

A Promising Approach to Supporting Knowledge-Intensive Business Processes: Business Case Management

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Abstract—Through the course of this paper we define Business Case Management and its characteristics, and highlight its link to knowledge workers. Business Case Management combines knowledge and process effectively, supporting the ad hoc and unpredictable nature of cases, and coordinate a range of other technologies to appropriately support knowledge-intensive processes. We emphasize the growing importance of knowledge workers and the current poor support for knowledge work automation. We also discuss the challenges in supporting this kind of knowledge work and propose a novel approach to overcome these challenges.

Keywords—Knowledge management, knowledge workers, business process management, business case management, automation.

I. INTRODUCTION

It is self-evident that there should be good linkage between knowledge-centric processes and the underlying knowledge needed to carry out those processes. However, processes and knowledge are generally not well integrated. For example, 'integrating knowledge management into business processes' was selected as the most important issue of Knowledge Management still in a well-known 2002 Humboldt University survey [1].

There was (and still is) a general lack of understanding of how valuable the fusion of processes and knowledge can be. The thought of actually taking the distilled knowledge and making it easily available to people executing the process was somehow overlooked. Employees would only stop to access the available knowledge base when the process execution came to a screeching halt due to an inability on the part of the employee to continue. Many times this would involve looking up information in an offline source like a procedures handbook or calling a friend who might know the answer [2].

We propose a novel approach to supporting knowledge-intensive business processes which we call Business Case Management, and highlight its link to knowledge workers.

II. DEFINING BUSINESS CASE MANAGEMENT

Business Case Management (BCM) is critical to the work of many organizations, and should become a common approach to supporting knowledge-intensive processes. Business Case Management describes the way organizations such as government agencies, banks, big legal firms and insurance providers handle complex customer and service interactions.

When a customer initiates a request for some service, the set of interactions with that customer and other relevant participants from initiation to completion is known as the 'case'. In the past, cases would have been managed using a manila folder of documents and records, with the folder moving through a department or organization from one in-tray to the next while the case was evaluated and progressed.

Evaluation of the case involved correspondence, phone calls, meetings and notes being appended to provide a record of the progress of the case. The staff working on the case, known as 'case workers', had to be knowledgeable about their organization and how previous cases had been progressed, and empowered to use their judgment and discretion when deciding how some part of the current case should be handled. Cases might follow a general pattern, but each particular case would take its own unique path from initiation to resolution depending on the circumstances of the individual whose case was being handled.

Case management is often intensely manual, paper-driven, plagued by delay and poor visibility, with isolated parts of the process automated by legacy systems or spreadsheets. There are two main reasons why case management has been so poorly supported.

Firstly, it is inherently more difficult to automate than other processes because of the extent to which cases processes must support human knowledge, judgment and discretion to determine their outcome. It is harder to manage the complexity and unpredictability of a case than, say, automating payroll processing or credit card transaction processing.

Secondly, the available technology simply hasn't been able to support the requirements for dynamic user driven changes to cases as they progress.

A. Features of Contemporary Business Case Management

Business case management scenarios share a lot of common characteristics. Case workers need to manage a complex set of steps from the start of a case through to its completion, usually

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involving interaction with others in their organization and with external agencies, and requiring the generation of correspondence, documents and records.

The key characteristics of contemporary Business Case Management include:

- *Knowledge-intensity*: Typically BCM processes require the intervention of skilled and knowledgeable personnel. Employees acquire their knowledge through their experience of working on similar cases and through collaboration with more experienced colleagues, becoming thoroughly familiar with the tacit and explicit rules governing how business cases should be managed. These people have to deal with issues that can be ambiguous and uncertain and that require judgment and creativity. Managing knowledge so it stays within the organization and is passed quickly to new members of staff is a challenge.
- *Variability*: While a particular type of business case will share a general structure (e.g. handling benefits applications), it is not possible to predetermine the path that a particular instance of a case will take. A case can change in unpredictable, dynamic and ad hoc ways as it is progressed through an organization. Certain elements may be fixed (e.g. the end-to-end duration for completing a case may be set to 18 months, or a fixed budget may be allocated to each case) but there can be considerable variation in how steps are executed, based on the particular circumstances of the case.
- *Long running*: Business cases can run for months or years, and are generally much longer running than the shorter interaction cycles handled by standard customer relationship management (CRM) systems. Because a case is long running, it changes hands over time, different people work on different aspects and no single individual has an accurate view of the case as a whole. This drives the need for a supporting Business Case Management system that can provide a single consolidated picture of the case.
- *Information Complexity*: Business Case Management almost always entails the collection and presentation of a diverse set of documents and records. E-mails, meeting notes, case documents and correspondence related to a case must be easily accessible to the appropriate case worker at the right time. This is often difficult for business case managers to organize and manage efficiently, with the danger that an important record, note or file will be unavailable, lost or overlooked when it is needed. Retrieving the correct information required at a particular decision point usually depends on the knowledge of the case worker and an adequate physical filing system.
- *Collaboration and coordination*: Business case workers usually need to coordinate interviews and meetings among interested parties e.g. scheduling an interview with an applicant, with other staff in the organization, with legal representatives. Many cases require a team-

