BigSpender

Task for the CPSA-Advanced Final Task

Information System

Content

Abstract for the task

Design a system for the complete process of handling expense claims electronically – from scanning in and archiving the receipts to approving the expenses, including queries, and paying out the expenses with the next wage payment – which also fulfills auditing requirements.

Case study BigSpender

Overview

The return of the "expense account squanderer"

Stefan R. (sales representative at BIG PLC) returns to his place of work on Fridays after spending a stressful week traveling. He has visited customers and presented his company's new products to them. He naturally also dined with them (Stefan's now worried he's put on weight, but that's a separate issue).

Stefan's colleagues call him an "expense account squanderer" as he spends a lot during business trips. His boss doesn't comment, because Stefan's simply unbeatable as a salesman. However, sometimes Stefan's boss does ask whether he really needs to spend so much money on the road.

Stefan slips the receipts for airline tickets, hotels, taxi rides, and the expenses for dining with his customers into an envelope, marks it with the word "expenses" in large letters, and throws it into the in-tray. He doesn't want anything more to do with it.

The consultant

Daniela S. and her colleagues work as consultants on projects where they install BIG PLC's systems for customers. The customer pays for Daniela's involvement. The expenses that Daniela incurs on the road are charged to the customer 1:1. It's important that the invoice is correct as Daniela's customers are skeptical.

Daniela, too, observes the Friday ritual: Collect receipts, slip them into an envelope, write the project name on the front, throw them into the in-tray. In terms of this task, she is also an "expense account squanderer", even if her colleagues don't call her that.

What is BigSpender?

BigSpender is an accounting system for expenses. For BIG PLC, the workload involved in processing the expense receipts has simply become too big, so Big commissions its IT department with creating a new system to handle expense claims electronically. It should cover the complete process from scanning in and archiving the receipts to approving the expenses, including queries, and paying out the expenses with the next wage payment. The customers of BIG PLC should receive correct invoices that include the expenses. Auditors must be able to verify what happened with the expenses in each individual case in the event of a company audit of BIG PLC by the tax office.

The task

BigSpender is an idea, it currently only exists in people's minds. CFO Manfred Schneider is planning to put the system into operation next year. On the following pages, you will find information about the environment and the requirements. Your actual task – a solution design for BigSpender – can be found following that.

