

Redesigning Information Systems

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Abstract

The objective of this thesis is to propose a redesign of TISS, the student information system used at Vienna University of Technology. A literature review covers redesign methods where the design is based on an existing design, as a contrary to design methods where a design is created from scratch. After analysing various successful and unsuccessful redesign projects, common patterns are identified that might count as success factors.

To inform a redesign of TISS, multiple student information systems that are in place at other universities are analysed in detail. In addition, a comparative expert workshop has been run to further evaluate the mentioned existing systems.

In the last chapter, all gathered knowledge is put into practice by informing a redesign of TISS, that has been qualitatively evaluated with students enrolled at Vienna University of Technology. Although not all flaws have been managed to be tackled in the first redesign iteration, the redesign project was successful, since the participants generally preferred the redesign over the existing version of TISS.



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Contents

Abstract	vii
Contents	ix
1 Motivation & Approach	1
2 Redesign	3
2.1 Methodology	4
2.1.1 Generative Walkthroughs	4
2.1.2 Merging Designs	5
2.1.3 Games with Interaction Design Objective	6
2.1.4 Dynamic User Interface Rendering	6
2.2 Case Studies	6
2.2.1 Unsuccessful Redesign Projects	6
2.2.2 Successful Redesign Projects	9
2.2.3 Success Factors	13
3 Comparative Analysis	15
3.1 OSIRIS	15
3.2 SAP Student Lifecycle Management	18
3.3 Campus Information System	20
3.4 TISS	21
3.5 U:Space	24
3.6 LPIS	25
3.7 MyStudies	26
3.8 Findings	26
4 Comparative Expert Workshop	31
4.1 Goal	31
4.2 Concept & Idea	31
4.3 Participants	32
4.4 Setup	32
4.5 Results	34
4.5.1 Documents	34

4.5.2	Courses	35
4.5.3	Study Program	37
4.5.4	Start Page	38
4.6	Findings	38
4.7	Method Review	39
5	Putting Redesign into Practice	41
5.1	Previous Work	41
5.1.1	Applied User Research Methods	41
5.1.2	Prototype	45
5.2	Redesigning TISS	46
5.2.1	Screen Mock-ups	47
5.2.2	Qualitative Evaluation	51
6	Conclusion	57
	List of Figures	59
	List of Tables	60
	Bibliography	61

CHAPTER 1

Motivation & Approach

This thesis identifies and addresses approaches to redesigning student information systems (SIS). SIS are commonly used at universities or related types of institutions to manage relevant entities such as students, study programs, courses, lectures, exams or grades. Usually, lecturers and students can log into their SIS and perform actions such as create a new course, enroll in a course, register for an exam or view the study progress.

Both the large amount of user roles and features, and the high effort of making changes to such a widely used system leads to a certain complexity when it comes to redesigning it.

Although design has been widely covered in literature, only little focus has been laid on redesign. The initial idea for this thesis has been motivated by informal discussions between doors about whether design methods can easily be applied to redesign as well, or if there are specifics to it that should be covered separately.

The objective is to propose a redesign concept for TISS, the SIS currently used at Vienna University of Technology. It first reviews redesign methods that are covered by literature, and case studies of successful and unsuccessful redesign projects. Then a comparative analysis among different SIS is conducted.

A comparative expert workshop is held to generate additional research insights. The goal was to find out whether insights generated by a group of experts are richer and more valuable than insights that evolve from an analysis done by a single researcher. This research method is introduced, applied and reviewed. Also, the findings that evolved from it are further used for the redesign project.

Afterwards, the knowledge gained from all information sources such as the comparative analysis, the expert workshop and existing previous work is put into practice by informing a redesign concept for TISS.



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CHAPTER 2

Redesign

The research field of Human-Computer Interaction offers a long history of methods for iterative design and ideation. Once a product has been designed, creators can again chose from a well-researched variety of evaluation methods to validate their work. However, little focus has been laid on the process of redesign, meaning starting the design process from an existing design instead of starting from scratch.

Throughout the history of design research, design has often been described as *problem solving*[25], [40]. Design problems have been classified as wicked problems: they are not problems for which all necessary information is, or ever can be, available to the problem-solver. It can not be guaranteed that one correct solution can be found[22]. However, connecting design to the problem solving theory has later been criticized by describing why design problems do not meet the criteria to be a problem in the first place by being mostly too complex[44].

Not many alternative approaches towards cognitive theory of design have been covered by literature yet. Some work in the field of psychology might be related and covers research around creativity in general.

