Moving From Personal Spreadsheets To Enterprise Solutions

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by The Edge Software Consultancy Ltd.

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Part I

1 Introduction

1.1 Abstract

In this case study we present a successful implementation of an expense, leave and absence tracking system using The Edge's spreadsheet technology Morphit. We review the business requirements and implementation details, and illustrate the main use cases, discussing the knowledge gained and planned improvements.

Adopting structured data techniques overcame many of the problems of isolated spreadsheet documents such as managing spreadsheet change, centralizing master data and scaling to a multi-user environment. Data was pooled an analysed from multiple spreadsheet instances in real-time management reports.

1.2 Background

The Edge Software Consultancy ("The Edge") is a leading provider of scientific software used by pharmaceutical companies to organise and capture research data. The same technology has been designed for both scientific environments and general business usage. In order to validate these design objectives and to deliver real business benefits The Edge has applied this technology to solve a number of internal administration tasks. These include expense tracking and payment; leave requests and approval; and recording of employee absence.

1.3 General Business Requirements

A number of general requirements were identified:

- **Accessibility** - The system must be accessible to both on-site and remote employees.
- **User Authentication** - Access must be limited to only Edge employees
- **User Authorisation** - Access to data and functionality must be restricted according to the user's business function.
- **Scalability** - The system must support at least 100 users and have a concurrency of 20 users running data intensive operations.
- **COTS** - In order to minimise the total cost of ownership, the system should be based on commercial off the shelf software and not require any customisation.

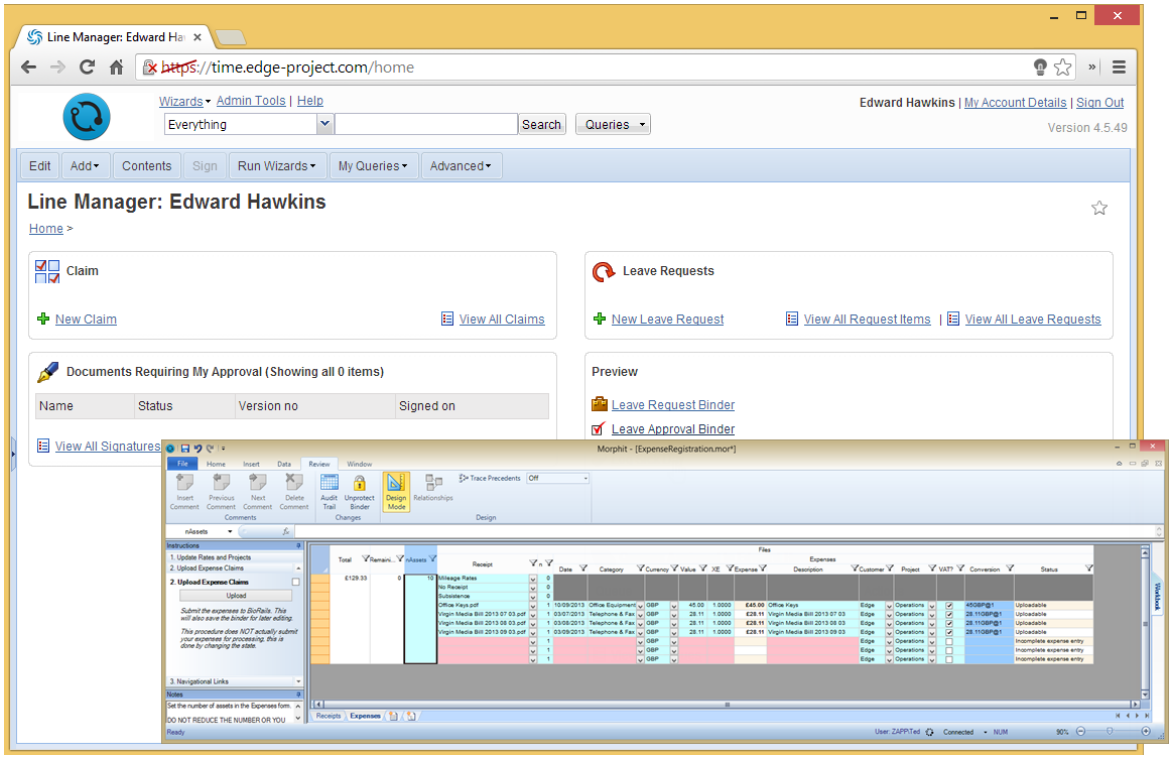
1.4 Software Components

This solution used Morphit to support complex business operations and Morphit Enterprise to provide content management and a reporting framework.

Morphit is a spreadsheet technology created and owned by The Edge. It helps to reduce error rates and improve spreadsheet validation through the use of field level formulae and a more formalized mechanism of creating spreadsheet models (see Introducing Morphit, a new type of spreadsheet technology, Hawkins, Lemon & Gibson, Proc. European Spreadsheet Risks Int. Grp. (EuSpRIG) 2013).

Morphit Enterprise is a web based system used to version control and deploy Morphit binders

and other documents. It enables the capture of structured data and facilitates reporting across spreadsheet instances in an enterprise environment. This includes support for requesting business processes, tracking delivery and recording of data.



Solution components

Part II

2 Implementation

These topics describe the specific requirements and implementation for expense, leave and sick day tracking.

2.1 Expense Tracking

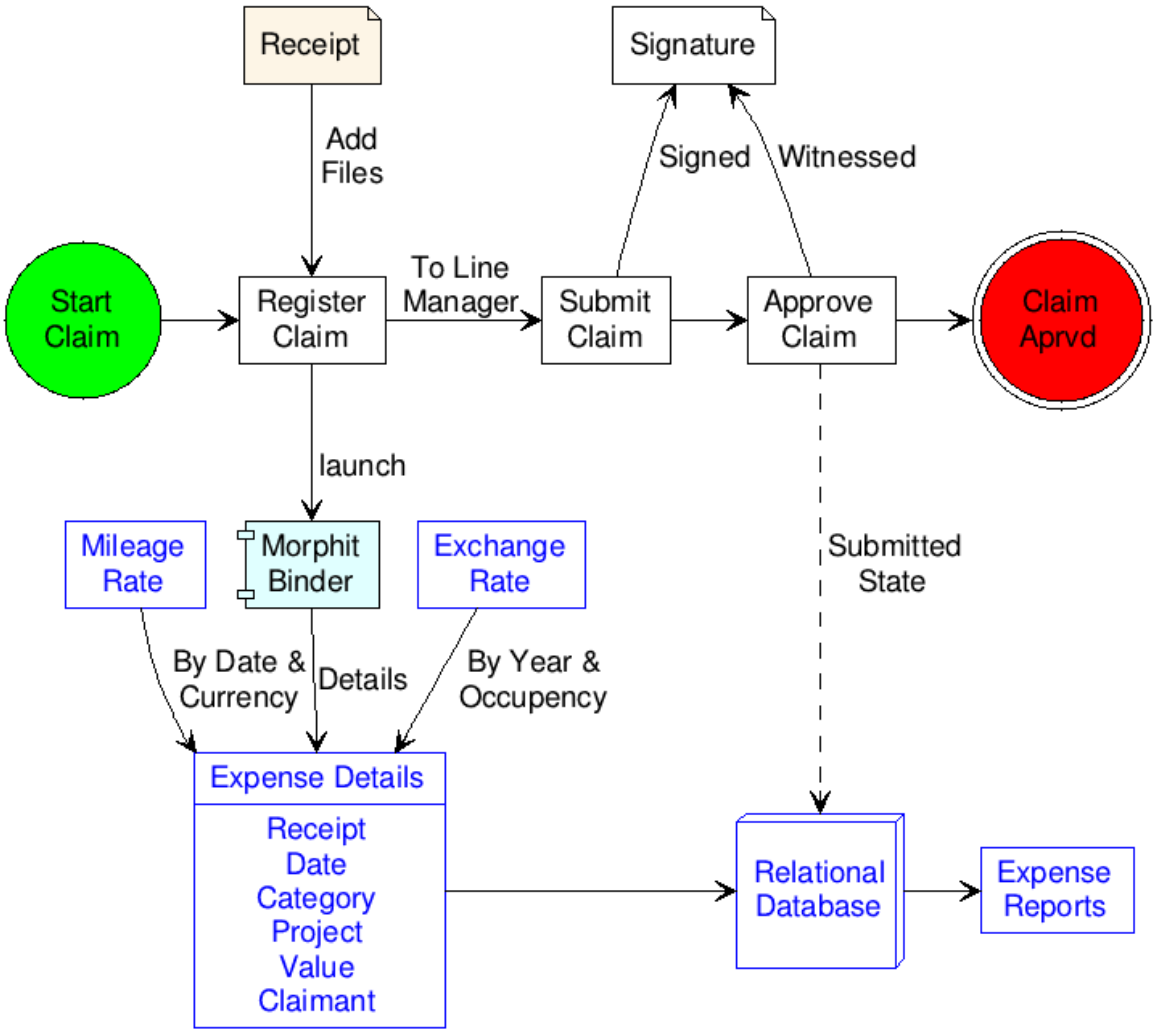
Company growth demanded a more scalable and enterprise solution to expense tracking than the existing document-based system. The objectives were to reduce the time taken to enter and process expense claims; minimise data entry errors; and provide project level reporting.