Business context

The following diagram shows from a business viewpoint with whom the future BigSpender system (shown in the middle) should interact:
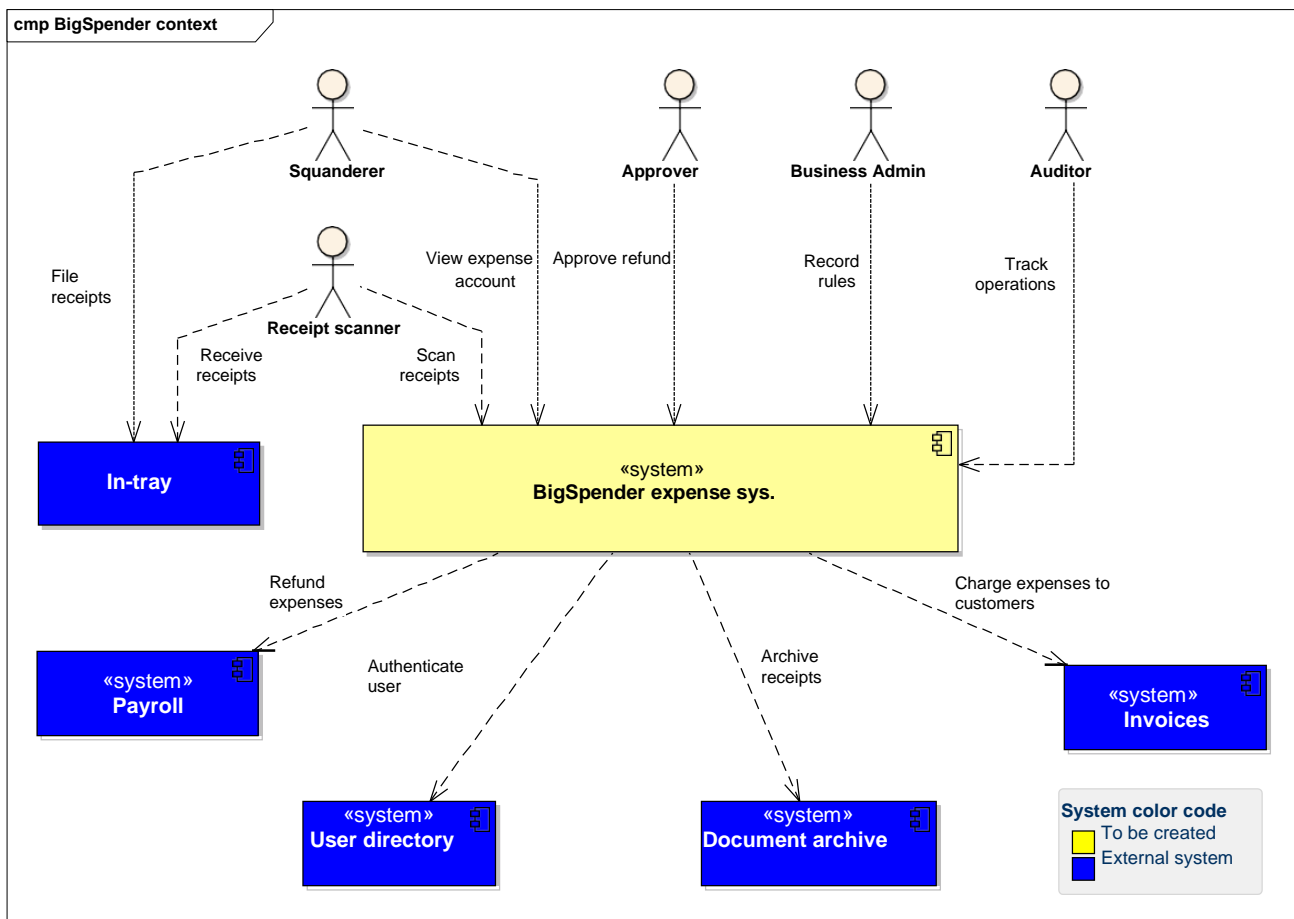

Brief description of the actors (users, external systems):

- Expense account squanderer: has receipts for the incurred expenses. They would like to have the expenses reimbursed and take a look at their expense account now and then.
- Receipt scanner: user who scans in and files the receipts and allocates them to the customers or projects in the system.
- Approver: usually a supervisor. They take a look at the expenses, approve them, or send queries to the expense account squanderer.
- Business Admin: employee who is responsible for ensuring that the system can make the majority of expense decisions autonomously and correctly. They set rules for this in the system.
- Auditor: employee who traces individual expense claims, for example for a company audit by the tax office, but also for internal reasons.
- In-tray: a physical container for the envelopes with the expense receipts.

- Payroll: external system, SAP-based, settles the wages of the employees and also pays out the expenses.
- User directory: external system, contains the user data (name, department affiliation, role in the department, etc.).
- Document archive: external system that electronically stores and retrieves documents (i. e., also expense receipts).
- Invoices: external system, SAP-based, which creates invoices for the customers of BIG PLC.