Later, Liikkanen, Laakso, et al. described a knowledge construction concept, where design is seen as a process of knowledge production[30]. The design process constructs mental representations, where designers keep adding bits of knowledge to these representations. The design process consists of different activities:

- Research (produces knowledge)
- Construction (produces prototypes and sketches)
- Decision making (produces design decisions)

To conclude from their research, designers construct mental representations both from the knowledge they hold, and also from knowledge they acquire through research activities in the design process. Thus, according to the authors, design is the acquisition and exploitation of knowledge.

The connection to the process of redesign can be made by understanding the redesign process as either adding new knowledge to the mental representation that the original design evolved from, or using various research methods to break away from the limits of existing knowledge and enriching the design with new bits of knowledge.

This chapter provides a selection of previous work done within the field of redesign methodology, as well as a discussion of several case studies of documented redesign projects.

2.1 Methodology

As mentioned above, design methods specific to redesign projects have not been given a lot of attention. The literature does not strongly distinguish between the challenges of designing and redesigning. However, some work has been done that specifically focuses on the redesign process, and will be introduced in the following section.

2.1.1 Generative Walkthroughs

Generative walkthroughs[32] is a method to create design alternatives by using a selection of socio-technical principles (Table 2.1).

"Situated Action" (beyond plans)	Go beyond planned activities; let users decide how to act in unforeseen circumstances
"Rhythms & routines" (identify use patterns)	Take advantage of routine activities and spatial patterns to help users integrate the system into their daily lives
"Peripheral awareness" (include the periphery)	Design for both the focus and the periphery, allowing users to vary their degree of engagement
"Co-adaption" (re-interpret system)	Expect users to re-interpret and customize software, help them capture and share those customizations
"Distributed cognition" (outside the head)	Consider how other people or objects in the world can reduce the cognitive load for memory or communication tasks

Table 2.1: Socio-technical Phenomena

Designers first create a scenario or storyboard describing the current situation of target users. Then they go through their scenario step by step, wearing one of the principles as a hat and trying to find new aspects to the design that could be adapted, inspired by the principle.

This process is repeated for an arbitrary number of principles.

2.1.2 Merging Designs

In this approach two or more distinct reference designs are merged into a single new product. This process emerges design conflicts, that are then to be solved using structured redesign techniques[41].

Innovation happens when design conflicts exists. The redesign approach aims to maximize the number and the degree of conflicts in order to stimulate ideation, and consists of the following steps:

1. Chose target product (eg. a cell phone that also has good high-resolution camera capabilities)
2. Identify needs: Users describe their needs for each of the products separately (eg. cell phone and high-resolution camera). The needs are then weighted.
3. Chose reference products (eg. cell phone and high-resolution camera)
4. Identify components of reference products (eg. screen, shell, lens)
5. Build a component factor table: Components from different products with similar functions are considered different factors of the same component
6. Determine component factor weights: Identify the impact of each component on each user need
7. Extract key components: Identify the important components for a given task
8. Identify conflicts
9. Apply design principles such as case studies, axiomatic design rules, inventive design principles or adaption rules
10. Verify results in a design review
11. Iterate and repeat the process until the design meets all requirements and satisfies its users

2.1.3 Games with Interaction Design Objective

GWAPs (Games With a Purpose) are games which explore the potential of human processing to solve problems that computers cannot yet treat. Examples are games where players move around in their physical surroundings using a camera and annotating real world locations with content, or taking photos from different angles so that a 3D model of real buildings can be created.

GWIDO (Game with Interaction Design Objective) is a GWAP with the purpose of helping in the interface design process.[38]

A GWIDO environment offers a way to consult large groups of users in order to determine the best choice for an UI element. GWIDO can for instance provide insights to designers about how users interpret images or icons.

In the end, GWIDO can either confirm the choices that the designer would have made without any recommendations, or it can contradict the designer's opinion. In this case, the designer might reflect about their choice and work towards a better informed decision.

2.1.4 Dynamic User Interface Rendering

This is a general framework to restyle UI widgets so that they adapt to user behavior. Changes are gradually applied so that they are not intrusive for the user.

The rendering of an interface should reflect the needs and usage pattern of individual users. Adaptive systems automatically accommodate the UI to the user. Adaption should be predictable, transparent, discreet, and should not interfere with the structure of the application.[29]

Examples from the paper: List of links is hovered by the user, therefore the padding between the links is increased to highlight the section. In another session, a user hovers the search, therefore the search bar is stronger highlighted.

