Establishing a Business Process Management System in a Telecoms Company

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Abstract. Gamma Telecom provides voice services and voice applications. But newer products are increasingly more complex and the largely manual processes involved in order fulfilment are unable to perform effectively enough. As a result Gamma and the University of the West of England (UWE), in a joint Knowledge Exchange Partnership (KTP) project, are investigating how to automate such product processes using Business Process Management System (BPMS) technology within a Service Oriented Architecture (SOA) development framework. A number of product processes have been automated, and the resulting experience and knowledge has been incorporated into a "meta-process", a process for capturing, modelling, analysing, improving, and providing IT support for Gamma's new business product processes. It is suggested that a generalised form of this "meta-process" would benefit other companies wishing to pursue process automation.

1 Introduction

Gamma Telecom is a UK provider of voice services and voice applications, switching around 8 billion minutes per annum and supplying services via its resellers to about 100,000 UK businesses and approximately 400,000 residential customers (Gamma 2008).

But new products that Gamma sought to introduce were significantly more complex to order and support than traditional voice services. For example, to fulfil an order for one of Gamma's current products, the company needed to place one simple order with one supplier. A typical new product, on the other hand, required knitting together orders placed across 10-15 different suppliers and careful management of the interdependencies between these separate suppliers. The company was finding this virtually impossible to do, as well as proving expensive in staff costs. In addition, orders were taking too long to fulfil.

In order to address these challenges, Gamma decided to adopt an infrastructure that would support the automation of different business activities, and thereby help the company to manage its services in a more robust and efficient manner. It was predicted that the introduction of a modern workflow system (better known as a

Business Process Management System, (BPMS)) (Ould 2005; Weske 2007) and more generally a drive towards a Service Oriented Architecture (SOA) (Erl 2007) would help Gamma to not only address immediate business problems but also to provide a new core capability upon which it could build new products not yet conceived. In using the BPMS and SOA approaches, the definition, design and execution of efficient business processes would require investment in requirements gathering, in consulting interested parties, and in defining the human and software resources that would interact with the process, as well as a communication protocol (Jennings et al. 2000).

To address all of these concerns, Gamma embarked upon a Knowledge Transfer Partnership (KTP 2008) project with the University of the West of England (UWE). The overall objective of the resulting KTP is to develop a new core capability within the business: the ability to automate processes using a BPMS within an SOA approach. The KTP consists of two interdependent projects:

- The first project is concentrating on developing and embedding a method and governance framework for process automation covering: process analysis, design, modelling, simulation, deployment and continuous improvement.
- The focus of the second project is on implementing the most appropriate BPMS and its requisite technical infrastructure.

Against this background, we are now developing a meta-process for identifying, modelling, analysing, improving and automating Gamma's business processes.

Operationally, the KTP project identified distinct roles for two associates, one to be concerned primarily with process elicitation, modelling, analysis and improvement, and the other with process automation implementation using a technology set comprising a BPMS, web services (Alonso et al. 2004), and an Enterprise Service Bus (Chappell 2004). Both associates were to be involved in developing the process for automating processes, i.e. with the meta-process referred to above.

In the event the second, more technical, associate (Justin Nwakacha) was not able to start until one year after the first associate (Ali Abughoush). This meant that the meta-process has been developed in two main phases, the first dominated by design and the second by implementation. The two associates have been managed by Tim Hill, and the participating academic staff are Ian Beeson and Stewart Green.

The paper is structured as follows. The next section describes methods, that were used both to transfer knowledge and, more particularly, to create knowledge. Section 3 describes the key knowledge that was created, i.e. the meta-process. After this, in section 4, we describe how this knowledge is being disseminated within the organisation, including through the use of seminars given by the current associate. Section 5 concludes the paper by reiterating its main deliverables and outlining future work.

2   Knowledge Creation: Building a Process Development Meta-process

This section discusses how knowledge was both transferred from the two academics to the KTP team - associates, associates' line manager, and line manager's manager -and how knowledge was created by the KTP team and the academics working together.