Class model and glossary

The following diagram comes from an initial analysis session with the customer and offers an (as yet very simple and incomplete) overview of the business.
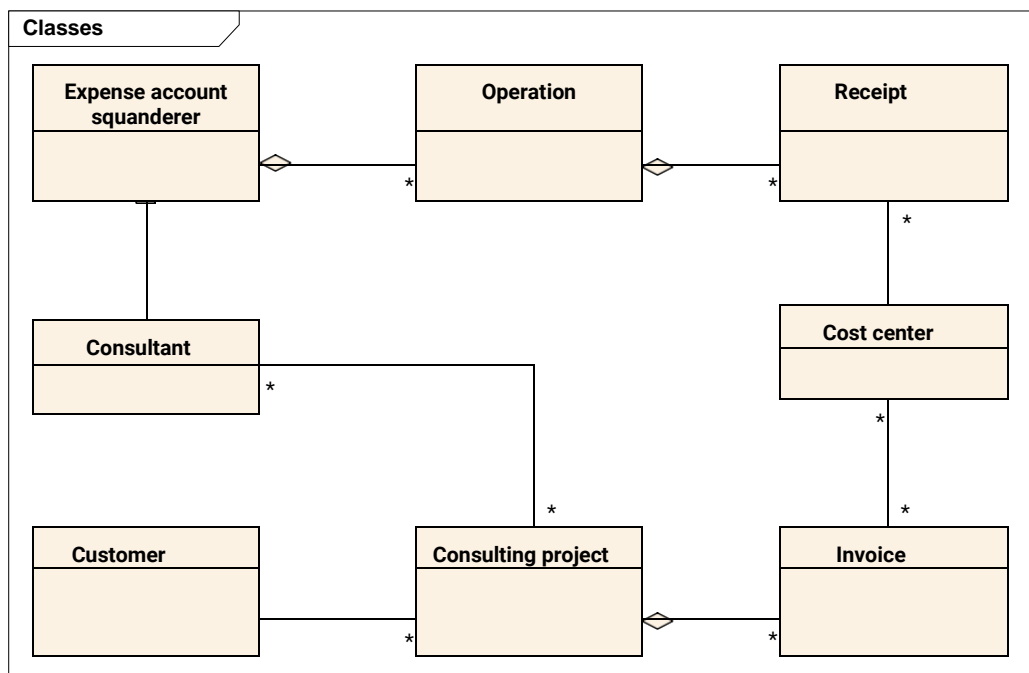
Term	Explanation
Expense account squanderer	Employee who has incurred expenses
Operation	Occasion to which several expense receipts are to be allocated, e. g., a trip to work on a project, a visit to a trade fair, or a sales campaign
Receipt	A document showing money spent, e. g., an airline ticket, a train ticket, a taxi receipt, a hotel bill, a restaurant bill
Cost center	Accounting object with the task of collecting costs that are to be allocated to a certain topic, cost type, period of time, or department
Customer	The person who must pay for the services of BIG PLC
Consulting project	A project involving consultants from BIG PLC
Invoice	A combination of services that have been rendered as part of a consulting project, together with information about the fee and expenses

Stakeholders

- Users of the system
- Data center that operates the solution
- Chief Financial Officer (CFO)
- Customers
- Development team

Interview with the client – CFO Manfred Schneider

As Manfred Schneider acts as the client, binding requirements on the system are explained in the following interview.

Question: Mr. Schneider, what exactly is BigSpender?

Answer: With BigSpender, we want to finally put an end to the large workload involved in processing expense claims. Employees should be able to simply submit their receipts as before. However, our accounting departments, which have previously been completely overwhelmed by this, should only need to scan in the receipts – everything else should be done for them by the system.

Up to now, my people in accounting have had to carefully examine the expenses, look at the proportion of tax and the monetary benefit, take into account the non-refundable proportion of catering expenses, and then reimburse the correct amount. And all of that with tax regulations that are constantly changing – simply a nightmare! (makes a pained expression)

In the future, most of that should be done by the system. The employees have their expenses refunded or are sent a query if something is missing or unclear. The customer receives an invoice that also includes the consultants' expenses. Many things have previously gone wrong there, which has then caused further work for the accounting department when handling queries. We want to put an end to that now.

Q: What about the data that isn't on the scanned receipts but is still needed for the tax office?

A: You mean travel time, destination, and the like. These should be entered when the receipt is scanned in, before the trip is allocated to a cost center.

Q: Are you focusing on the German-speaking world with BigSpender?