based approach, with different specialists working on different aspects of a case or acting as consultants to their colleagues. These team members need to be able to access case information and discuss it with each other [3]. Collaboration is particularly important in knowledge-based Business Case Management because workers rely on each other's advice and experience when making decisions on a case.

- *Multiple Participants, Multiple Roles*: There are often a range of involved parties, either directly or indirectly related to a business case, who play different roles during the lifetime of the case – e.g. applicant, witness, claimant, injured party, appellant etc. There can also be a large range of staff roles required to complete a case end-to-end. And case workers can fulfill different roles in different types of business cases.
- *Cases can be interrelated*: The outcome of separate business cases may have an impact on each other. Business cases can be explicitly linked or they may be linked by inference and conducted with this inferred link in mind.
- *Critical nature of timescales*: While business cases may have great variability in how they are completed, very often there are inflexible requirements for end-to-end timescales, driven by legislation or Service Level Agreements (SLAs).
- *External events affect business cases*: External, out-of-band events and intervention can change the state of a running business case e.g. a phone call from a lawyer or the unscheduled arrival of an auditor.
- *Difficulties in Gaining Visibility of Business Case Progress*: This is a common characteristic of Business Case Management as it is implemented today, although it is not an inherent characteristic. While case workers may have a good understanding of how they are progressing individual business cases, it is often difficult to monitor progress when work has been passed to colleagues within their own unit or to an external department. At a higher level, managers usually have poor visibility of how long it takes to progress a case on average, how much a case costs to process, and what the expected completion time is for a particular case. It may also be difficult to obtain information on which cases are stalled waiting for an external communication and which steps in a case are repeatedly causing bottlenecks. The result is that processing of business cases is often serialized, because to run them in parallel, while more efficient, is just too difficult for many organizations to manage.
- *Strong reporting requirements*: There is usually a significant requirement to report on and analyze information derived from business case handling, both at operational and management levels, for example workload analysis of cases by stage, by individual and by department and case performance versus target [4]. Managers want to gain insight into operational performance and quickly identify exceptions.

- *History*: Every action performed, every decision taken and every piece of correspondence received has to be tracked, not just for audit purposes, but also to provide guidance for future similar business cases. Case workers need access to this historical data when making decisions, while auditors need the history to ensure policies are being adhered to. The case history is the organization's defense mechanism against any allegations of failure to perform, particularly in cases which have high cost or personal impact.
- *Security*: There is a requirement to provide fine-grained control over who has access to particular information and functionality. In certain environments, these security requirements assume particular significance e.g. policing, health care, human rights and child protection.
- *Isolated pockets of automation*: This is a characteristic of business case management as it is generally implemented today, rather than an inherent characteristic. Business Case Management is usually only partly automated and there is disjoint between those pockets of automation. Legacy systems automate slices of the processes, but the end-to-end management of a business case still relies too heavily on paper documentation, physical folders, spreadsheets and e-mail.

B. The Importance of Business Case Management

Business Case Management is important because knowledge workers are important. Business Case Management is the most common approach to supporting knowledge workers with technology, but it is not done well.

First, we'll discuss just why knowledge workers are so important.

Knowledge workers are defined as 'people whose primary job is to do something with knowledge: to create it, distribute it, apply it' [5]. Knowledge workers think for a living [6]. They solve problems, they understand and meet the needs of customers, they make decisions, and they collaborate and communicate with other people in the course of doing their work.

Knowledge workers are important not just because they make up a growing proportion of the workforce, but also because of their disproportionate impact on the companies and economies they work in. Even if they're not a majority of all workers, they have the most influence on their economies.

They are paid the most, they add the most economic value and they are the greatest determinant of the worth of their companies. Companies with a high proportion of knowledge workers – let's call them knowledge intensive – are the fastest growing and most successful in today's leading economies, and have generated most of these economies' growth in the past couple of decades [7].

