International Journal of Advanced Computer Technology (IJACT)

ISSN:2319-7900

DELIVERING PROCESS IMPROVEMENT THROUGH RE-ENGINEERING INTERFACE DESIGN: A CASE STUDY

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Abstract :**This paper discusses the benefits achieved through re-engineering interface design as a means of improving employee performance. It discusses the issues related to the inherent relationship between employee's performance and the systems that they use to complete their work. Whilst work standards have not been an issue, maximizing the output of the workforce has becoming increasingly important as the business experienced rapid expansion. Re-engineering the interface saw huge impacts on workload awareness from the offset. Implicitly, the software engineering process also implemented beneficial changes in relation to knowledge management within the business. Through implementation of a user-orientated interface, both process improvement and employee performance increases have been achieved.**

Introduction

For any business that operates as a service provision sector, the quality of the service has a direct impact upon the ongoing success and growth of the business. For customers of that business, the quality of provision may be specified within service level agreements (SLAs) that determine the standard of service that a customer may expect. Adherence of a service provider to an SLA can be expected to be closely monitored by customers, particularly if that service is supporting high-value or regulated market sectors (for example oil, financial, medical and so on).

Whilst the delivery of the service is important to customers at a holistic level, the providers must determine means through which they can not only meet but improve upon, and indeed exceed, the standards that are set for customers. For provider this presents a challenge in relation to the practices that have been adopted by the business. Whilst it might be clear that implementing IT systems to automate many of the operations that are performed in a service could lead to enhanced performance, it is often the higher level workflows that can be reviewed to implement the greater impact.

The company discussed in this case study, is a Small to Medium Enterprise (SME) within the United Kingdom. The customer base for this company consists of a number of high profile clients who are dealing with high-value products. The company structure features a focused and easily managed operations department carrying out the core operations of the business. In addition to the business being relatively small, the processes within the business were proportionate with less departments/employees involved.

The business developed new technologies and developed more complex service levels that in turn required more complex tasks with increased demands on employee workloads. The addition of the new technologies and service levels led to a more competitive organization and led to a significant period of growth, up 100% within a 2 year period.

It soon became clear that the management teams did not have the data they required, readily available. Whilst the data could be extracted from the system the length of time this took was significant. Below the management level the individual employees suffered the same fate of an increasing number of tasks, more complex tasks and an increase in difficulty to access information.

It was possible to extract the data required by spending significant time manually extracting and even counting the data. As part of the growth phase it became evident that it would be essential to turn the data into information and have it easily displayed for the purposes of aiding team and management work flow.

Management Reporting

The company utilized a bespoke data management system. Using this system, the company are able to collate data from their clients to identify unexpected conditions, deemed to be alerts. Teams of analysts, under the supervision of Consultants and Contract Managers, review the incoming alerts to determine the most appropriate action to be taken. It may be considered that there are two distinct areas of data interpretation that is embodied within the system: the analysts interpret the individual alerts or content of the system, whereas the Contract Managers are making holistic interpretations relating to the ongoing processes with which their teams are

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engaged [1]. Reporting of information from the system is integral within the operations department to ensure targets are met and for the company department to ensure the wider goals of providing evidence that the Quality Management System is maintained. To support this, the company designed workflows that determined the appropriate procedures to be followed.

Within the operations department the Analyst requires information to ensure their own targets are met, the Consultant to ensure their analysts have met their targets and the Contract Manager to ensure their Consultants were on track and to be able to provide the relevant information to the Directors. Within the core areas of analysis each report to be generated required a different manual report to be produced at the analyst level. This would often mean the combining of multiple ad hoc reports from different sections of the data management system. The output of such ad hoc reports must then be manually copied and pasted to form one holistic report for one of the core areas of the business. It may be deemed, therefore, that this function within the company is highly process-based, requiring the integration of outputs from a range of diverse business processes [2]. An additional level of complexity is that the system would not necessarily be able to run the same information at either a team or department level resulting in the combing of reports between the Analyst to the Director more complex.

The core areas of analysis have different timescales and targets from morning and daily to weekly and monthly. As a result, various reports would be required at different time intervals which added to the interruption of actual operations tasks; while reports are being generated the system was placed under additional stress and directly affected workload continuity.