2.1.1 Requirements

1. **Compliance** - The software must comply with company expense policy.
2. **Submission** - Employees must be able to efficiently submit expenses.
3. **Approval work flow** - Claims must be approved before payment.
4. **Notification** - Users should be notified of any changes to the status of their claims.
5. **Content Management** - The system must support the storage and control of scanned receipts.
6. **Exchange Rates** - Expenses in multiple currencies must be converted to GBP (Great British Pounds).
7. **Mileage Rates** - Mileage claims must conform to HMRC (Her Majesty's Revenue and Customs) mileage rates.
8. **Archiving** - The system must support archiving in a long term storage format (PDF).
9. **Project Invoicing** - Project expense reports must be provided to improve invoicing efficiency.
10. **Searching** - Must be able to search for expenses by category, date, claimant, project and status.

2.1.2 Implementation Overview

A claim is created by the employee and is used to store scanned receipts. A Morphit binder is used to register the details of the expenses matching the receipts. This binder uses centrally managed information, such as exchange and mileage rates, to calculate expenses and collect other meta data. When the binder is saved, the information is uploaded to the claim. The user then submits the claim to their line manager. This action initiates an electronic signature event that protects the data as a legal record. After checking the details the line manager counter signs the claim, making it available for expense processing by finance personnel. The claim can be outputted to PDF as a defensible document for long term storage.



Expense submission and approval workflow

2.1.3 Tasks

A number of new data objects were necessary to support the business requirements. These are defined as data storage templates in Morphit Enterprise. The data described in these templates is typed as numeric, text, date and lists of values (dictionaries). Tasks are then created from these templates in order to store data for subsequent analysis. Content such as text, images and other files can be attached to a task. Additional task metadata is automatically captured such as audit dates and the creator.

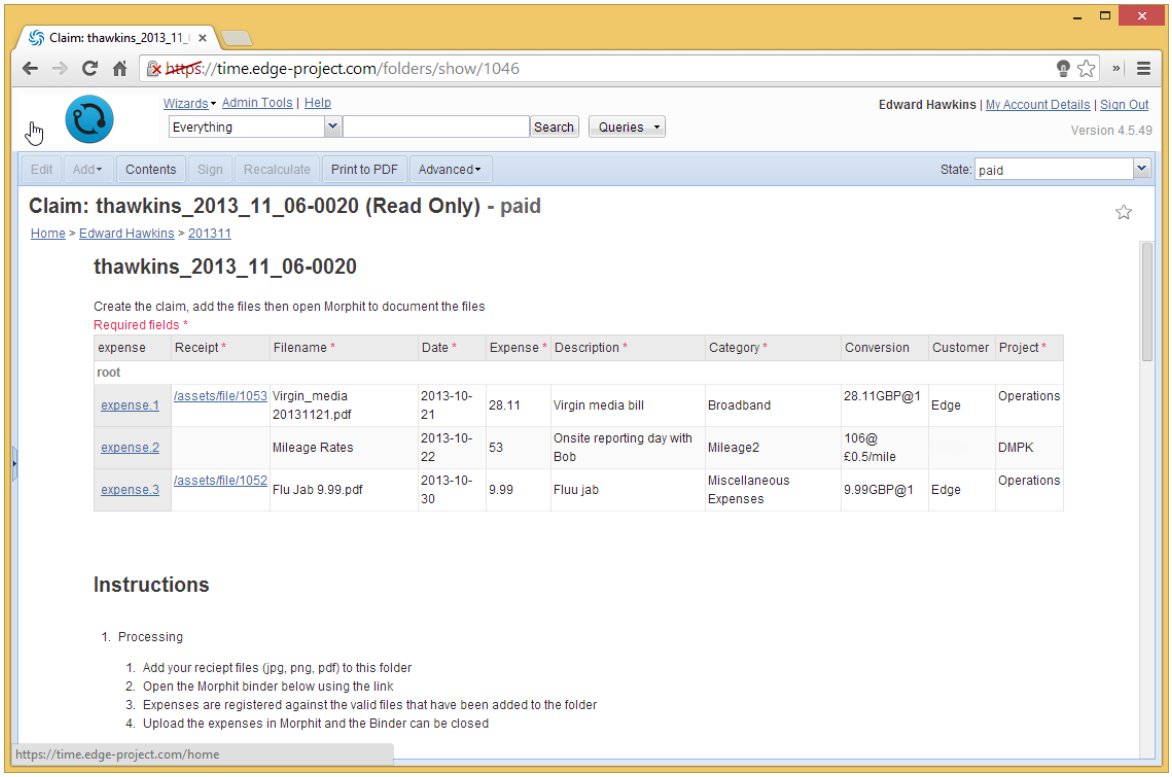
Each of the required templates are described below.

2.1.4 Claim Template

When employees make a claim the data object captures the following data:

- Date (Date)
- Expense (Decimal) - GBP
- Conversion (Decimal) - from local currency
- Description (Text)

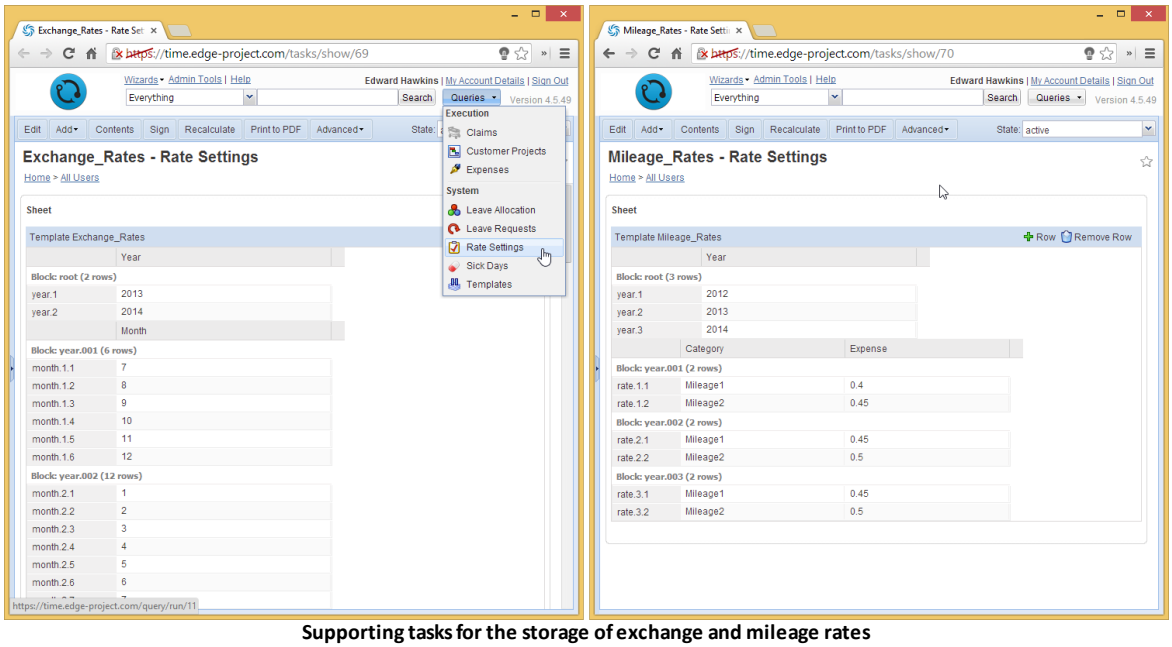
- Category (Dictionary)
- Customer (Dictionary)
- Project (Dictionary)
- Receipt (File)
- Filename (Text)