2.2 Case Studies

The following section analyses case studies of redesign projects that have been discussed in scientific literature. Both successful and unsuccessful projects are documented and discussed. Afterwards, approaches of successful projects are extracted in order to find common patterns that might lead to a successful redesign project.

2.2.1 Unsuccessful Redesign Projects

Redesigning answerbag.com

Research has been conducted in order to analyse churn and the fragmentation of a platform community immediately after a fundamental redesign[23]. The research questions are

why active and established users abandoned the community after redesign, and how they migrated and regrouped elsewhere.

Brandtzaeg and Heim conducted a survey of 500 participants who became less active or terminated membership in online communities[18]. They identified some most common reasons for churn:

- Absence of friends or other interesting people in the community
- Low quality content
- Poor usability
- Online harassment or bullying
- Dissatisfaction with moderators
- Sense that the community had become over-commercialized

Answerbag decided to perform a redesign in order to add functions long requested by users, and to update the site's look and feel that has remained unchanged since 2006.

Until then, due to the lack of a private messaging feature, users used the comments and real-time notifications to communicate. Accepting a friend request created automatic notifications for all comments posted by that person. Comment threads turned into (sometimes off-topic) conversations.

The homepage of the platform contained a live feed of recent activity, unfortunately often subject to spam.

After the redesign, the feed on the homepage was replaced by static, edited content. Also, the new private messaging feature did not work, and the popular workaround of communicating via comments was broken as well.

The study gathered data by administrator access to Answerbag's backend. Having all site data available, it has been queried for the 500 most active users in the period of 3 months before the redesign (out of 49 000 who logged in at least once in that period). The contribution of the most active users during these 3 months has been coded by using an adapted version of the above list of common reasons to abandon online communities.

The results suggest that the key factors in the decision to leave the site were:

- the inability to communicate with friends
- conflict with other users related to supporting or opposing the redesign
- lack of access to collective content

