Project Guide **2IO71**
Design Based Learning – Information Systems

2012/2013 kw4

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This project guide gives an overview on the project course 2IO71 **Design Based Learning – Information Systems**, explains the project assignments, gives hints on how to run the project, and information about the grading.

Contents

1 The Assignment

Information Systems are the backbone of the business operations in all kinds of companies and enterprises that need to keep track of orders, materials, customers, suppliers, requests, financial data, etc. The purpose of an information system is to store, process, and provide information to employees, customers, and other business stakeholders. In particular, the right information should be available to the right person at the right moment in time. If information gets lost or is dealt with in an improper way, companies and enterprises suffer from loss in income and revenue or damages, and customers do not get the products and services they ask – and pay – for. For this reason, designing information systems that operate error-free and satisfy all stakeholder requirements is a critical operation in today's companies and enterprises.

1.1 Background: Designing Information Systems

An information system typically consists of multiple, complex software components such as a database, a user interface, and a processing engine. The processing engine contains the rules to show or request information on the user interface, to transform and process information, and to query and store information in the database. All components have to designed, connected, and configured in a way that they interoperate error-free and their joint functionality satisfies all stakeholder requirements.

There is no general purpose information system. Rather, an information system has to be custom built and configured for each business individually, taking into account specific customer demands, legal requirements, employee knowledge and habits, and finally how the very business operates. This highly specific design of an information system implies very high development costs. By 2011, implementing an Enterprise Resource Planning (ERP) system, in average costed 5.48 million USD and took over 14 months. [1] Such a project is not a mere "programming" tasks but requires collaboration of different disciplines and steps, including the following:

1. Analyze the existing processes, data, and available IT infrastructure.
2. Elicit stakeholder and user requirements on processes and system.
3. Create a high-level "business" model of the system that maps out business rules, processes, user interface, and information processing.
4. Refine models into an operational design and implement the design.
5. Analyze and test the implemented design, assess its quality with respect to all requirements.

At any point in time, one may have to go back to an earlier stage (possibly the very first stage) to improve the implementation and maintain the desired quality. Quite often, contradicting requirements have to be resolved.

To lower implementation and deployment costs, modern information systems no longer have business rules, processes, user interface, and information processing hard coded, for instance in Java. Instead, the structure and behavior of all components is described in high-level models which are interpreted and enacted by general purpose process engines. However, this only takes away effort and costs for the implementation step. All other steps requires involvement of human experts and critical analysis.

[1] http://panorama-consulting.com/2011-erp-report-erp-implementation-project-costs-and-durations-down-business-benefits-up/

1.2 DBL Project: Information Systems

In this DBL project you will take the role of a group of information system engineers that is asked to (re-)engineer and (re-)design an information system.

1. You will be given process documentation and data artifacts of an existing information system that supports the order and sales process between two companies. The existing information system is considered outdated.
2. You, as information system engineers, are requested to use the provided information and build a new information system using state of the art technology.
3. The process stakeholders ask you to provide a comprehensive analysis of the given process documentation and data artifacts for deficits, improper process handling and potentials for process improvement.
4. You are asked to build a new information system that exhibits the same functionality as the old system, and to propose changes to the process, postulate improvements, and realize your proposed changes in the new information system as well.
5. You will have to discuss and negotiate your design with process stakeholders to resolve contradicting requirements.

1.2.1 Prerequisites

This DBL project[2] assumes that you have taken another DBL project earlier and are familiar with a number of basic skills such as coordinating group work, organizing and holding meetings, presenting results, preparing intermediate and final reports, and meeting deadlines. As technical skills,

- You have a basic understanding of modeling processes (or of modeling system behavior in general).
- You have profound knowledge of databases, in particular of developing data models, database schemas, of defining and executing database queries using SQL.

1.2.2 Objectives

The project is structured into three major phases of an information system redesign project. Each phase ends with a "deliverable" by which you and the process stakeholders track the progress of the project and ensure success.

- Phase 1 (Weeks 1 and 2): The process stakeholder provides you with descriptions of a several inter-related real-life processes, process models that were used for documentation, and data artifacts of these processes that document how the processes have been executed in the past by process stakeholders. You are asked to provide the stakeholders with a high-level design of the process that also highlights deficits and room for improvement, and to present a plan for implementing the new system.
- Phase 2 (Weeks 3,4, and 5): You turn the provided process models into executable models by adding data-flow and resource perspectives. At the end of this phase you are able to demonstrate a running information system prototype

[2]DBL (design-based learning) is the English translation of OGO (ontwerpgericht onderwijs)

that implements the central features of your design to the process stakeholder. You provide the process stakeholder with plausible arguments about the quality of your implementation and present a plan for the final phase.
- Phase 3 (Weeks 6, 7, and 8): At the end of this phase you have a running information system that implements your complete design and solves all analyzed problems. Your final project report documents your problem analysis, your design, how it has been implemented, and the quality of your solution. You will give a comprehensive overview on your project result in a final presentation in which you defend the quality of your work.