A claim detailing expenses

2.1.5 Supporting Tasks

Tasks can also be used to store data which is applied across claims, such as exchange and mileage rates. These tasks can only be updated by those with administration rights.



Supporting tasks for the storage of exchange and mileage rates

2.1.5.1 Exchange Rates Template

Monthly exchange rates are stored with the following data:

- Year (Integer)
- Month (Integer)
- Currency (Dictionary)
- Exchange Rate (Decimal)

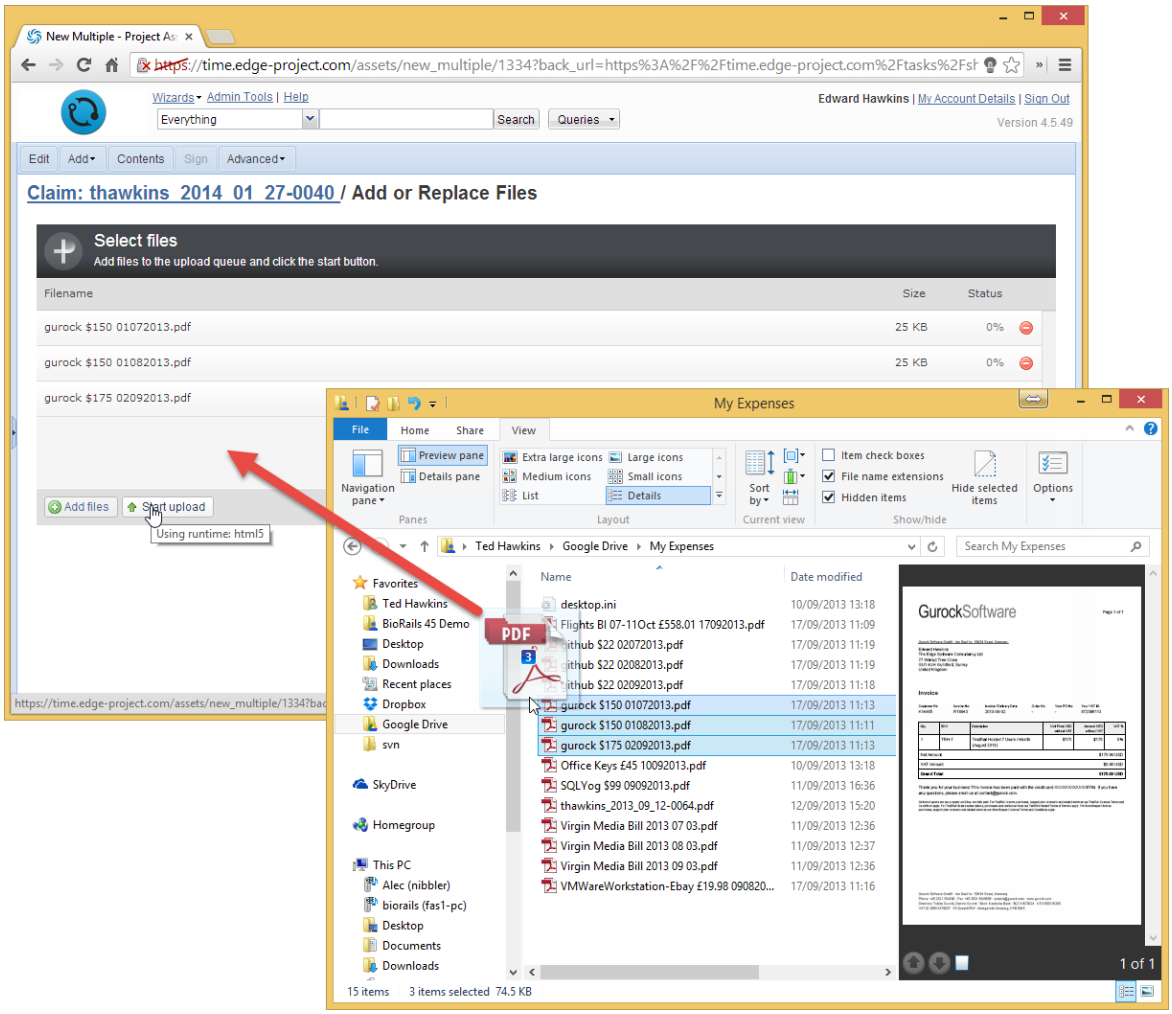
2.1.5.2 Mileage Rates Template

Mileage rates are set annually according to the rules set by HMRC:

- Year (Integer)
- Mileage1 (Decimal) - Single occupancy rate
- Mileage2 (Decimal) - multiple occupancy rate

2.1.6 File Management

Receipts are scanned as images or PDF files and attached to the claim. These are handled as version controlled content.



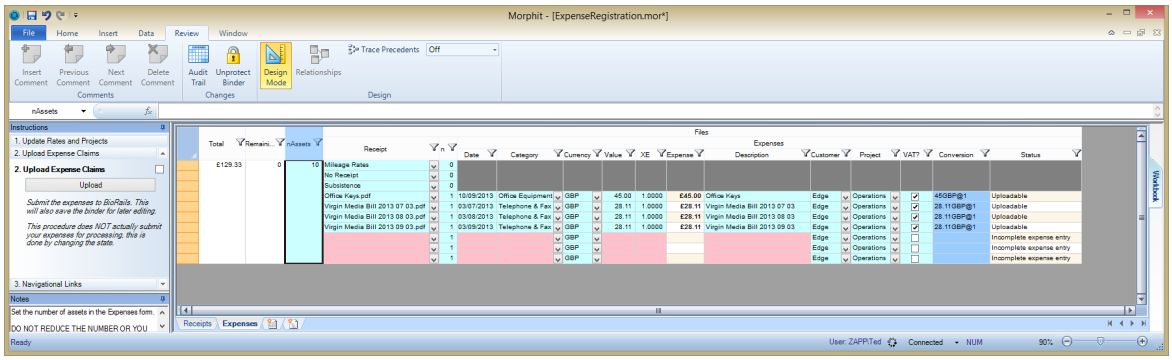
Attaching receipts to a claim

2.1.7 Expense Registration

The entry of expenses was streamlined using a Morphit binder in which the user enters one or more expenses for each receipt, adding the following information:

- Date
- Category
- Currency
- Value
- Description

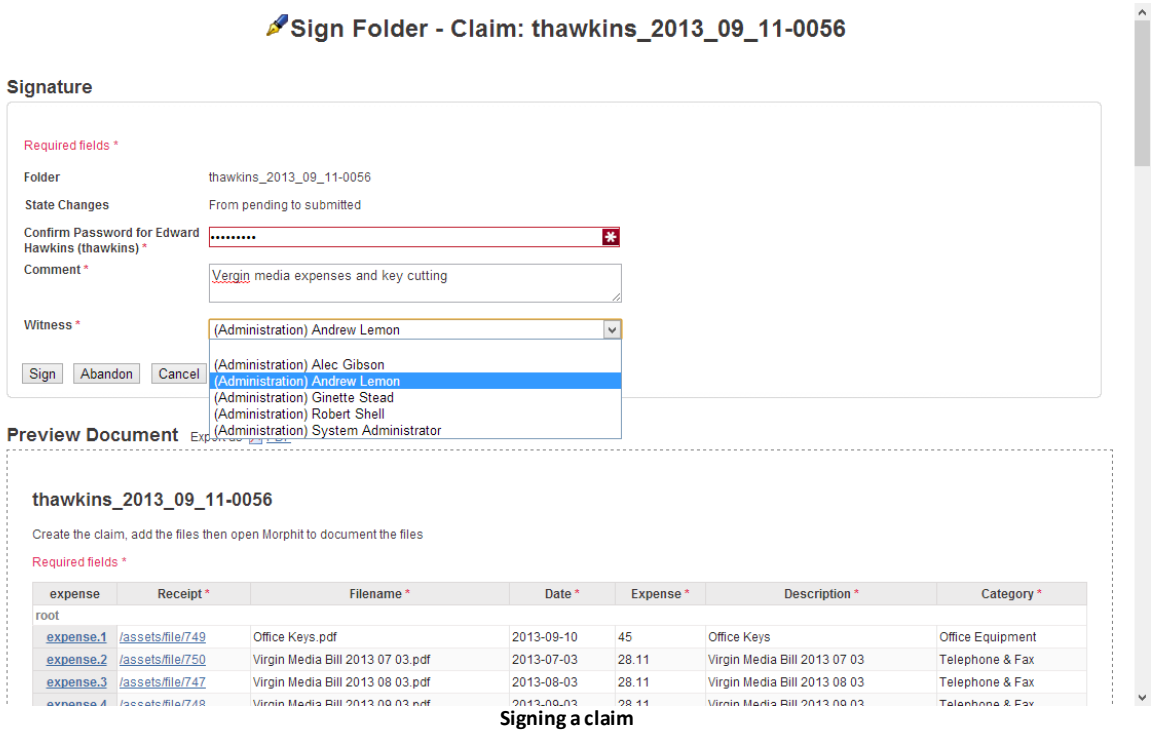
The Morphit binder calculates the actual expenditure in GBP using current exchange and mileage rates. When the binder is saved details of the claim are stored in the Morphit Enterprise database.



Entering expense details

2.1.8 Submission

When the claim is complete the user signs it and submits it to their line manager, who then receives an email notification. The line manager reviews and counter-signs the claim, making it read-only and ready for payment.



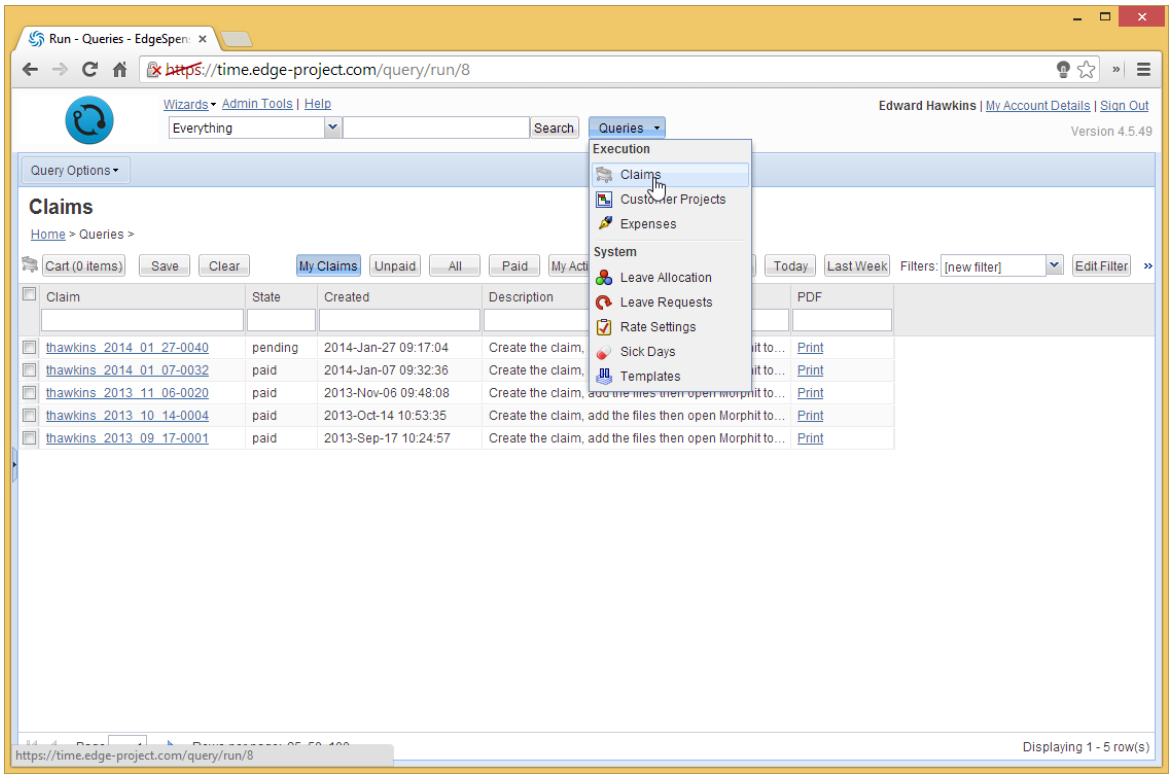
Signing a claim

2.1.9 Payment

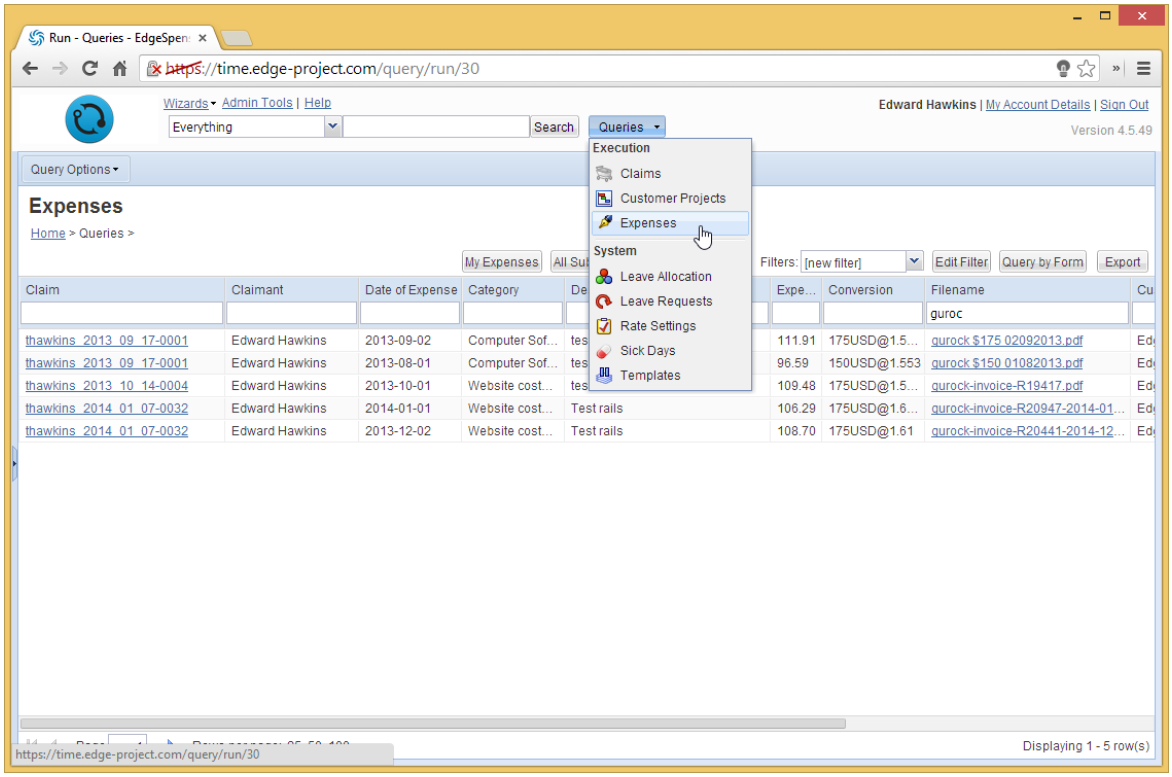
Every month, finance personnel will take a report of submitted claims and review them, and if they deem them valid make payment. Each claim is printed to a PDF, which is stored in the long term archive. The claim is marked as paid.