2. REDESIGN

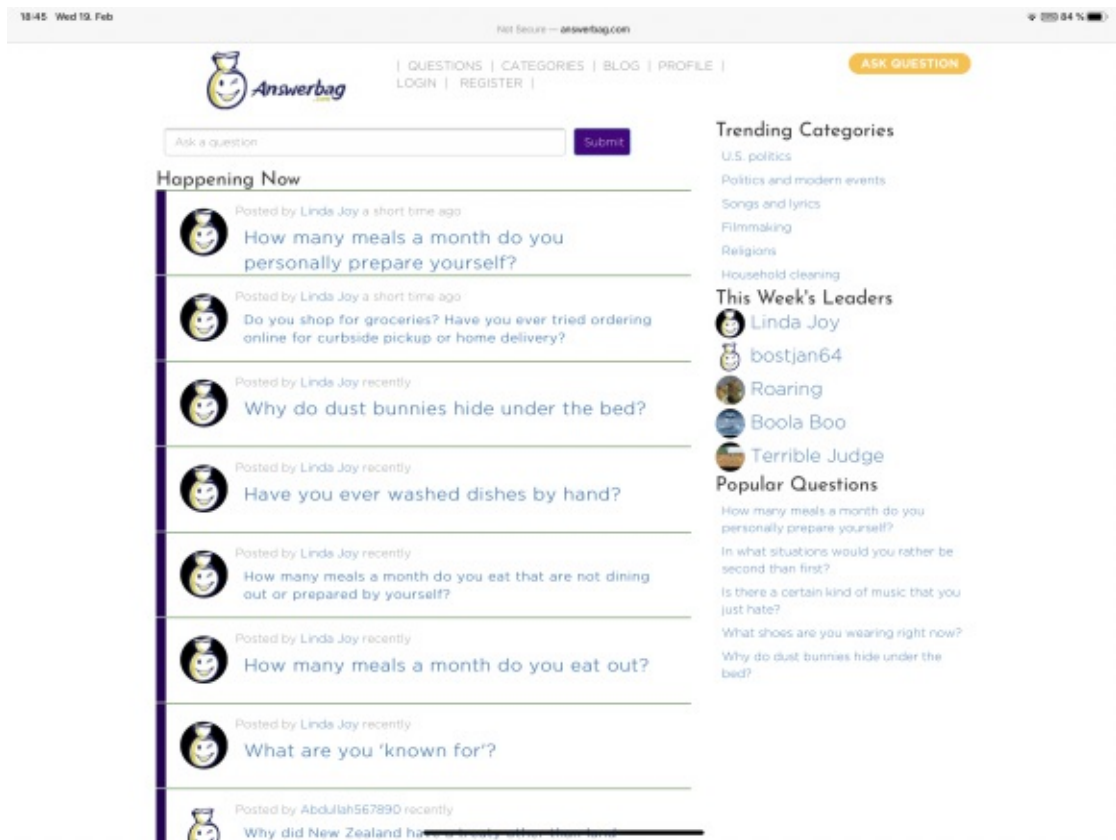


Figure 2.1: answerbag.com homepage on Feb. 19th, 2020

- poor usability during the transition between old and new sites

Also, rogue user's average number of actions during the post-redesign crisis outnumbered those of other active users by nearly a factor of ten. Many rogue users were well-connected in terms of friend lists and used their contacts to encourage migration at a critical time.

Users used the remaining functionality (profiles, usernames) to direct others to competitor platforms. Rogue users drew large amounts of traffic by serving as active hubs of information exchange. People used their known usernames and avatars on the new platforms to welcome fellows and mourn the old site.

As of now, the answerbag.com homepage mainly consists of a "Happening Now" section which contains a feed of recent user activity (see Fig. 2.2).

Redesigning Skype

In 2017, Microsoft decided to redesign its messaging application Skype[8] in order to update its user experience. Since the concept of Stories has been around for a while



Figure 2.2: Skype's redesigned mobile application[3]

among mobile social media applications, Microsoft wanted to jump in and include those into Skype. Moreover, the design was updated to a more colorful style[9].

However, not even a year after launching the redesign, Microsoft published a statement announcing the rollback of the redesign[6]. The statement said that the redesign not only increased complexity, but also made core features such as calling harder to use. In the second round of the redesign, user research was involved heavily and feedback was collected using prototypes in order to validate assumptions. Also, a website has been launched in order to collect ideas from users[13].

2.2.2 Successful Redesign Projects

Redesigning disneyworld.com

After 9/11, the way in which people traveled changed significantly. The travel industry suffered and many companies increased their effort to target new consumers. Disney World invested into redesigning their online presence in order to react to these developments[42].

On disneyworld.com, "Repeaters" (those who visited Disney World in the last 5 years) performed well, but "Intenders" (those who haven't visited Disney World in the last 5 years) didn't, and failed to gain basic knowledge about Disney World from the website. Users also struggled with the booking engine.

A site redesign was meant to help "Intenders" to understand the scope and value of a Disney World vacation, while "Repeaters" are provided with direct access to relevant content and booking information.

The objectives of the redesign were:

- Increase bookings
- Cut operational costs
- Decrease cancellations
- Increase average time spent on a Disney World vacation
- Encourage repeat visits

The disneyworld.com redesign was performed in 3 phases:

1. Generate Excitement: Enhanced media and copy for all attractions and entertainment, redesign of top-level landing pages, first phase of user segmentation
2. Re-architecting the User Experience: Complete redesign of the site architecture, mapping experience paths and visual themes to location-based navigation, channelling users into CRM and booking streams
3. Extending CRM: Targeted/relevant messaging to keep anticipation high and decrease cancellation, improve functionality of booking engine

The project was set up in two streams during discovery phase: Stakeholders defined and prioritized their requirements, while the UX design group conducted research with the existing site.

12 users (3 "Intenders" and 9 "Repeaters") were interviewed in 30-60 minutes sessions. In the first half, they described how they usually plan their vacation using the internet. In the second half, they planned a vacation at Disney World using the old version of the website.

The interviews, usability tests, a heuristic evaluation and competitive analysis emerged a prioritized list of 137 user goals mapped to 6 personas.

After that, a gap analysis was performed, and the user goals were compared to the business goals. Where they contradicted, compromises were found.

The redesign was tested in one-on-one usability tests using clickable PDF prototypes. Also focus groups were run.

In the third phase of the project, a process called "pre-wireframing" was initiated. A pre-wireframe consists of 2 columns. The right column contains the primary objectives of the page and the corresponding user and business goals. The left column has the list of possible content and interface elements.

Overall, the redesign showed strong success and performance exceeded the expectations in terms of bookings and user satisfaction.

Redesigning AT&T's Online Billing Application

Telecom service providers usually keep working towards reducing cost-intensive customer services such as call centers, paper bills or mail. AT&T already offered an online billing application as part of their eServices. However, its adoption was low among their customers.