A: No, it needs to work worldwide! As you know, we have up to 1,000 employees at any one site and we are present in 13 countries, including in the Americas, Europe, the Middle East, and Asia. Our consultants, who return from projects in London, New York, and Singapore, have incurred expenses in various currencies. This needs to be booked and converted correctly.

Q: What does a typical user want? What's important to them?

A: The **expense account squanderers** want to "just quickly" get rid of their receipts and think

no more about them. And they shouldn't do either, as their working time brings us direct turnover. An automatic decision can be made up to a certain amount, which is specified per expense account squanderer or per department.

Supervisors definitely don't want to be bothered with every single operation, but just make a decision about approval above a certain scale. The cut-off point for this naturally differs from department to department. If an **approver** now has a query for an expense account squanderer and the answer only comes back in a few days, they naturally don't want to have to trudge through the whole history of the case, but just want to be shown quickly by the system what it's all about. Managers reserve very little time and space in their heads for this, that's important!

The **auditors** are different. They are "bean counters" and really want to be able to trace every detail of an operation. And they need to. If the tax office has performed a company audit at one of our customers and then wants to compare the expenses with us, this must take place quickly and nevertheless precisely and transparently. At least here in Germany. Different customs sometimes apply in other countries – do you know what I mean?

Q: I think so, but: compliance is also an issue there, isn't it?

A: Absolutely right. And yet: It's sufficient if the BigSpender system manages the relevant rules that apply to expense claims and if it can be made country-specific where required. You don't have to shout compliance from the rooftops, but you also mustn't lose sight of the **auditors**. Our main addressees are nevertheless the **expense account squanderers** and **approvers**!

Q: Are there external systems that need to be integrated?

A: We drew up this system context together. Our **payroll system** needs to be integrated so that the employees get their expenses back. The **invoice system** also needs to be connected so that the expenses are added to our customers' invoices. All of the employees are entered in our central user directory. As only one password may be required per person, it's important that BigSpender contacts the **user directory** as soon as it's a matter of logging a user in. And, last but not least, our **document archive system**. We use this for all of the documents that we want to keep electronically, i. e., also for expense receipts.

Q: What about the user interfaces?

A: The users interact with the system in three areas: The document scanner slides the receipts into a scanner. They only need a very simple user interface to specify who the receipts are from and which cost center they are for. The second interface should be available as intranet websites. The expense account squanderers can look on the intranet to see what the situation is in their expense account and respond to any queries from the approver that have been sent to them by e-mail. The approvers also work with this intranet web application. The third place is the e-mails themselves: In terms of their content, it has to be possible to save templates in the system with placeholders that are then filled in by BigSpender using the real data from the expense operations.

Q: The thing with the e-mails isn't very clear to me. How does that work exactly?

A: BigSpender sends e-mails to those involved in the workflow. If for example an approver

discovers that something isn't right or is incomplete in the submitted expense receipts, they write down a couple of questions about it. BigSpender saves the questions and notifies the expense account squanderer by e-mail that there's a query about their expenses. The e-mail contains a link that allows the expense account squanderer to access the respective operation in the system with one click. The expense account squanderer answers the questions directly in BigSpender and completes the response. In that moment, BigSpender sends another e-mail to the person who asked the question, i. e., the approver. It continues like this back and forth until everything has been cleared up and the approver approves the operation.

Q: How does BigSpender know that it can decide about certain expenses itself and the approver doesn't need to be involved at all?

A: Our Business Administrator sets corresponding rules for this. They can set, for instance: "If expenses are incurred for project X that are less than Y euros in total at the end of the week, then approve immediately and don't query." Or vice versa: "If expenses are incurred that deviate from the weekly average of project Z by more than 20%, then trigger a question to the approver." This way, our approvers are not bothered with every little detail and are nevertheless involved in good time.

Q: Is designing the intranet website also part of our task?

A: No, we're working on this with an agency. They will then provide you with HTML pages, the image material, … The first presentable versions are already available.

Q: Does the site need to be highly available?