Knowledge workers tend to be closely aligned with the organization's growth prospects. For example, knowledge workers in management roles come up with new strategies; knowledge workers in R&D and engineering create new products; and knowledge workers in marketing package up

products and services in ways that appeal to customers. Without knowledge workers there would be no new products and services, no innovation, no development, and, consecutively, no growth.

But, process improvement has still mostly been for other workers: transactional workers, manufacturing workers, employees in call centers, etc. Unfortunately, all the serious approaches to improving work have largely escaped knowledge work.

III. THE CHALLENGES OF AUTOMATING BUSINESS CASE MANAGEMENT

The characteristics of Business Case Management we outlined earlier indicate where the challenges lie when trying to more fully automate this style of work. As with the automation of any other business process, the technology has to support exception handling, collaboration, decision making, unstructured information, negotiations and work and paper flows [8].

But the fundamental challenge in automating Business Case Management is using technology to support the unpredictable ways cases progress and people work in practice. Traditional automation assumes that a sequence or pattern can be determined in advance by careful initial analysis and catered for by good design. More formally, it assumes that the logical flows can be understood in advance.

In a traditional approach the designer has to specify what is permitted. Any routing which is not specified at design time will not be supported by the system at runtime [9]. However, when seeking to automate business cases, there is no predetermined sequence, and new tasks and processes can be added at any point during the life cycle of the case as the need for them arises. The emphasis must be on supporting the ad hoc nature of business cases.

The challenges specific to automating Business Case Management include:

- *Striking a balance between practice and procedure*: Almost any job today has both clearly defined, predictable elements and less well defined, more ambiguous aspects where workers exercise their judgment. Different types of job, and the activities within a particular job, can be thought of as a spectrum running from 'well defined procedure' to loosely defined 'discretionary practice'. Someone working in a call center generally doesn't exercise great discretion in how they carry out their job, while a senior investment analyst probably does.
- *Capturing implicit rules and tacit knowledge*: This challenge is related to the point made about practice versus procedure. Many Business Case Management processes will never have been previously automated. They rely on paper forms and tacit and implicit rules governing how cases should be managed in addition to documented and explicit policies and procedures. Examples of implicit rules will include how employees cope with particular exceptions, how they make

decisions at particular stages of a case and how they deal with unstructured information. The challenge here is to discover these implicit rules and, where appropriate, try to support their automation, while leaving room for those steps and decisions that should continue to depend on individual discretion.

- *Formalizing experience, supporting learning:* A good Business Case Management solution should help an organization learn from previous cases. This learning could be exhibited in the definition of new processes, new procedures, better online help etc., where lessons learned by knowledge workers during a previous case were quickly applied to process definitions to improve them [10]. We use the phrase 'formalizing experience' to describe this process of changing a practice into an automated step where appropriate or supporting some other action that will assist in the processing of future cases.
- *There is a related area of research, called Case Based Reasoning (CBR),* which has some obvious applicability to Business Case Management. Case Based Reasoning is the process of solving new problems based on the solution of similar past problems: it's based on two tenets, 'similar problems have similar solutions. Consequently, solutions for similar prior problems are a useful starting point for new problem-solving' and 'the types of problems an agent encounters tend to recur. Consequently, future problems are likely to be similar to current problems' [11].
- *Supporting ad hoc change:* It is not possible to fully analyze and define at design time how a business case will actually unfold at 'runtime'. While the overall pattern of a typical case may be known, any Business Case Management system must allow for entirely new and unpredictable process paths being required at execution time. This is due to the nature of business cases, where a range of outcomes may arise at each stage in the case, unpredictable at design time, and these outcomes then determine the next stage or stages. Also because business cases are long-running, change may be introduced into the policies governing how cases are handled while previous cases are being processed. For example, mid way through the execution of an application for social welfare benefits, an entirely new set of steps may be initiated to comply with new procedural guidelines, or to cope with an unplanned external event such as the completion of a related case.
- *Involving participants in the design of knowledge processes:* the challenge here is to let knowledge workers influence the design of those processes they participate in, helping them make changes to processes or innovating new ones. Any solution needs to support, fast easy change initiated by a worker.
- *Supporting collaboration:* Collaboration is a key requirement, but it is not simply a matter of enabling instant messaging or document sharing. Business case

workers need to share everything related to a case, including history, discussions, correspondence and previous decisions. The collaboration support for case management must ensure that the correct information is made available to team members at the correct time, without losing the context or current state of progress of the case. This requires a 'smart' system that knows who needs what when. Conversely, it is important that irrelevant information is not provided at the wrong time, and that confidential information is not made available to inappropriate recipients.