A cross-disciplinary human factors team worked on redesigning the application in order to better meet the needs of their customers and increase the application's adoption rate[27].

The following methods have been applied:

- Visiting customers at their work sites and interviewing them to learn about their tasks
- Internal customer surveys
- Usability testing of the current application in a controlled lab environment where both qualitative and quantitative data has been collected
- Expert heuristic review of the application
- Benchmarking other billing applications
- Creating storyboards
- Sketching
- Creating a HTML and JavaScript based prototype
- Creating alternative user interface designs and collecting customer feedback on them

After launching the redesigned version of the application, the number of online bill transactions was doubled within the first month after deployment.

Redesigning Online Banking

Wells Fargo started a redesign of their online banking in order to update the visual user interface and navigation schema[35]. The project was conducted in 4 phases:

1. Gather business requirements from stakeholders and map them to user types, goals and tasks
2. Test user scenarios with users who matched profiles, using card sorting, interviews and usability tests with the current system

In phase 2, the team discovered that users keep staying in routine activities and do not explore different areas of the site to learn about new features. This phenomenon is called "View/Do Loop" in the paper.

4. Develop strategy against "View/Do Loop", test storyboards with users using paper prototypes
5. Usability testing paper and HTML prototypes

After the launch of the redesign, both traffic and site engagement increased dramatically. Another redesign project in a similar setup has been performed 3 years later in 2006.

Redesigning Adobe Acrobat

Adobe Acrobat is a digital document reader for desktop computers launched in 1993. Even though it generates annual revenue of around 700\$, the user experience has remained mostly unchanged for years. Adobe then decided to redesign the product in order to keep up with the market[31]. The internal experience design group was in charge of the project. These steps were taken towards the launch of Acrobat X:

- Interviews with 10 stakeholders
- Revisiting usability issues of previous versions
- Analyse feature usage metrics
- Review from senior design team members

The mentioned methods concluded into 9 major fields for improvement, whereof some were deferred because of limited resources and priorities.

The team also defined two guiding principles for the redesign project:

- Acrobat X must be a subtractive process
- All users are new users (this has been decided because the team learned that most users use only 2 or 3 features out of the 100+ feature set)

During the redesign process, the user interface was iteratively tested in usability studies. Also, regression testing ensured that previously successful tasks were not broken at a later iteration.

According to Adobe, the launch of the product has been successful (no details have been disclosed).

Redesigning a Business School Web Site

The University of Michigan Business School invested major effort to brand itself as one of the top business schools in the country. This also required a website redesign in order to match their new image. The current website was large and complex, consisting of more than 3000 pages. It served various types of users such as students, staff, alumni, prospective students, media or recruiters.

The project was set up around usability metrics such as task completion rate, task time, subjective task ratings and subjective overall ratings. These metrics were monitored throughout the project.

The redesign was conducted in phases:

1. Strategy and user needs analysis: Setting website goals, gather user needs, competitive analysis, focus group
2. Conceptual design: Task analysis, user scenarios, walkthroughs
3. Prototyping: Card sorting, diagnostic user testing, wireframes
4. Production: User testing, beta site release, expert reviews (some parts of the usability testing happened during site development due to short resources)
5. Deployment: Quality assurance, user testing

Since the user testing was set up in a more quantitative manner, each of the tests was conducted with at least 24 participants, performing 25 tasks in total (5 core tasks, plus 5 or more tasks specific to the user group).

As a result of the redesign, all 4 major usability metrics improved significantly. For example, task completion rate increased from 61.7% to 92.5%[19].

2.2.3 Success Factors

The following section analyzes the previously described redesign projects and identifies common patterns that might have lead to project success.

Cross-Disciplinary Teams

In all projects that have been described in the "Successful Redesign Projects" section, the authors disclosed the setup of the project teams:

Table 2.2 shows that all teams that successfully ran large redesign projects were set up in a diverse, cross-disciplinary way with strong representation of user experience roles such as design and research. Some teams also included developers or non-product related roles such as marketing or customer service.

disneyworld.com	Information architecture, content development, enhanced media, visual design
AT&T	Human factors person, product manager, program manager, project manager, system engineers, developers, human factors engineer, testers, deployment engineers, customer training professional, customer adaption professional
Wells Fargo	User research, visual design, information architecture, project and product managers, business strategists, technologists, marketing, online customer service management, agents
Adobe	Internal experience design group, product management, marketing
University of Michigan Business School	Project manager, lead usability, user testing, information architecture, usability engineer, lead visual design, lead engineer, software engineers