It was identified that the time taken to generate and manually manipulate data for the purposes of reporting was significant; significant enough to create gaps within the information that further impacted on root cause analysis and the ability to resolve issues and improve efficiencies. This became a particularly pertinent issue as the role of the analysts drove quality management, both within the company and for their clients. This knowledge management impacts the quality processes not just for a single client of the company, but for all the clients. Understanding events that occurred, and the eventual outcomes, is widely identified as key to the success of an organization [3]. Equally, the quality and delivery of relevant interpretation of data is core to the company maintaining a leading stance within their industry [4]. The following section considers the steps in the process that needed to be completed for reporting purposes.

Existing Processes

The original process for retrieving reports, as captured within the process management workflows [1] is demonstrated in Figure 1. User's where required to follow a number of stages in order to retrieve the data. They had to select the report type, choose the data range they wanted to report on, this then required the user to generate the data into the cache before being able to recall the generated report into a view.

From there, the data was displayed in rows with a small font that made manually counting the results rather difficult. After generating numerous reports and counting all of the rows, the user's had to add their progress results into a team spreadsheet.

The data that is required for the report is simple, but the process behind the retrieval adds unnecessary layers of complexity and complication, with large scope for errors.

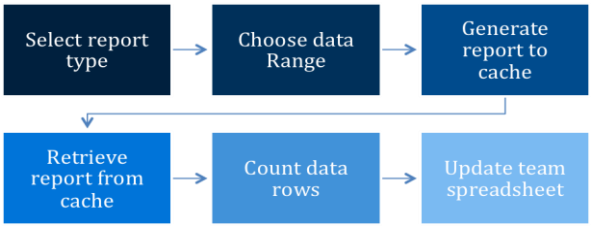

Figure 1: Original Process for Report Generation

- Stage one requires the user to navigate a busy menu structure in order to find and choose the appropriate report type. See Figure 2.

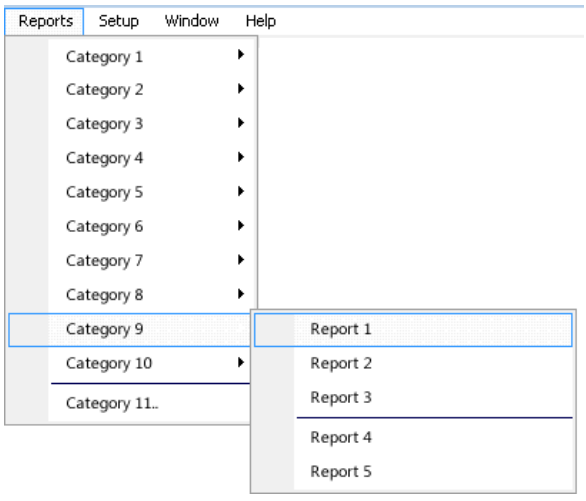

Figure 2: Menu Complexity

ISSN:2319-7900

- Reports are nested inside a menu structure that has been added to over the lifetime of the software, but has never been re-organized/refactored in order to ensure it is logically structured, making finding a particular report difficult and confusing at times.
- Stage two is where the data range to be reported on is selected. Pressing a key combination on the keyboard whilst clicking the report name completes this action. This then presents the user with a window where they can make a selection of the range they wish to report on. See Figure 3.

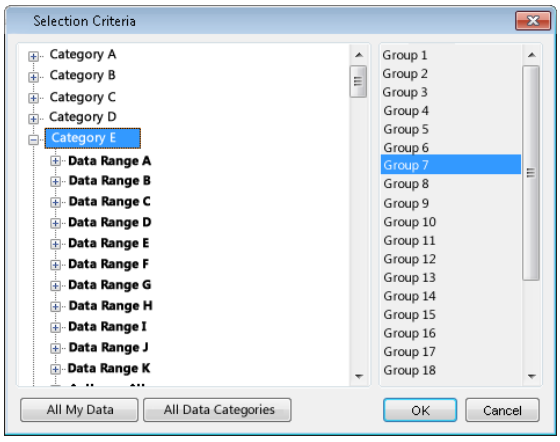

Figure 3: Range Selection

- Stage three requires the user to toggle between options in multiple select menus in order to generate the data to a report cache before retrieving it from the cache. This poses a huge risk as user's can often regenerate to the cache and overwrite existing reports that other user's may already be using.
- Stage four requires the user to change back the options in the select menu, so that data retrieval is possible. The risks at this stage are that the user will struggle to retrieve the information by selecting the incorrect options inevitably resulting in failure to display the information they require.
- During stage five, the generated report is required to be counted by the user manually. This is the most difficult stage of the process as it requires the user to count rows of data on a difficult interface.
- The window shows multiple rows of data and is grouped by ID's as per figure 4. The user is required to sum the totals of each group which would scroll over several pages, making it extremely difficult to count.
- The user is required to count all of the results and then deduct the total that has a check in the "C" column to give the total completed versus the total number of results.