A: I don't know exactly what that means. It's obviously inconvenient if the intranet site is unavailable. But expenses are not necessarily time-critical: Their processing can be delayed until the site is back online. What, however, would be completely unacceptable is: If an approver reviews and comments on an operation, the site suddenly disappears, and they then have to start the workflow from square one again.

Q: What may happen to the data if BigSpender ever suffers a catastrophic failure?

A: During a failure, the system – as already mentioned – can be unavailable for a certain amount of time. However, we should be able to back up and restore the data in an appropriate manner. We can probably cope with a loss of data over the last 24 hours. But we need to be able to reallocate data to an operation if it has already been entered and confirmed.

Q: How will the launch work and what do you expect for the future of BigSpender?

A: We first want to start small in three very different countries to ensure that our initial perspective isn't "too German". Then we'll gradually add other countries around the world.

Even once everything is up and running, we'll still not be finished! Legal requirements change frequently, and we need to be able to constantly adjust the rules in the system. It's also possible for the structure of our organization to change. Or we could acquire other companies, which we would then need to integrate. Consequently, BigSpender needs to be

flexible and be able to cope with all of that.

Q: When do you plan to go live?

A: In 6 months. I hope that's not too ambitious. But, as I said, only in three countries at first. We have 950 person days of work available in the development team until then.

Q: Thank you very much for the interview!

Examplary user stories

The following user stories provide an impression of the required functionality.

- As a receipt scanner, I want to scan expense receipts in, save them in the system, and allocate them to a cost center.
- As a receipt scanner, I want to save additional travel data in the system and allocate it to the scanned receipt.
- As an expense account squanderer, I want to be able to look in my account to see which of my receipts have already been recorded, which have been approved, and which have already been paid out.
- As an approver, I want to be informed by e-mail about any operation that needs approval, but only if the expense amount exceeds a specified limit. I want to access the operation with just one click in the e-mail.
- As an approver, I want to be able to send a query about an operation to the expense account squanderer.
- As an approver, I want to be notified by e-mail once an expense account squanderer has responded to my query. I want to access the operation with just one click in the e-mail.
- As an expense account squanderer, I want to be notified by e-mail when there are queries about one of my operations in the approval process. I want to access the operation with just one click in the e-mail.
- As an auditor, when I'm presented with a customer invoice for auditing, I want to be able to immediately find the associated expense receipts and have them displayed in a readable form so that I can compare them with the invoice.
- As an auditor, I want to be able to send a query about existing expenses. (Note: in principle, implement as for the approver, the handling of e-mails and operations in the system is analogous).
- As a Business Admin, I want to save or change tax regulations in the system.

Availability of the system

If one of the external systems (payroll, document archive, or invoices) is unavailable, BigSpender must nevertheless continue to work correctly.

Technical constraints

The intranet is based on Windows servers, the user directory is accordingly a Microsoft Active Directory. The browsers use NTLM to authenticate the users.

Quantity structure

	Expected quantity
Users	100-1000 per location
Locations	25
Receipts per operation	5
Operations per person and week	80%: only 1 operation 20%: up to 5 operations
Storage requirement per operation	1.5 megabytes

Your task

As part of this task, you design an architecture for BigSpender on the basis of the presented information. You record your decisions clearly in the appropriate areas in the subtasks. You have the freedom to make assumptions that are in line with the task definition and help you clarify open issues, even without feedback from stakeholders. You record your assumptions in the same way as your decisions. In doing so, ensure that these do not conflict with each other or with the task definition!

Subtask 1 – Quality requirements

Derive quality scenarios from the case study and allocate content-related importance to them. Create a utility tree showing the connection with the relevant business features. Filter out the most important quality goals and give these a weighting. Please show which quality features are influenced by which quality scenarios.

Expected results:

- 3-5 quality goals as a table, quality feature for each objective and brief motivation behind the objective (2-3 sentences per objective) as well as the weighting of the objective
- A formulated quality scenario per quality goal, each with business importance
- 1 utility tree as a graphic

Subtask 2 – Solution strategy

Describe the solution strategy that guides your design for the BigSpender system. You should thus convey to all stakeholders the key constraints, assumptions, and basic principles that underlie the design decision.