Table 2.2: Team setup in project teams

Combining User Research Methods

Another aspect that all described successful projects have in common is a pattern of how the teams applied research methods:

1. Explore the problem space:
Projects usually start with interviews. Interviewees are either users that are invited to the office, customers that are visited at their workplace, or main stakeholders.
2. Understand the users:
After that, a combination of multiple qualitative and quantitative research method is applied to understand the problems and generate solution ideas. Mentioned methods are surveys, user tests, heuristic evaluations, competitive analysis or card sorting.
3. Iterate with Prototypes:
In the final project phase, low-fi and hi-fi prototypes are iteratively generated and evaluated. Prototypes can be both paper prototypes or sophisticated HTML & JavaScript prototypes. They are evaluated with users (qualitatively and quantitatively) and the feedback is integrated into next prototype iterations.
4. Validate:
After the launch of the redesign, the final version is usually again subject to usability testing in order to uncover any remaining issues.

Comparative Analysis

In order to collect research material, my colleague Johannes Dostal and I contacted several universities and asked them for access, demo-access or a live demonstration of the production environment of the student information system they have in place. Because most of the access was time limited, we screen recorded ourselves while going through the user interfaces in order to have saved material available for future analyses. This chapter explains which type of material has been obtained from which university. A description of each system is provided, covering general setup and the main features.

This chapter also covers lessons that could be learned from each student information system that has been reviewed.

3.1 OSIRIS

OSIRIS is a SaaS student information system that came to market in 2001 and is now used by 49 higher education institutions[37]. According to an account manager, the user interface can be branded by adding logos and changing the color scheme.

We have been provided a demo account to the web interface of OSIRIS Student. There are also native apps for Android and iOS that we didn't have access to. According to the manufacturer, the differences between the web interface and the native applications are the usage of push notifications, GPS location, native calendar integration and accessing the digital student card. In general, OSIRIS also provides a self-service module for lecturers and an API for integration in other platforms.

OSIRIS has a responsive frontend based on Google's Material Design system[33]. The desktop version has a menu on the left side. The content is organized in two columns: the middle column usually contains an overview, and selecting an item in the overview shows a detail view on the right side.

3. COMPARATIVE ANALYSIS

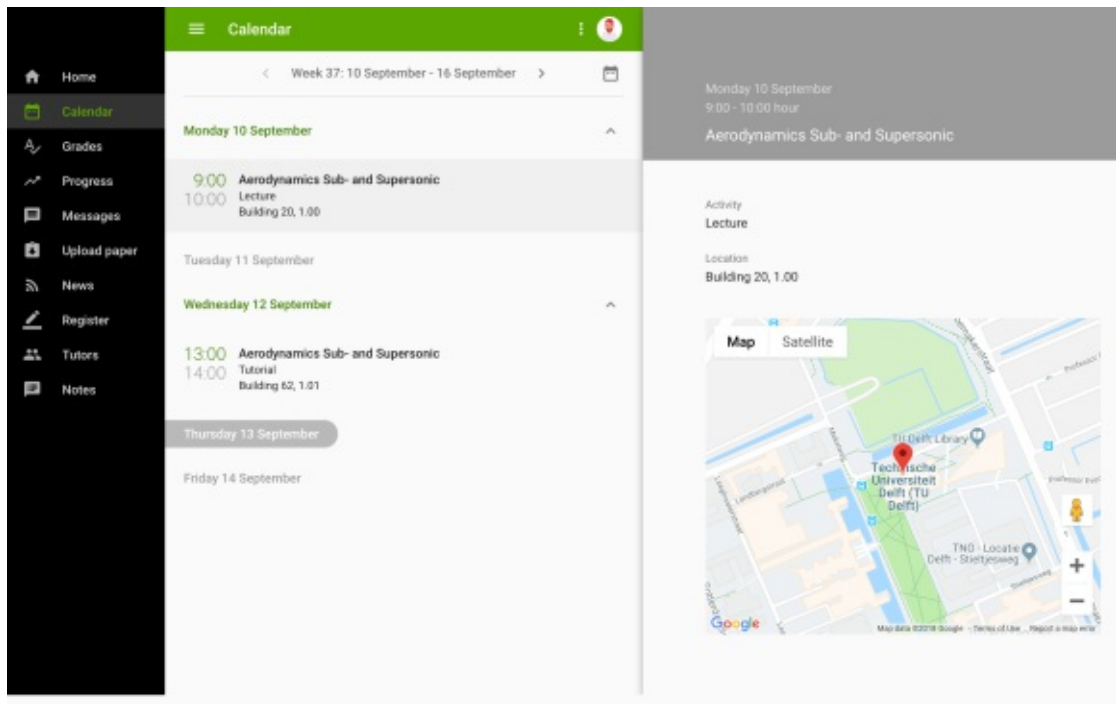


Figure 3.1: OSIRIS desktop and tablet version

The mobile version contains the same amount of functionality. Design wise, the menu is behind a hamburger menu icon. The master-detail logic from the desktop view is implemented by switching back and forth between master and detail pages.