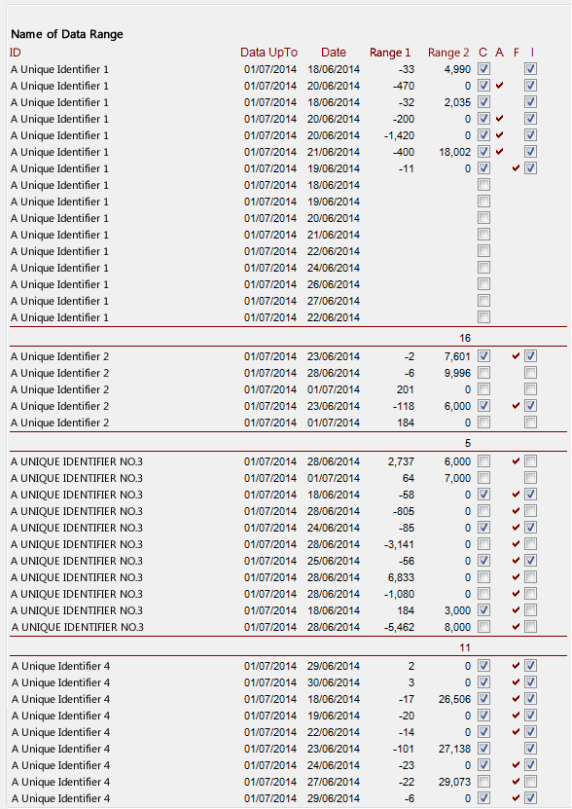

Figure 4: Identifier Selection

Process Redesign and Implementation

In order to achieve the most appropriate and effective solution to address the cumbersome nature of the existing processes, a decision was made within the company to re-engineer the quality management procedures. As the bespoke reporting toolkit used within the company had been in existence for nearly 20 years, there was a clear need to not only determine the required changes within processes to meet evolving company needs but also to drive these changes through the systems to ensure that analysts would follow the re-engineered workflows [5]. Indeed, the alignment between re-engineering the technical and organizational processes was critical in gaining a successful outcome for the project [3]. There was also an identified need to integrate the company training procedures into the workflows, facilitating the adoption of past cases as training exercises for new analysts. The use of knowledge management as a means of transferring knowledge within an organization has been recognized as an effective means of cognitive collaboration [6].

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Initial investigations met with a level of resistance from the established members of the analysis teams. This led to a need for a flexible and evolutionary approach such that the user base would experience the benefits of re-engineering in an incremental manner [5]. The most popularly deployed methodology for web-based projects is the Agile methodology, or an adaptation of the Agile methodology. The agile method refers to an iterative approach that should respond to changes in requirements and inputs from clients where appropriate. The term Agile was coined in 2001 when the "Agile Manifesto" was formed [7].

An Agile based methodology was deemed most effective for this project as it allows for modules to be created and tested until stable versions are achieved. By using this methodology, incomplete sections are prevented from holding up other sections of the build, as they can be revisited and refined. The Agile methodology fits in perfectly with the chosen build method, which is modular, and MVC based. Some articles discuss the issue that when clients are involved they can often feel that this approach produces incomplete or unsatisfactory work, but where a direct client is not involved, it is a more iterative process and allows for better development, justifying its use for this project [8].

In relation to the redesign of the company workflows, the alignment between the distinct elements of process and content management led to an approach that would embody knowledge management [1]. The complexity of the processes, particularly in relation to the reporting aspects of the system as outlined above, had been a result of the system evolving over a number of years. This led to the consideration of knowledge mapping as a means of gathering a high-level representation of the full lifecycle processes involved [9]. As this system supports the quality management functions of the company, the emphasis was placed on process management as a central deterministic function of the reporting framework [10]. The design procedure adopted by the company was consistent with practices relevant to the Agile framework adopted. Throughout the evaluation of the existing processes and the re-engineering tasks, qualitative and quantitative data was collected from all stakeholders through focus groups, workshops and email feedback to the system designers and developers. The identification of focused sprints within the design and implementation phases enabled flexibility within the approach and ensured that high visibility concerns were prioritized in the workflow design.