Knowledge was transferred from the academics to the KTP team in the following main ways:

- Discussions at regular meetings
- Literature recommendations
- Course recommendations
- Tool recommendations

For example, at one of the regular meetings, the first associate was made aware of the existence of Ould's *Riva* method for identifying an organisation's process architecture (Ould, 2005). Identifying such a process architecture is potentially very relevant to this KTP because the architecture's constituent processes could be used to select from among Gamma's business processes particular processes for automation. The academics explained the *Riva* method to the associate and followed the explanation with references to Ould's book on *Riva* (Ould 2005).

Similarly, knowledge was transferred from the KTP team to the academics during discussions and through reports summarising process automation work. For example, the first associate created a report for each Gamma business process that he identified, captured, modelled, analysed, improved and supported using the BPMS. The reports contained, for instance, details of the XML schemas (XML 2003) used to describe messages passed to and fro between services comprising an improved, automated process. And the processes themselves were specified using the Business Process Modelling Notation (BPMN) graphical models (BPMN 2007). So through studying these reports, the two academics improved their knowledge of contemporary BPMS technology.

The critical knowledge that was created by the KTP team and the academics working together was the *meta-process*, an evolving process for automating a succession of selected Gamma business processes. This knowledge was created using the following method, which was suggested by the academics and developed and put into practice by the two associates.

Starting in the first iteration with a straw-man meta-process (identify, capture, model, analyse, improve and automate), the associates, in tackling a series of projects in Gamma, would follow the current version of the meta-process, record and reflect on their use of the meta-process in the current project, and review and revise the meta-process for use in the next project. One effective way of recording and reflecting on experiences in this development work proved to be the maintenance by the associates of a blog.

The meta-process is described in more detail in the next section. As the associates have embarked on increasingly complex Gamma projects, the meta-process has been refined, and strategic knowledge has been created for the organisation.

3   The Meta-process

What we refer to as the 'meta-process' is a key longer-term contribution of the KTP project at Gamma Telecom, because it provides a regular method for redesigning business processes at Gamma and   implementing them within the BPMS/SOA framework. By repeating the same general method of conversion, and refining it as experience accumulates, the BPMS approach and its associated technologies become gradually established in the company, and each new implementation, while inevitably bringing its own challenges with it, becomes more straightforward, because it uses a method that has already been shown to work, and with which analysts and developers at Gamma are increasingly familiar. The meta-process has two principal aspects to it:

- an iterative aspect: each BPM project at Gamma follows a regular development process, as defined at the time of the project;
- a cumulative aspect: experience from each successive project produces learning about the development process itself, which is distilled and feeds forward into refinements of that process.

As originally envisaged, the meta-process has four broad phases to it: envisioning, design, implementation and testing. These are focused on the iterative aspect of the meta-process. These were established in outline during the first year of the KTP project. Because of the way the project unfolded, however, with the first associate strongly focused on design, and the move into implementation delayed until the arrival of the second, the detail of the first two phases (envisioning and design) was worked out before that of phases 3 and 4 (implementation and testing). These are the four phases of the meta-process:

1. **Envisioning phase:** understanding how the existing process works and defining its limitations, then deciding whether the process is suitable for BPM implementation by measuring it against the 'BPM acid test' (see below and (Havey 2005)).
2. **Design phase:** designing a model in BPMN that shows how the improved process will be automated and defines the messages that will be exchanged between the process and its related services.
3. **Implementation phase:** implementing the process by adding Web Service Definition Language (WSDL) files (WSDL 2007) to the BMPN diagram, applying the XML schemas that will be used for defining the messages between the web services, applying error handling mechanism and converting the BPMN diagram into executable code that is ready to be deployed on a BPMS server.
4. **Testing Phase:** deploying the process on a test BPMS server and testing its functionality by executing test cases that cover different scenarios for triggering the process.

The constituent steps in each of these phases will now be presented in outline. Although Implementation and Testing were originally seen as separate phases, they are in fact interconnected and have proceeded in parallel. We show this here

by embedding testing within implementation. Phases 3 and 4 have therefore been combined in what follows, and a new phase is defined, called Incorporation, which captures the cumulative aspect of the meta-process.