2.1.10 Expense Reporting

Details of all claims and expenses can be searched and reported on.



Claims report



Expense report

2.2 Leave

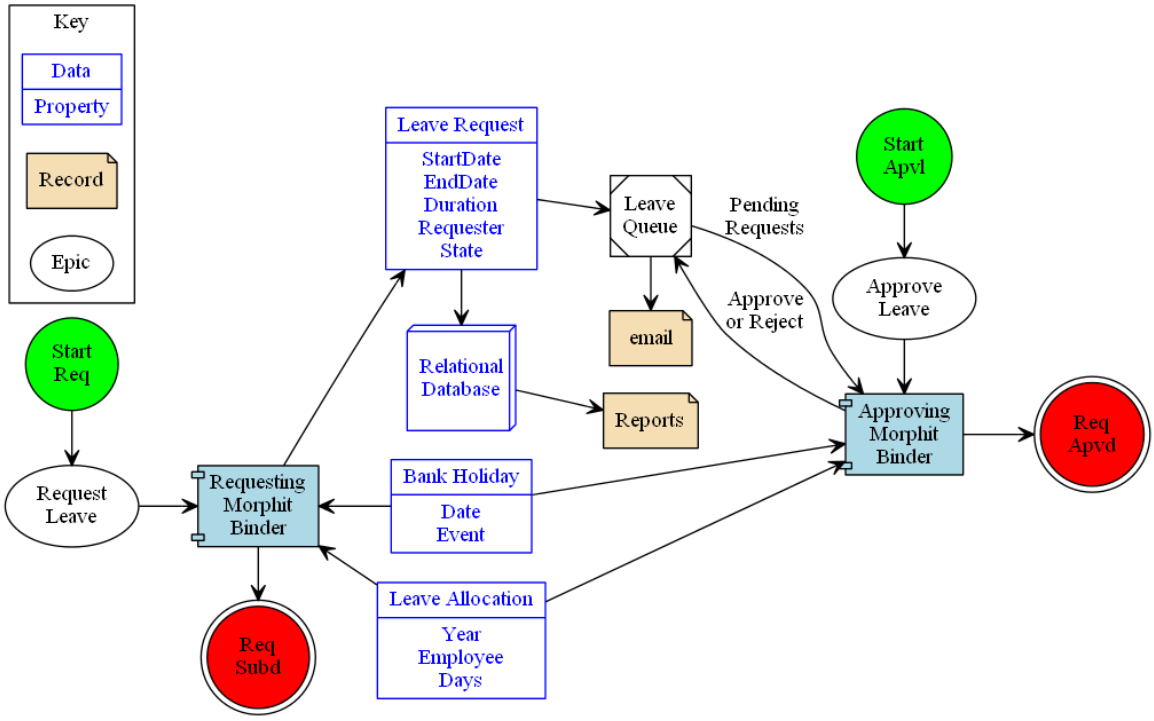
Company growth has demanded a more formal method of approving leave, generating the following requirements.

2.2.1 Requirements

- **Available days** - When requesting leave the employee must be made aware of their total and remaining leave allocation.
- **Days required** - The system must account for weekends and bank holidays
- **Cancellation** - Employees should be able to cancel requests
- **Approval** - Leave requests must be approved by the employee's line manager based upon the number of remaining leave days.
- **Notification** - Employees should be notified when their leave request is approved or declined.
- **Reporting** - The system should provide management reports for resource planning.

2.2.2 Implementation Overview

Implementation was split between requesting and approving leave.



Leave request and approval work flow

2.2.2.1 Requesting Leave

A leave request is created by the employee. A Morphit binder is used to register the details of the required leave. This binder leverages centrally managed information such as current bank holidays and employee leave allocation. The employee then submits the leave request to their line manager for approval.

2.2.2.2 Approving Leave

The line manager receives by email a daily summary of leave requests. A Morphit binder is used to review all pending leave requests and approve or reject them. The employee receives an email notification of the decision.

2.2.3 Requests and Queues

In order to meet the business requirements the solution uses the requesting features of Morphit Enterprise. Requests consist of a list of items (employees) and a business process (leave request). The person providing the business process being requested manages a queue of requests processing the items.

2.2.4 Supporting Templates

The leave system relies on a number of centrally maintained tasks which hold data for UK bank holidays and employee annual leave allocations. These can only be updated by those with administrator rights.

2.2.4.1 UK Bank Holidays Templates

UK bank holidays are stored with the following data:

- Year (Integer)
- Date (Date)
- Description (Text)

2.2.4.2 Annual Leave Allocation Templates

Employee annual leave allocations are stored with the following data, which is confidential information and can only be seen by the relevant employee -

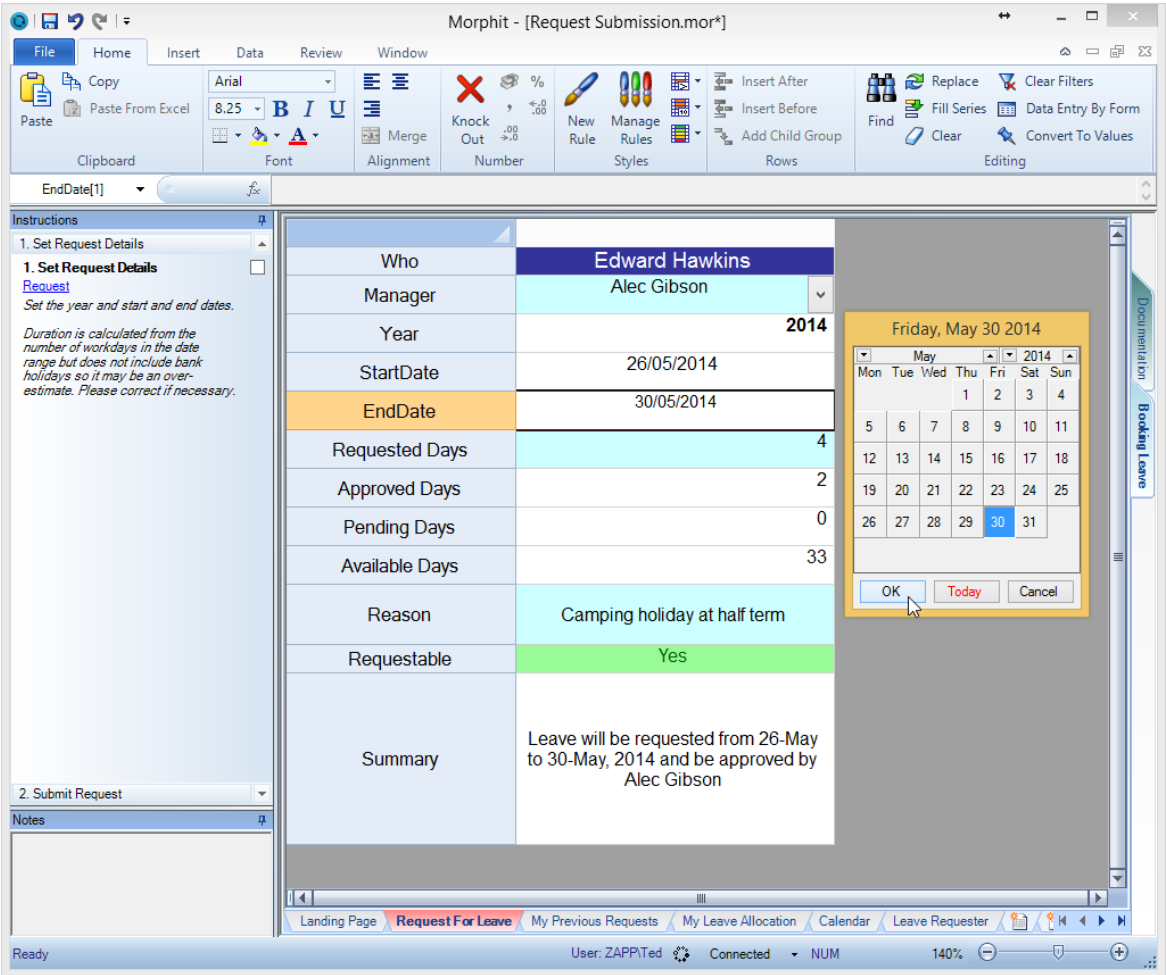
- Year (Integer)
- Who (Dictionary)
- Leave_Duration (Integer)