The available sections are *Home*, *Calendar*, *Grades*, *Progress*, *Messages*, *Upload paper*, *News*, *Register*, *Tutors* and *Notes*.

The *Home* section is the page a student sees after login. It contains a calendar summary of upcoming events or activities, information such as the re-enrolment status, a news feed and a selection of quick links.

The calendar contains an overview of one week, including an entry for each lecture (Fig. 3.1, 3.2). Clicking on one of the lecture opens a detail view with lecture details and a map to facilitate finding the correct building.

Grades provides a list of received grades, including the course name, type of achievement such as *Written exam* or *Assignment*, date and grade. The detail view contains more details about the grade, information about the final grade and a leaderboard.

Another section worth mentioning is *Progress*, which offers a small chart showing overall progress towards the degree (e.g. 51/180 credits), and the curriculum with comments on each course stating whether a course has been passed or is currently enrolled.

What I specifically like about OSIRIS is the calendar overview. It offers a list of upcoming

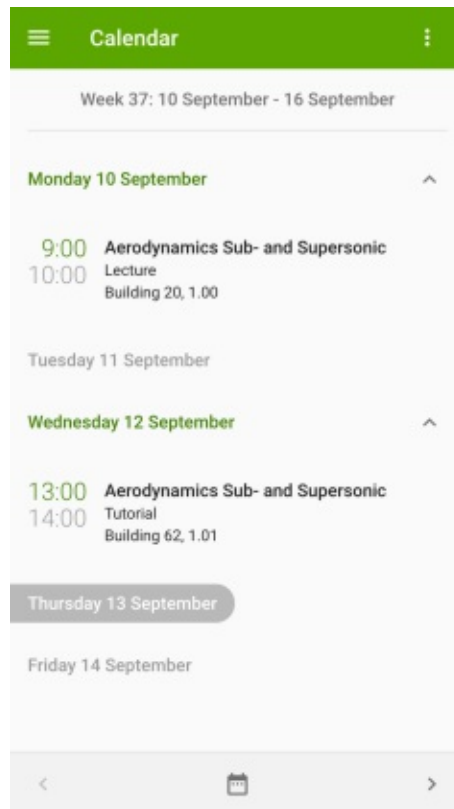


Figure 3.2: OSIRIS mobile version

lectures at a glance. The detail view shows additional information, including a map that shows where the lecture theater is located. This comes handy for students who aren't yet experienced in navigating the campus.

The overview of lectures that a student is currently signed up to can be found behind the *My registrations* menu item. It basically shows the modus of each lecture, including what needs to be done in order to pass the course, such as a list of assignments and exams.

The list of grades is also well-structured. The detail view of a grade shows additional information such as the type of the exam. There is also a nice feature where students can compare their grade against the total share of grades of the class.

The home page also comes handy as it offers a calendar overview for today, shortcuts to the system's main features, warnings about important activities such as open enrollments, and a news section.

One of my favorite features however is the progress overview. It shows all modules and courses that need to be completed in order to complete the study program. The overview is very well structured and has a small sort of pie chart that visualizes the overall progress (Fig. 3.3).

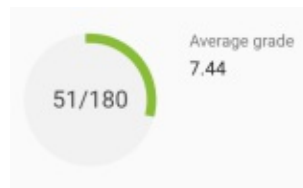


Figure 3.3: Study progress visualisation in OSIRIS

To sum up, OSIRIS contains features for a student's most relevant activities such as signing up for courses, checking their daily schedules and overall study progress, and receiving grades. The system also has decent usability. I only detected a handful of issues with room for improvement and minor design flaws such as:

- Regarding the master-detail views, there is no active state in the master section, meaning that it could be unclear which master element the detail view is connected to.
- The navigation might be confusing. Once a user enters multiple navigation layers, the back navigation is counter-intuitive since one has to press *back* first, before the home button reappears.
- There are differences in the content of the navigation between desktop and mobile version. Menu items are not always located in the same place.
- The breakpoints are not ideal, the navigation appears quite late in the desktop version when scrolling down.