- *Supporting Decisions:* Business case workers are the key decision makers in determining how a case will progress, supported where appropriate by automated rules. Automation of business cases must recognize that control will continue to reside with human case participants, rather than seeking to encapsulate everything in an increasingly complex rule-base.
- *Effectively coordinating participants:* Related to the point above, effective Business Case Management requires that work is routed to participants at the appropriate time and in the appropriate sequence, given the history of the business case to date. This coordination requires sophisticated workflow routing, synchronization of process flows at various points, ensuring overall milestones are monitored and met, and ensuring that delays are identified and exceptions raised where necessary.
- *Managing complexity:* Information and data has to be organized and presented to all case workers in a useful way so they do not become overwhelmed or confused by the various pieces of documentation, records and notes related to a case. The interface used by business case workers to interact with automating systems is a key determinant of the success of any automation.
- *Managing artifacts:* Beyond the presentation of business case information to the user, there is a need to effectively store, manage and retrieve information related to a case. Case history and associated records may need to be retained for specific periods, as a result of legislation or organizational policy. Content may be structured or unstructured, and may reside on multiple supporting systems such as databases, content management systems and electronic record management systems. Any Business Case Management solution must manage this content efficiently and effectively.
- *Integrating disparate systems:* While key aspects of Business Case Management are poorly automated, there are almost always some important legacy systems in use at an organization that will be part of any solution. Effective Business Case Management requires the smooth integration of these existing systems into any future solution.

IV. A KNOWLEDGE-CENTRIC APPROACH TO BUSINESS CASE MANAGEMENT

The focus of our approach is on supporting knowledge workers by removing many of the mundane tasks such as tracking progress, managing and generating required artifacts through automation, guiding them through critical aspects of a process while respecting that key decisions and the overall flow of the case will be decided by the participants, not the technology. We understand this support in two ways – by the case-centric architecture of the Business Process Management (BPM) suite and, on the other side, through the agile delivery methodology.

A. Guiding Principles

In supporting for Business Case Management, we have followed these principles:

- The primacy of the business case rests with the human case workers, not the supporting systems.
- The end-to-end activity flow of a case does not have to be fully determined in advance at design time.
- In real life, new tasks and processes may be added to a case at runtime.
- All business case documentation, including e-mails, meeting notes, and correspondence, must be organized and readily accessible to participants working on the same case.
- Complex business case information should be structured and presented to case workers simply and intuitively so that they can understand them easily.
- The state of a particular case may be changed by unpredictable external ‘out of band’ events, such as a phone call, thereby by-passing some or all of the steps laid out in the standard case definition.
- The outcome of a business case can be affected by the disposition of other separate but related cases.
- Meetings among parties to the business case may need to be scheduled and coordinated.
- Maximum flexibility in business case ‘disposition’ (i.e. how it is progressed) must be maintained, within specified time and budget constraints.

B. Conceptual Architecture

The conceptual architecture for the Business Case Management solution is based on a single process platform. The platform should drive intelligence behind business cases, coordinating the various processes that are being executed against a particular case, and orchestrating other supporting systems.

The platform should also retrieve documents from the e-mail and other related content management systems, insert documents and unstructured data to them, and retrieve customer data from existing CRM systems and other third-party systems.

Business case workers should interact with the platform

either through a browser-based front-end or via their normal desktop applications. The browser-based user interface should be customizable to suit the particular requirements of the organization and the type of business case.

C. The Business Case Management Framework

The process platform should involve all the features expected from a standard Business Process Management (BPM) system – process modeling, simulation, user interface generation, process execution, system integration and business activity monitoring.

However, underpinning the framework of Business Case Management is the concept of a Business Case Definition (BCD) which differs from standard BPM processes.

D. Business Case Definition

In conventional BPM systems, execution of a process runs from start to finish along a pre-defined path. Even with complex nesting and chaining logic, what happens is fully predictable, based on a process model produced at design-time.

For example, if there is a process model that contains a decision point with 10 different possible paths to choose from, one of those ten will be surely executed at run time – standard BPM does not enable the selection of an arbitrary new ‘Path 11’ at execution.

However, for Business Case Management we cannot assume that a process will run from start to finish down a particular path. Instead, we have to be able to coordinate a collection of independent processes, all of which are leading to a common goal, but which may be initiated in any order.

These processes need access to a common set of business case related data, and may need to synchronize with each other at different times or stages, but apart from that they are independent processes that execute autonomously, and they are invoked in an order that is driven by human case workers and external events.

To support these requirements, we have developed the concept of a Business Case Definition (BCD). The BCD can be thought of as a container used to hold a set of ‘process fragments’ and their associated context. These process fragments are available to the business case at runtime for invocation, although some or all of them may not be invoked.