Each of the phases ends with a number of deliverables that will be explained together with the grading in Sect. 3. Before that, we give some general instructions and technical information for the project in Sect. 2.

2 Instructions and Technical Information

2.1 General Instructions

The entire course is subject to the following rules and hints.

- Carefully study all documentation and data on the original processes that is provided to you. The documentation may be incomplete, the provided data may be inconsistent with the documentation.
- One goal of the project is that the reengineered information system addresses various requirements (same functionality as the old system and improvements) postulated by the process stakeholders. These requirements are give to you through the process documentation and data, as well as through your tutor, who will take the role of a process stakeholder. In that role, your tutor will also discuss and negotiate ideas and requirements from stakeholder perspective.
- Remain critical about the process documentation and data that is given to you. Do not just implement what is given to you, but also do not forget that your time is limited: you may not be able to address all problems and deficits you identify. In this case, rank the assessed issues, approach the most critical problems first, and document open problems.
- When distributing tasks in your group, take experiences and prior knowledge of your group members into account. It will not be necessary (and timewise infeasible) that all students work on the same tasks with similar effort. Make use of the special skills in your group, there will be challenging tasks for each of you.
- Remember that the deadlines gives to you indicate the *latest* moment of handing in a deliverable. You may always hand in earlier. However, the intermediate and the final presentations will take place as planned.
- This project is worth 6 ECTS study points, which is equivalent to 168 hours of work for each of you. Keep track of your time.
- All project documents and software artifacts that are declared as "deliverables" in Sect. 3.4 have to be handed in via your group's submission folder in OASE. Deliverables that are not handed in via the group's submission folder will not be considered for grading.

- You will be provided with a software environment to complete your project. The usage of the provided software environment (see Sect. 2.2) is mandatory as your implementation will be graded as how it functions in that environment.

2.2 Technical Instructions

2.2.1 Software for Implementing Your Solution

You are required to implement your solution on the basis of the Activiti process engine and a relational database. To simplify your work, we provide you with

- an extended version of the Activiti process engine that supports SQL queries in the data perspective, and
- a virtual machine image (Ubuntu) containing a running installation of the extended Activiti engine together with a running installation of a MySQL database, and the Activiti Designer modeling tool to edit and extend process models given in BPMN.

The virtual machine image together with instructions and additional information is available for download at the website of this course at `http://www.win.tue.nl/~dfahland/courses/2io71/`. The virtual machine image requires *Oracle Virtualbox* which is freely available for Windows, Linux, and MacOS at `http://www.virtualbox.org`.

For development, you may set up the development environment yourself (e.g., natively under Windows) using the following software

- Apache Tomcat 7[3] with MySQL JDBC Connector[4].
- Activiti Process Engine with SQL Extensions 1.0 [5].
- MySQL Database 5.5 [6].
- Eclipse [7] with Activiti Designer 2.0 [8].

However, technical support will only be provided for the software in the virtual machine. Your implementation will be graded based on its capability to run in the virtual machine.

2.2.2 Software for Analyzing Data Artifacts

In addition to process descriptions, you will be provided with data artifacts of the existing process, in particular *event logs* that contain information about previous executions. The information in these event logs can be analyzed using *process mining* software. We recommend

- ProM6 with packages *Dotted Chart* and *Fuzzy*[9], or
- Fluxicon Disco (a free academic license is available)[10]

Tutorials for ProM6 and the mentioned packages will be made available.

[3] `https://tomcat.apache.org/`
[4] `https://dev.mysql.com/downloads/connector/j/`
[5] see course website `http://www.win.tue.nl/~dfahland/courses/2io07`
[6] `https://dev.mysql.com/downloads/`
[7] `http://www.eclipse.org`
[8] `http://www.activiti.org/userguide/#activitiDesigner`
[9] http://www.promtools.org/prom6/
[10] http://fluxicon.com/

3 Organization and Logistics

3.1 People Involved

3.1.1 Project coordinator

The project coordinator is responsible for a good execution of the project. He will, together with the tutors, discuss the progress of the groups and grade the intermediate and the final products. He will resolve organizational and content-related problems, as far as they cannot be resolved by the tutors or within the groups.

The project coordinator will also supervise a few groups in the role of a tutor, and provide technical support for the software described in Sect. 2.2.