2.2.5 Leave Request

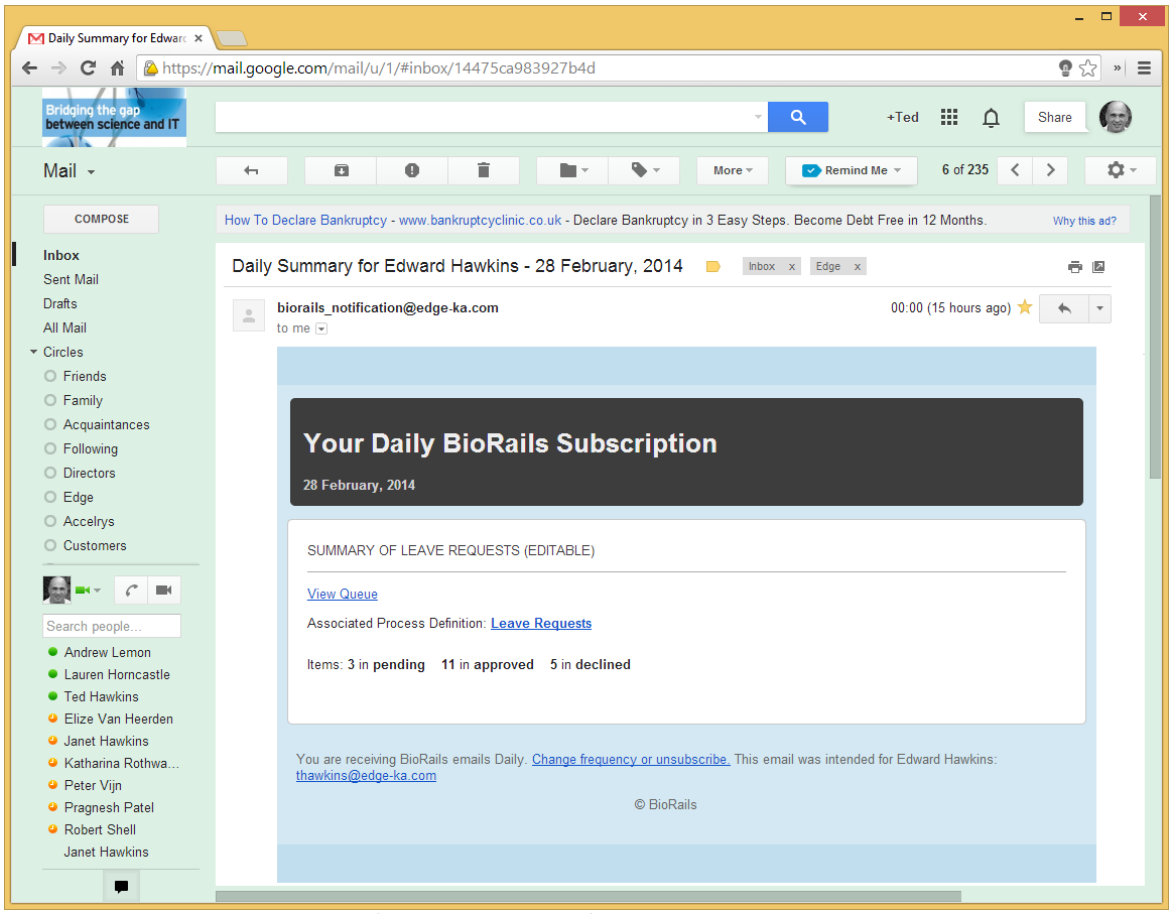
The employee logs onto Morphit Enterprise and launches the ‘Leave Request Binder’, which is automatically updated with details of their holiday allocation and the status of their previous requests.

The employee enters the start and end dates of their leave, and the binder then calculates for them the number of days actually required, taking into account working days and bank holidays. They are instantly provided with a total of approved, pending and available days for the current calendar year and prompted for a reason for the leave.

When the ‘Submit’ button is pressed the information is submitted to a ‘Leave Queue’. An email notification is sent to their line manager informing them that there are new requests to approve.



Morphit helps the requester request leave by providing up to date information at point of need and automatically takes into account weekends and bank holidays

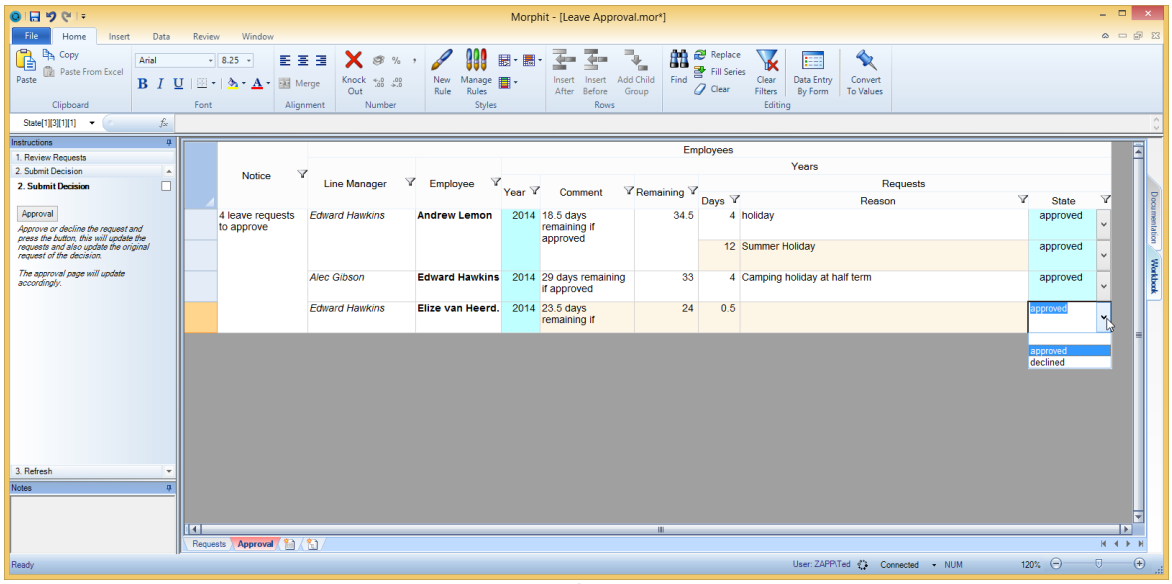


The line manager then launches the 'Leave Approval Binder', which is automatically updated with all the pending leave requests. The binder then calculates the remaining leave days currently available for each employee and the projected number of days they have remaining if the requests are approved.
The line manager can approve or reject the leave request and the system will send an email to the employee informing them of the decision.