In order to realize the designs through the implementation of an interactive framework that could be accessed by all stakeholders, a web-based platform was adopted. The benefits of re-engineering the system from a client-server architecture to a Model-View-Controller (MVC) architecture were determined to be

- Simpler deployment model in that the refactored software could be deployed as a single action for every user
- Control of deployed versions as every user would access the same version of the software
- Management of requests for additional features through a defined change request procedure

In light of this decision, the development team opted to implement the software designs using PHP and the CodeIgniter framework. As a means of underpinning the MVC architecture with established technologies such as PHP, AJAX, JSON, jQuery and Javascript, CodeIgniter offered a framework that was "proven, agile and open" [11]. The flexibility and speed of the chosen implementation architecture complemented the Agile development approach and the strategic aims of the project. Through each sprint, the requirements were reviewed in context of the outcomes of previous implementation phases to determine the most appropriate set of requirements for consideration within the following phase of implementation. In this context, the Agile methodology complemented the implementation of the knowledge management framework. The re-engineered workflows that had been established following review of best practice processes could be incrementally introduced into the business working practices. The result facilitated the acceptance of changes to working practices by the end users of the system, in this case the analysts, as there was no single significant change to the manner in which the analysts would undertake their daily tasks; rather subtle changes to implement best practice in quality assurance.

Evaluation

In order to determine the effectiveness of the re-engineered process, the company undertook an analysis of the original processes with a team of 80 analysts, and then re-evaluated the procedures following re-engineering. Within the process under consideration there were four key steps for each analyst to perform to generate the desired report. Timing the analysts actions using the original software system, it was determined that the average time taken for each step was

- Stage 1 – 5 minutes
- Stage 2 – 1minute 45 seconds
- Stage 3 – 45 seconds
- Stage 4 and 5 – 5 minutes

ISSN:2319-7900

For 80 analysts, completing these reports on a weekly basis would result in 16.6 hours of work per week. However, it was also determined that in order for the Contracts Managers to collate accurate data then the analysts would need to perform these tasks once per day. This would equate to 83 hours of work per week.

Following the implementation of the automated reporting system that integrated the required data to generate the reports from within a single framework, it was found that the time taken to produce the required output was reduced to 8 seconds per analyst. Given that the analysts would be producing daily reports, this would result in a time saving of 82 hours of analyst work time per week. This reduction in working time for a single task resulted in a significant cost saving for the company, as analysts were then able to direct more time to their core activities of servicing customer demand.

The analysis also revealed that the improved processes facilitated not only more accurate reporting by Contract Managers, but a desire to produce more detailed reports. This was determined through review of the change requests that were made throughout the development process. Requests were made to incorporate additional fields and to implemented functionality supporting drill-down of data sets. The Agile approach enabled a number of these requests for new features to be fulfilled within the sprint that directly followed the request.

Conclusion

The impact that the company felt after the implementation of the web-based reporting framework cannot be underestimated. The participation of the Contract Managers and the Consultants in the design and the development process led to an implementation that was not just fit for purpose, but was also fit for practice. As the system was integrated into the business, the requests for changes to the reporting system in relation to the implementation of new features grew. This represented a re-engagement by Contract Managers and Analysts within the company as they felt empowered to not only deliver expected results, but to drive improved quality assurance processes for their clients.

Prior to the implementation of the knowledge management system, the company faced delays and some inaccuracies when generating reports for their clients. The company also offered access to its reporting system for a small, but growing, number of international clients. To make use of the original system these clients, known internally as licensees, were required to use a remote desktop connection to open the client software. This led to software performance issues for those clients. The re-engineering process removed these issues as the software platform was migrated to a web-based architecture.

The successful outcome of the project has led the company to realize large cost savings related to the man-hours required when producing reports. Indeed, these savings are more significant as the company continues to grow and employ additional analysts; the company has currently grown to employ around 200 analysts and plans further expansion in the near future. Such has been the positive impact of the project that the company is now planning to migrate other internal systems following the same software engineering processes.

Acknowledgments

The authors would like to thank the Technology Strategy Board and Astley Associates for their invaluable advice and support during the project.

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