Contact information:

- Dr. Dirk Fahland, room MF 7.066, 040 247 4804, d.fahland@tue.nl

3.1.2 Tutors

The tutors accompany the groups through the project. Their task is to stimulate and motivate the group, give frequent feedback, facilitate learning and reflection by asking questions and providing feedback on general technical aspects, process of the group, and self-development. Moreover, the tutor will act as process stakeholder in discussion of process requirements and solutions. The tutor will also be involved in evaluating the work of the group and of each individual group member.

The tutor is present in one or more group meetings per week and in all intermediate assessments of the group.

Contact information:

- E.O. Sabelnikova, e.sabelnikova@student.tue.nl
- K. Traganos, k.traganos@student.tue.nl
- tbd

3.2 Groups

You will be working in groups of ca. 6 students. The groups will be formed through the student administration to ensure a good mix of students with different educational backgrounds. You can find your group on OASE. Each group organizes their work completely by themselves. Each group meets in one of the following OGO rooms in MetaForum at the allocated time slots (see OASE).

group 1	3.073	group 2	3.099	group 3	3.100	group 4	3.101
group 5	3.102	group 6	3.103	group 7	3.105	group 8	3.140
group 9	4.199	group 10	4.212	group 11	4.122		

You get about 4×4 hours per week to work on the project as a group in one of the OGO rooms. You will (and have to) spend additional time on the project.

Logbook. Besides contributing to the group's deliverables, each student will maintain an individual log book to document the progress of the project and his own contributions. The logbook maintained by each student should cover the following parts (for instance in tabular form):

- phase of the project
- particular activity or task conducted
- planned time (start and ending time, number of hours)
- actual time (start and ending time, number of hours)
- additional notes

3.3 Meetings and Consultations

3.3.1 Group meetings with tutors

Your tutor will attend at least one of your group meetings per week. The exact times of that meeting will be negotiated with your tutor. In that meeting, you will give a brief presentation on the progress of your group, discuss issues and open points, and plan further actions. During that meeting, your tutor will provide you with feedback and ask questions to stimulate your work.

3.3.2 Intermediate presentations

At the end of phase 1 and phase 2, you will be giving intermediate presentations to present your current results and your proposed plan of actions for the next phase(s). The tutors and the project coordinator will be present at these meetings to evaluate your presentations (see also Sect. 3.4).

3.3.3 Consulting the stakeholder

Your tutor will take the role of the process stakeholder in your weekly meetings. Use the opportunity to refine your ideas to meet stakeholder requirements.

3.3.4 Technical support

Technical support for the provided software (Sect. 2.2) will be provided through OASE.

3.3.5 Communication within groups and with other students

Information of general interest to the entire course will be posted within the course website of OASE. The course website in OASE also provides forums for both, the entire course and for your group. Use these to discuss matters with other students, and to coordinate the work in your group.

3.4 Project Deliverables, Presentations, and Final Report

This section provides details on the deliverables of the project and when they are due. Section 3.5 provides details on how these deliverables are included in the grading.

3.4.1 Deliverables for Phase 1

The following deliverables have to be provided at the end of week 2 (which actually spans 3 weeks with numerous holidays).

- **D1.1** Document "Process Analysis" describing the results of your analysis of the provided process, process stakeholder requirements, possible problems in the process, possibilities for process improvement, and your project plan to address these issues.
  formal requirements: a document of around 5 pages following the guidelines listed in Sect. 3.4.4.
  deadline: 12th May 2013, 23:59.
- **D1.2** Presentation "Process Analysis and Project Plan" that summarizes the points of deliverable D1.1 together with an explanation of your design and your project plan.
  formal requirements: a presentation of 10mins (+10 minutes discussion afterwards)
  will be scheduled for the beginning of week 3 (during the allocated time slots for the project).

3.4.2 Deliverables for Phase 2

The following deliverables have to be provided at the end of week 5.

- **D2.1** Your preliminary implementation consisting of the data model, the process models, and all additionally required Java classes, services, and programs, and a step-by-step documentation describing how to deploy and execute your implementation in the plain virtual machine image that is provided for this course. Additionally, you provide data and scenarios to test and assess the quality of your implementation.
  formal requirements: All files are bundled in a .zip file and complete. The deliverable will only be accepted if the tutor can get your implementation running by following the step-by-step documentation.
  deadline: 2nd June 2013, 23:59.
- **D2.2** Presentation "Preliminary Implementation and Assessment" that summarize the design of your implementation D2.1, justifies design choices, and describes the quality of your current implementation based on your assessment, together with a plan how to improve the implementation and finish the project.
  formal requirements: a presentation of 10mins (+10 minutes discussion afterwards)
  will be scheduled for the beginning of week 6 (during the allocated time slots for the project).

3.4.3 Deliverables for Phase 3

The following deliverables have to be provided in week 8.