3.1   Envisioning Phase

The envisioning phase includes the following steps:

1. *Identify a process for BPM implementation*: meeting project stakeholders to define a process at Gamma that needs to be optimised to enhance the company's operations.
2. *Perform stakeholder analysis*: identify the key people that may significantly influence the successful analysis and implementation of the process; draw a stakeholder diagram.
3. *Understand the initial process*: interview stakeholders; capture the end-to-end process definition; analyse other process definition sources; identify process limitations and areas for improvement.
4. *Apply the 'acid test' for BPM implementation*: use Havey's test (Havey 2005) for process-oriented applications – which should be long running, idle most of the time, and in need of 'orchestration' (coordination of system or human communication).
5. *Create a business modelling document*: this gathers all the details on how the current process works, its limitations and areas and improvement.
6. *Analyse the development effort*: meet the software architect and development manager at the company to identify the changes and additions that need to be applied to the existing systems to make it suitable for automation (e.g. web services to be developed, code changes to existing components, stored procedures to be developed, database tables to be built/modified).

3.2   Design Phase

The design phase includes the following steps:

1. *Model the process in BPMN*: create a graphical representation of the process using BPMN to show how a proposed process is triggered and then invokes different system services.
2. *Validate the design with stakeholders*: check understanding and modify diagram as necessary.
3. *Define process XML schemas*: agree on the input and output messages that should be exchanged between the new process and existing systems (messages between invoker and process, and between the process and services it invokes; and fault messages).
4. *Create a design document*: this should include the BPMN diagram, a description of the process's lifecycle, and the XML schemas.

3.3 Implementation Phase

This stage involves implementing the XML schemas and the operations depicted on the BPMN diagram in order to create an executable process that can be deployed on a BPMS server. It includes the following steps:

1. *Implement a demonstration process*: define WSDL files for the processes in the diagram; as proof of concept, use dummy web services to return predefined responses back to the process.
2. *Prepare and execute test cases*: prepare a list of the possible input XML requests and run them against the test interface, to check whether actual responses match expected responses.
3. *Implement the real process*: develop the real web services (using Java Business Integration (JBI) components) and correct any errors discovered during the demonstration implementation, then replace the operations of the dummy services with the operations of the actual JBI components, applying error handling to catch any fault messages returned from the services and send them to the invoker.

3.4 Incorporation Phase

As each successive project of conversion of a Gamma process into the BPM framework is completed, the opportunity arises to learn from it and to consolidate the knowledge gained into a broadening and maturing practice of business process management at the company. This can include the following aspects:

1. Refining the envisioning, design and implementation phases to reflect the experience and learning on the recent project.
2. Refining and extending the set of essential business entities (Ould 2005) that characterise the work of the company. In Gamma's case, these include customer, switch, order, number, trouble ticket, and payment.
3. Identifying and implementing entity-centric services to handle these critical entities. By developing consistent and thoroughly tested services for handling key entities, manual handling and the need for ad hoc intervention can be reduced, services can be re-used, and the level of automation is increased.
4. Building a process repository. Once entity-centric services have been implemented, they can be indexed and stored in a directory that can be accessed by different processes requiring that service.
5. Disseminating the knowledge gained into the wider organization.

This last aspect is developed further in the next section.

4   Knowledge Dissemination: Embedding the Meta-process within the Organisation

Transferring knowledge to people of different disciplines is challenging. It is Gamma's intention that a significant proportion of their business processes will be automated. Therefore one major goal of the KTP is to embed knowledge of the meta-process, as well as the knowledge and skills of related technologies, e.g. Java, Java Message Service (JMS), and BPMS, within the organisation. In particular the business analysts and software developers will need to be very familiar with the meta-process and associated technologies, but managers and other employees will also need to be aware of them.