2.2.6 Approval

The line manager then launches the 'Leave Approval Binder', which is automatically updated with all the pending leave requests. The binder then calculates the remaining leave days currently available for each employee and the projected number of days they have remaining if the requests are approved.

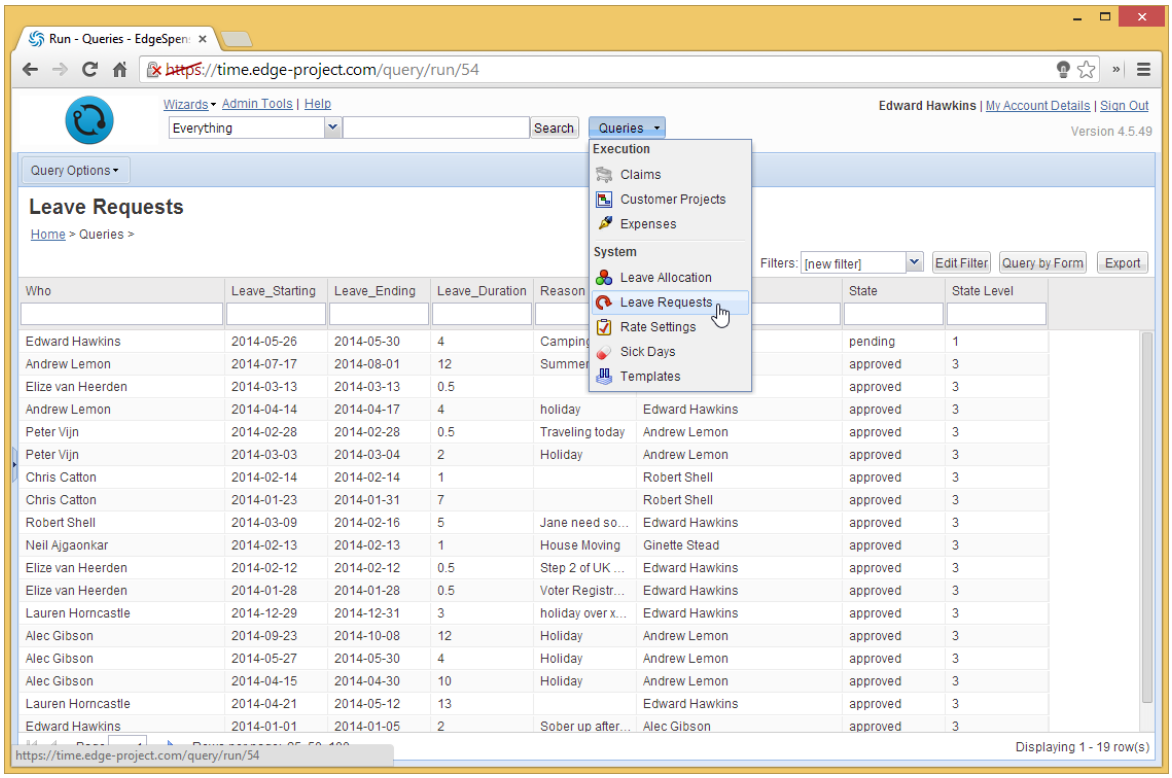
The line manager can approve or reject the leave request and the system will send an email to the employee informing them of the decision.



Approving a number of pending leave requests

2.2.7 Reporting

Details of all approved and rejected leave requests can be searched and reported against. Access to these reports is restricted to employees with line management responsibility.



Leave request report

2.3 Sick Days

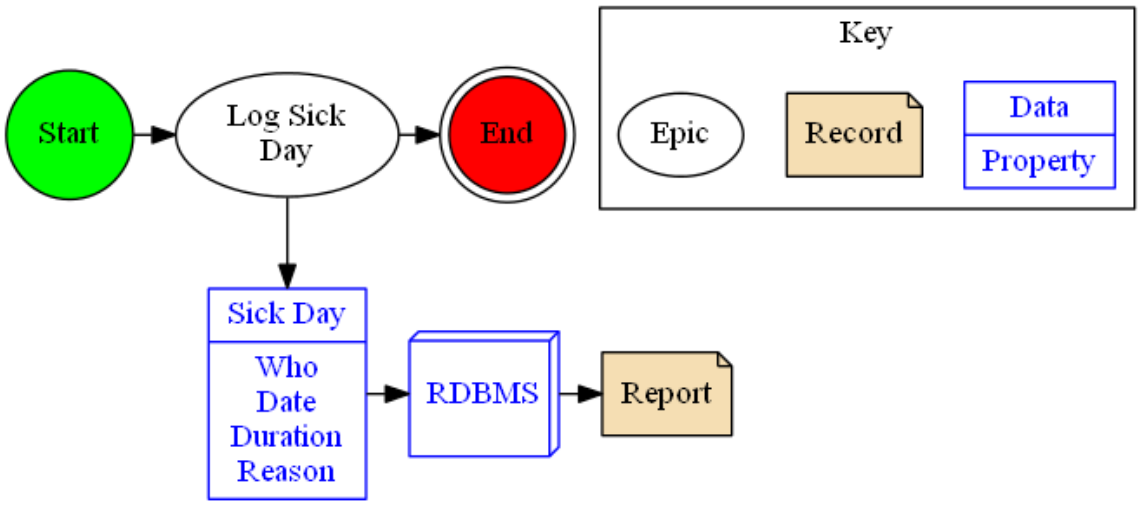
In reaction to an increase in the number of employees, we required a system for tracking sick days in support of the company's sickness policy. This generated the following requirements.

2.3.1 Requirements

- **Logging** - The line manager must be able to log sick days for an employee with dates and reasons.
- **Reporting** - Management must be able to review sick days by employee.

2.3.2 Implementation Overview

Logging of employee absence (sick days) was achieved using simple tasks in the Morphit Enterprise web application without the need for supporting binders.

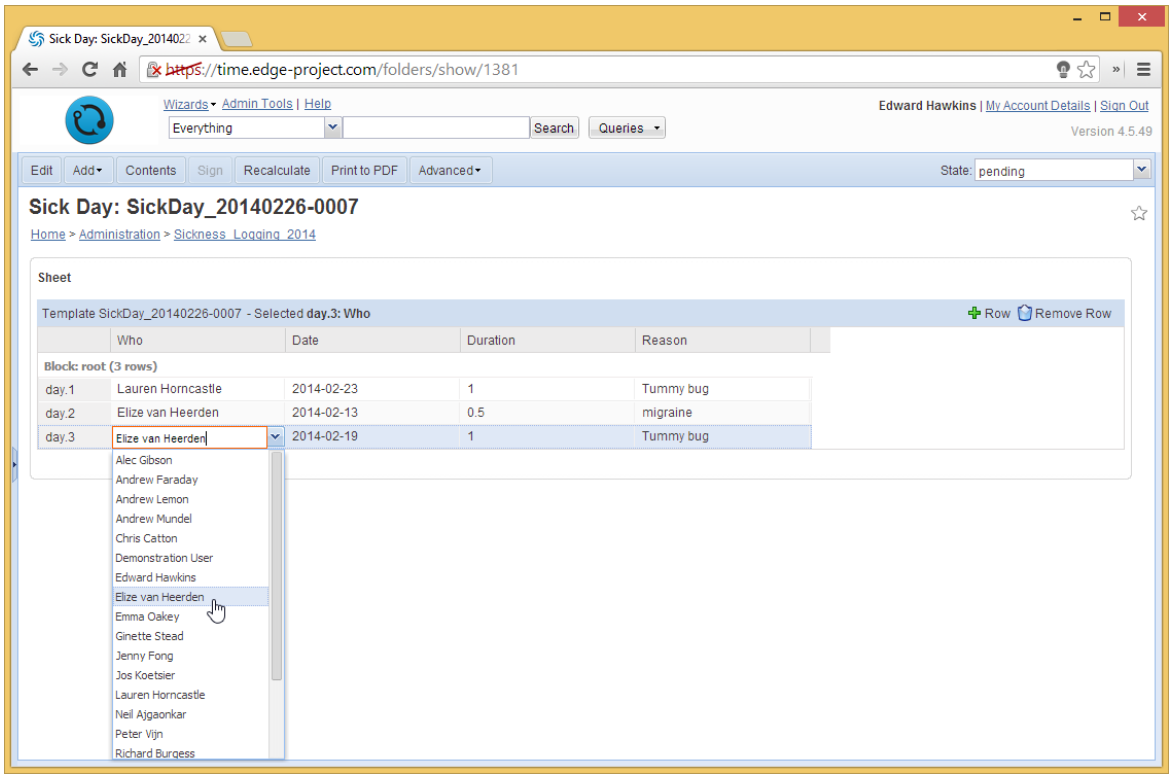


Work flow for logging sick days

2.3.3 Sick Day Template

Employee absence or 'Sick Days' are stored with the following data:

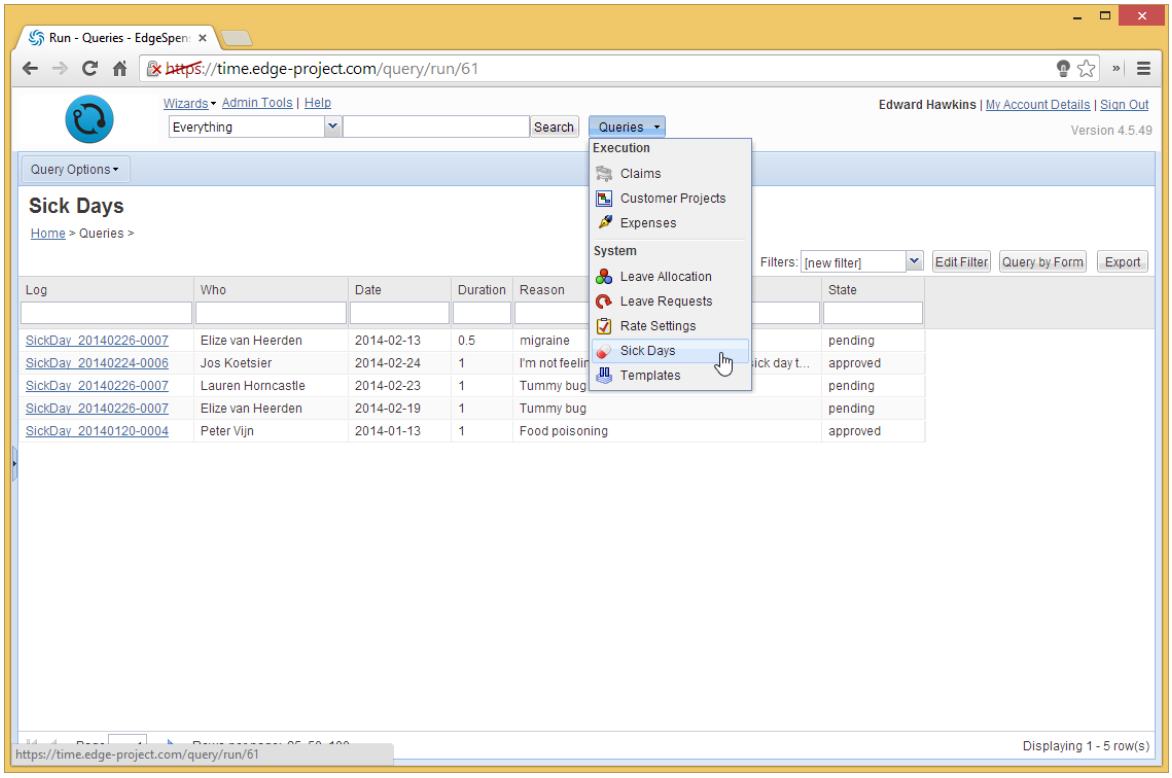
- Who (Dictionary)
- Date (Date)
- Duration (Decimal)
- Reason (Text)



Sick day task

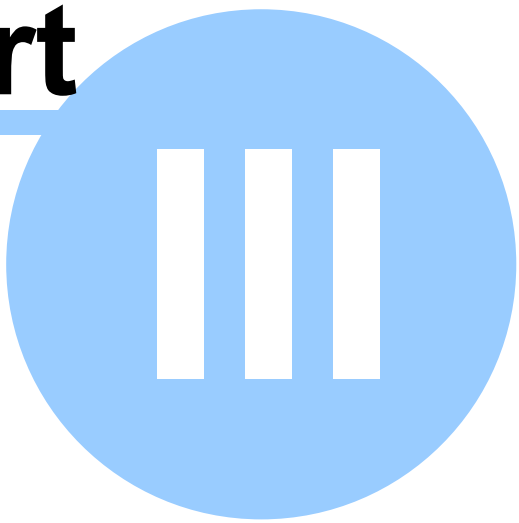
2.3.4 Reporting

Details of all logged sick days can be searched and reported on. Access to these reports is restricted to employees with line management responsibility.



Sick days report

Part



3 Results And Conclusions

3.1 Knowledge gained

In these sections will describe the lessons learned in terms of usability issues, controlling scope and added value provided by desktop applications and why documents alone are not enough.

3.1.1 Usability Issues

Despite the main users of this application being developers or expert application users, it can never be too simple. The application was simplified, without disrupting the primary use cases, by removing as many decisions points as possible.

3.1.2 When is it Good Enough?

The effort made in capturing user requirements and design, combined with an agile methodology, meant that change was accommodated and it was clear when the project was ready for production.

3.1.3 The Added Value of Desktop Applications

Morphit spreadsheets proved invaluable as they allowed expert users to implement complex business models quickly and without the need for software development and deployment.

3.1.4 Documents Are Not Enough

The use of centralized storage and deployment of documents, combined with structured data and workflow, enabled the system to scale from being a point solution to an enterprise one.

3.2 Planned Improvements

Based on the success of the project, extension to other financial operations such as customer quotations, project estimates and invoicing is being considered. This will allow tracking of company finances and modelling of future revenue growth.

3.3 Conclusions

Morphit Enterprise is adaptable enough to apply to generic business problems. The scientific pedigree of the software provides extensive support for numeric data recording, making it applicable to finance and engineering domains. The system overcomes many of the problems associated with document based systems, and enables spreadsheet solutions to be deployed and managed across large groups of users. It does this without the usual issues of change control and maintenance, thus minimising the total cost of ownership.

Part IV

4 Biographies

4.1 Ted Hawkins

Ted Hawkins is both the VP of Product Delivery and a founder of The Edge Software Consultancy Ltd., where he is responsible for setting product direction and the delivery of systems to customers. Ted has been implementing data management and spreadsheet solutions to researchers in drug discovery since 1996. This has included validated environments with roles encompassing project manager, business analyst and 'spreadsheet guru'. Ted gained a Ph.D. in environmental physics and entomology from Nottingham University, in 1995, where he was first exposed to the use of relational databases. Before that, in 1992, he received an M.Sc. in environmental pollution from the University of Manchester, where he first started using spreadsheets seriously for population dynamics. This followed on from a B.Sc. in Biology (Hons) in 1990, also from the University of Manchester, where he received his grounding in the biological and statistical sciences and lost his hair.

4.2 Andrew Lemon

Andrew Lemon is a founder and chief executive officer of The Edge Software Consultancy Ltd. He is business lead, focusing on business development and marketing whilst maintaining his consulting portfolio. A specialist in life science informatics, Andrew has been focusing on helping organisations to implement and maintain sustainable systems and business processes for over 18 years. He has experience covering the full product life cycle, from inception to replacement. Andrew works with leading pharmaceutical and biotechnology companies from around the globe, analysing their processes and implementing solutions. He has a PhD in Computational Chemistry from the University of Bath and has been in the scientific software industry for all of his career.