- **D3.1** The final implementation consisting of the data model, the process models, a dump of the 'acme' database, and all additionally required Java classes, services, and programs, and a documentation describing how to deploy and execute your implementation in the plain virtual machine image that is provided for this course. Additionally, you provide data and scenarios to test and assess the quality of your implementation.
  formal requirements: All files are bundled in a .zip file and complete. The deliverable will only be accepted if the project coordinator can get your implementation running by following the step-by-step documentation.

deadline: Thursday, 20th June 2013, 23:59.

- **D3.2** Document "Project Report" covering the following aspects:
  - an updated process analysis (i.e., an update of D1.1);
  - the overall design of your solution;
  - the design choices you made;
  - the data model of your design;
  - the process models of your implementation, in particular the integration of the data-flow perspective, how the different processes are integrated, and which changes have been made to the processes;
  - the results of the quality assessment of your implementation; and
  - a description of possible further improvements of the system based on the quality assessment.

  formal requirements: a document of at most 15 pages following the guidelines listed in Sect. 3.4.4. The document can have an appendix containing technical details that support your main arguments, however, the main text has to be self-contained and understandable without requiring to read the appendix.
  deadline: Thursday, 20th June 2013, 23:59.
- **D3.3** Final presentation that covers the key results and shows the highlights of your project covering process analysis, overall design and implementation, design choices, and quality assessment. Most of all, it should be interesting and fun to watch!
  formal requirements: a presentation of 20mins (+5 minutes discussion afterwards)
  The final presentations will take place on **Friday, 21st June 2013**.
- **D3.4** Your logbook as described in Sect. 3.2.
  deadline: Thursday, 20th June 2013, 23:59.

3.4.4 Guidelines for deliverables

Each deliverable file should clearly indicate the deliverable it belongs to (i.e., the number of the deliverable and the number of the group). Each deliverable should list on the title page (for implementations on the title page of the documentation), the number of the group, the names of the students and their student ids.

Text documents. The text document deliverables D1.1, D3.2 have to be handed in A4 format as PDF files. The font is a serif font (e.g., 'Cambria' in Word or 'Computer Modern' in LaTeX) in 10 point size. Pages have at least the following margins: 2.5cm (top, left, right) and 2cm (bottom) (when using a double-page layout, left and right margins can be adjusted accordingly).

The logbook D3.4 is handed in as a PDF file in A4 format using 10 point sans-serif fonts (e.g., 'Arial' or 'Verdana').

Implementations. The implementation deliverables D2.1 and D3.1 have to be handed in as .zip file with a comprehensible folder structure. The documentation of your implementation has to be included in the root folder of the .zip file. The documentation follows the same requirements as the text documents.

Slides of the presentation. You do not have to hand in the slides of your presentation.

Submitting deliverables. All deliverables must be submitted through OASE course website which has a submission folder where each group can submit its deliverables.

3.5 Grading

	criteria	by	grades	amount
D1.1	structure, understandability of analysis, completeness of analysis, plausibility of project plan and task distribution	tutor, project coordinator	1-10	5%
D1.2	structure, understandability of presentation, focus on relevant aspects, handling of discussion	tutor, project coordinator	1-10	5%
D2.1	correctness of models, quality of implementation and testing scenarios wrt. chosen "core functionality", quality of design, readability of installation and testing instructions	tutor	1-10	5%
D2.2	structure, understandability of presentation, focus on relevant aspects, handling of discussion	tutor, project coordinator	1-10	5%
D3.1	correctness of models, quality of implementation and testing scenarios wrt. analyzed stakeholder requirements, quality of design, readability of installation and testing instructions	tutor, project coordinator	1-10	20%
D3.2	structure, readability, completeness, scope of the report in all aspects	project coordinator	1-10	30%
D3.3	structure, understandability of presentation, focus on relevant aspects, handling of discussion	tutor, project coordinator	1-10	20%
D3.4	regular updates on tasks and deadlines	tutor	pass/ fail	-

In addition, your work within your group as a member of the group will be assessed both, by your tutor, and by your peers regarding the following criteria:

- engagement (in the project, in discussions),
- work (share, quality, timeliness),
- feedback (taking and providing),
- roles in the group (discussion leader, note taker, giving presentations),
- ability to identify and summarize problems,
- ability to take different perspectives,
- ability to draw conclusions and implications.

Your tutor's and your peers' assessment each count 5% for the final grade.

Each student group will get a grade for the entire project based on grades for the deliverables as described in Sect. 3.4. Each part of the final deliverable has to have at least 6 points or 'pass'. The grades for individual students can deviate from the group's grade by up to 2 points (in both directions) based on peer assessment in the groups and the interactions with the tutors.

Finally: keep an eye on course website in OASE for most recent information.

Enjoy the project and good luck!