A number of ways have been suggested for embedding this knowledge and the associated skills. These include:

1. Company wiki
2. KTP blog
3. Lunchtime seminars
4. Technology workshops (BPMS, JMS, Java, SQL)

By themselves, making the meta-process documentation available on the company Wiki (knowledge base) and publishing the KTP blog internally are probably insufficient to encourage people to use this technology. Some staff might not even know it is available on the Wiki. One solution to leverage the advantages of the meta-process was to inform staff through lunchtime seminars. The meta-process contains detailed information, but the seminar is meant to notify the people of the meta-process's existence (per project), and give an overview of the technology driving the project, and its advantages. The seminars allow other staff to expose their difficulties, which they hope the technology would help solve.

Gamma Telecom organizes seminar sessions every two weeks, so the avenue for delivering this had been setup. Alongside the meta-process is a Power Point presentation of the seminar. The seminar on the meta-process lasted for an hour and was attended by the associated software development team.

In addition to lunchtime seminars, workshops have been organized for the teams that rely on the technology described in the meta-process. The introduction of this technology will affect the way they carry out their jobs, so it is not just a workshop, it can also be seen as an interactive session where these teams can be convinced that the impact of this change can be managed. The information dispersed will be more detailed, unlike the lunchtime seminar, whose audience cut across users of different technology. The format of the workshops will be:

- Introduce the technology and meta-process
- Outline its advantages and limitations
- Indicate what problems it will address
- Describe the likely impact on the team
- How changes would be managed
- Assure the team that support will be provided
- Answer any questions

These methods that have been tried have been found to be effective in embedding the knowledge in the organisation. The most effective method was the lunchtime seminar because it had a larger audience and because it wasn't detailed – so people listened attentively. It also provided a medium for feedback which helped in all of the following: revising the meta-process, finding a suitable time to deliver the seminars / workshop, selecting the audience, updating the wiki frequently, and informing interested staff of the updates.

5 Conclusions

The paper has described, first, the two-way transfer of knowledge between Gamma and the academics about business process management systems; second, the joint creation of a meta-process for automating Gamma's business process products; and third, some ideas about how to embed the meta-process, i.e. the newly created knowledge, into the organisation.

The key deliverable to date has been the meta-process. It is suggested that if this were generalised then it would be very useful to other companies at the same technology level that wished to pursue automating their business processes in an SOA development framework.

In the future, the meta-process will be further refined through its application to increasingly complex Gamma business product processes. In addition, the meta-process seminar and related technology workshops will be refined, run again, and refined once more for further deliveries. Associated work with the development of entity-centric services and of a process repository will also be taken forward.

References

BPMN, Business Process Management Notation (BPMN) Information (2007), `http://www.bpmn.org` (accessed January 28, 2008)

Chappell, D.: Enterprise Service Bus. O'Reilly, Sebastopol (2004)

Erl, T.: SOA: Principles of Service Design. Prentice-Hall, Englewood Cliffs (2007)

Gamma, Gamma Telecom (2008), `http://www.gammatelecom.com` (accessed January 28, 2008)

Havey, M.: Essential Business Process Modelling. O'Reilly, Sebastopol (2005)

KTP, Knowledge Transfer Partnership (2008), `http://www.ktpoline.org.uk` (accessed January 27, 2008)

Ould, M.: Business Process management: A Rigorous Approach. Meghan-Kiffer Press, Tampa (2005)

Weske, M.: Business Process Management. Springer, Heidelberg (2007)

WSDL, Web Services Description Language (WSDL) Version 2.0 Part 1: Core Language (2007), `http://www.w3.org/TR/wsdl20/` (Accessed June 29, 2009)

XML, XML Schema Part 0: Primer Second Edition (2003), `http://www.w3.org/TR/xmlschema-0/` (Accessed June 23, 2009)

Alonso, G., Casati, F., Kuno, H., Machiraju, V.: Web Services: Concepts, Architectures and Applications. Springer, Heidelberg (2004)

Jennings, N.R., Faratin, P., Norman, T.J., O'Brien, P., Odgers, B., Alty, J.L.: Implementing a Business Process Management System Using ADEPT: A Real World Case Study. Applied Artificial Intelligence 14(5), 421–463 (2000)