Expected results:

- This can optionally be in the form of a table or as pure text.
- If you do not use any tables or diagrams, limit the description to 3-4 short paragraphs or up to one A4 page.

Subtask 3 – Technical context

Create a technical context for BigSpender. Identify all of the users, devices, and external systems, including those that are technically motivated and are missing in the business context view (above). Decide which parts you would develop yourself as part of the project, and which you would buy in (or use as open source) and distinguish these accordingly. Also state the communication mechanism for each connection between technical nodes.

Expected results:

- Context diagram
- Short descriptions of the actors and systems shown (each 2-3 sentences)
- Statement of the communication mechanism as a label at the connections between the nodes shown
- Overview of the purchased and open source parts

Subtask 4 – Business structuring

Develop and visualize a rough business structuring of the BigSpender system. Name the individual system parts and their responsibilities and define how the individual parts interact. Select a suitable level of granularity for the presentation.

Expected results:

- Business building block view with the decomposition of the system into business subsystems
- Visualization including dependencies
- Short descriptions of the responsibilities of the building blocks shown (each 2-3 sentences)

Subtask 5 – Technology decisions

Roughly define a technology stack that maps your design on real IT and describe it (programming language, operating systems, database technologies, communication mechanisms, etc.).

Then explain and rationalize how you will technically ensure the quality goals you identified in subtask 1, and which of the elements and mechanisms offered by your technology stack you are using in your solution.

To make it as specific as possible, please pick out **one** user interaction with the BigSpender system and describe precisely how it works and what parts of the system are involved. In doing so, show which of these involved parts you have made responsible for compliance with the quality goals in your solution and how these parts actually ensure compliance with the quality goals.

Also deliver a tabular step-by-step presentation of the workflow for the **one** interaction, whereby each row of the table describes one step in the system. Three columns of the table answer the following questions for each of these steps:

1. What happens in this step?

2. Which parts of the system are involved? (e. g., state the business components, infrastructure components, frameworks, layers in the system, etc.)
3. What contribution towards achieving the quality goals do these system parts make in this step?

It should be possible to see from this what strategies you have chosen to ensure the quality goals and what "concert of system parts" you will bring about to do this.

Depending on which technology stack you have chosen, the following aspects will have a different effect:

- Client technologies: User interfaces, processing of user inputs
- Server technologies: Request processing, workflow control
- Persistence technologies: Saving, ensuring data integrity
- Communication technologies: Clients to servers, servers to external systems
- Security technologies: Authentication, authorization, multi-client capability

Select a suitable presentation of the technology stack and ensure that it is possible to see how the technology is used.

Subtask 6 – Evaluation

Identify from your quality scenarios (subtask 1) the top 5 riskiest and most important scenarios and cover each of these with decisions or refer to decisions that have already been made.

Expected results:

- List of (in your view) the top 5 riskiest and most important scenarios
- Rationale as to why you have selected these specific scenarios
- For each scenario, a short textual discussion in which you
  - Refer to central decisions in your architecture that address this scenario,
  - Submit any decisions that have not yet been presented, where applicable
  - Counter any risks
  - Highlight any tradeoffs

Bear in mind in your solution

- The general examination criteria (see iSAQB website) apply. These make statements, for instance, about the form and extent of your solution.
- You are not expected to design the solution right down to the smallest detail. The problems that you consider to be central should, however, be handled and, where possible, also resolved.

How to handle open issues

In this task definition, requirements are sometimes formulated in a vague or imprecise way – as is also the case in many real systems. Unlike reality, however, you have no real stakeholders available to clarify these questions during the task. In such cases, we recommend:

- Make assumptions – and justify them.
- If you have corresponding background information available to you, you are welcome to use this (stating the sources).
- If you believe that open issues pose technical risks, or even jeopardize the achievement of the business objectives, you should expressly indicate them. Suggestions to minimize such risks are appreciated.