At design time the BCD should be used to define:

- The start and end points for the business case;
- Case attributes such as milestone dates for the case, overall budget for the case, and allowed roles that can work on that business case;
- Business case data – the case-level data that will be available to all process fragments as they execute;
- Virtual case folder – a folder containing references to documents and other content pertaining to the business case and held on external data stores; and
- Case states – a set of ‘states’ can be defined, defining different stages in a business case lifecycle.

E. Business Case Data and Scope

One of the key aspects of modeling and executing business cases is managing the 'scope' of data related to the case i.e. which processes can gain access to the data pertinent to a case. The data could refer to the personal details of a party to a case and also to the related data about the case as it executes. In other BPM systems, process data can be accessed by the executing process itself and by any of its subordinate embedded processes, but separate independently executing processes cannot see this data.

However, when processing business cases a number of autonomous processes need to be aware of the data pertaining to the business case as a whole. The process platform should enable business case data to be shared across independent, loosely coupled processes.

This should be accommodated through the case definition and its associated case data [12]. The process fragments are entirely autonomous of each other but they all have access to the shared pool of business case data as well as case-level milestones, states and other variables.

F. Business Case Process Fragments and Inter-Process Synchronization

There is usually a need to coordinate the activity of process fragments at different points in a business case. For example, two or more processes may need to 'wait until response letter received from supplier'.

The process platform should make it possible to model these inter-process synchronization points in the process modeler, without having to resort to software coding.

The process platform should monitor when both internal (e.g. an event from another process) and external events (such as a file being added to a document management system) occur. This is a critical feature for BCM – and very difficult to model in most environments.

G. Business Case Milestones

There are usually scheduled points along the execution of a business case e.g. 'once started the case must be completed within 12 months from beginning to end'. With the process platform the overall schedule for a business case should be seeded from any date or any base date and re-calculate dates if a base date is changed. Scheduling of individual tasks should be calculated in relation to these overall milestones as a positive or negative time difference, eliminating the need for manual coding of timelines.

H. Content Management for Business Cases

The process platform should address the need for managing content and case artifacts through integration to multiple content management technologies. A process or case should store and retrieve content from a variety of sources simultaneously e.g. an e-mail server, a database and an Electronic Document and Record Management System (EDRMS).

While the emphasis is often on the storage and retrieval of

documents, there is also value in assisting with the automatic creation of additional artifacts to be managed within a business case, such as letters, spreadsheets, e-mails etc.

Doing this should provide a view of what is both received from external parties and what is generated internally in relation to a case.

I. Document Generation

Document generation is a common requirement of many Business Case Management processes. This should be facilitated by supporting automated document generation from within a running process. When designing a case process, business analysts can model a process node for generating documents.

Using this node, a document template can be associated with a step in a process fragment, and fields in that document that should be dynamically filled at runtime can be marked-up. During business case execution these placeholders should be dynamically updated with values (e.g. the names of parties to a case can be inserted into the document) and the corresponding document should be generated in preferable format.

J. Business Case Level Roles

Work distribution for individual tasks (process steps) can be achieved by defining one or more 'roles' at the individual process and/or business case level, together with static organizational groups or teams [13]. Roles should be assigned and re-assigned dynamically within each business case instance so as to distribute work to the necessary resources throughout and anywhere in the organization.

This is a great way of engaging staff across a large enterprise to achieve a shared business outcome, particularly if everyone interacts through the same business case framework.

The 'business case manager' or 'business case owner' is often the person who has oversight (and responsibility) for the overall case processing. So the 'business case manager/owner' is just one specific role in the overall context of a business case, whereas there are typically multiple roles involved in the successful execution of most cases.

Getting the roles and task sequencing correct goes a long way to addressing case management needs, optimizing throughput and time to completion, particularly with parallel processing scenarios. Traditional case processing where a case is just 'handed' or assigned from one person to the next implies linear processing, which is much less effective and efficient overall.

K. Individualized Business Calendars

Individualized business calendars should be provided to enable customers to manage resource availability and facilitate scheduling of resources to work on particular elements of a business case or process. The same is worth for a facility to manage inter-team resource lending, which would enable teams to lend one or some of their workers temporarily to a different project or team while still retaining full accountability of time and effort spent by 'their' workers.

V. CONCLUSION

We believe Business Case Management is important because knowledge work is important. As we noted, the most important processes in most organizations involve knowledge work – they add the most value and have the greatest impact on long-term success.

But processes and the knowledge required to execute them have generally been badly integrated, which means that knowledge work has been poorly supported by technology. With Business Process Management, there is now an effective way to address knowledge-intensive processes.

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