street Journal*, 26 November, p. 1.
- Zairi, M. (1997), "Business process management: a boundaryless approach to modern competitiveness", *Business Process Management Journal*, Vol. 3 No. 1, pp. 64-80.