3.2 SAP Student Lifecycle Management

The SAP product has been presented to us in a video call. We had permission to record the session and also received some additional marketing material.

According to the SAP employee we talked to, the SLCM (Student Lifecycle Management) product consists of 3 main components: academia (study programs, exams), teaching (lectures) and students (personal data, controlling). The product also has interfaces to other SAP products and can be connected to finance, controlling, CRM, et cetera. SLCM is available both as SaaS or as a self-hosted product. However, there are no cloud systems in use throughout Germany. The system is used by more than 100 universities worldwide.

The user-facing platform is web only, there are no native apps available. However, universities can integrate SLCM into their existing apps using the available SAP interfaces.

The start page from a student's point of view is the launchpad. It consists of tiles that are grouped into sections. The sections are *Meine Startseite* (my start page), *Kurse*

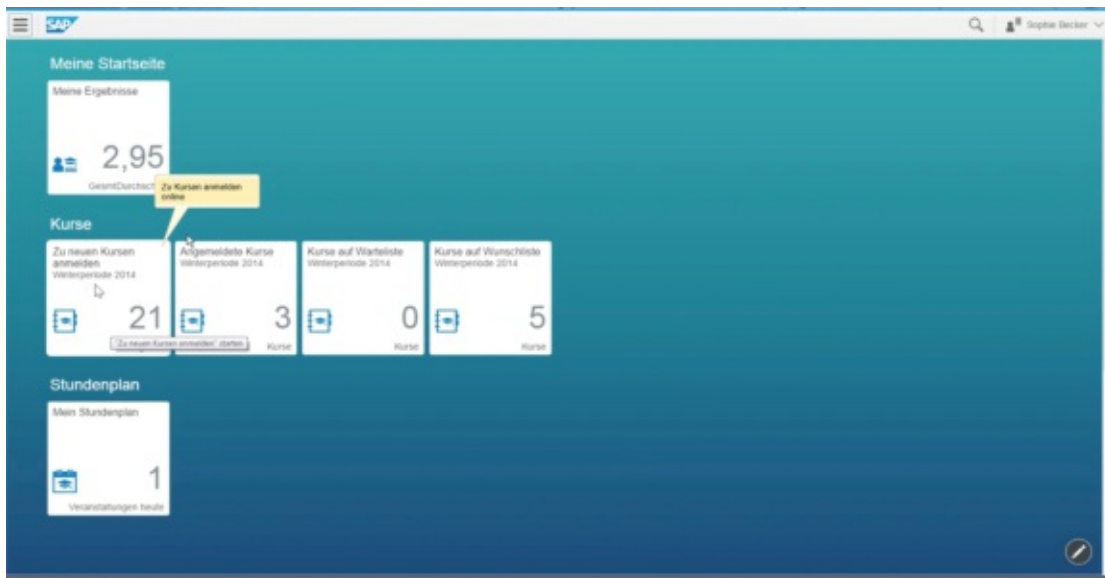


Figure 3.4: Dashboard in SAP SLCM

(courses) and *Stundenplan* (timetable). The tiles contain both content such as grades and courses, but can also be call to action buttons such as *Zu neuen Kursen anmelden* (apply for new courses).

The tile-based layout offers a quick and structured overview. However, the effectiveness of the launchpad strongly depends on the context sensitivity of the tiles, meaning that the system needs to tackle the challenge of displaying the right tiles at the right time. For example, course registration related tiles might be more relevant at the beginning of a semester, while the end of a semester is more connected to exams and grades.

Unfortunately, the design of the tiles is unified. Each tile consists of a title, an icon and a figure. This might be limiting in some use cases. The time table tile for example does not show any information regarding the upcoming lecture, but just the total number of lectures on a given day as a figure.

Clicking on a tile leads to the respective detail page. These pages differ in layout and features. The course page (Fig. 3.5) for instance has a course list on the left side and a course detail view as main content on the right side. The page contains all relevant features such as a course list, filters, detail information about location, lecturer etc., course options and an enroll button. However, the large amount of information leaves the navigation slightly cluttered. As an addition to the master-detail view itself, the detail view is again a tabbed view with 3 tabs. I believe that an improved information architecture might improve usability and increase user value, apart from the old-fashioned look and feel that could also be improved.

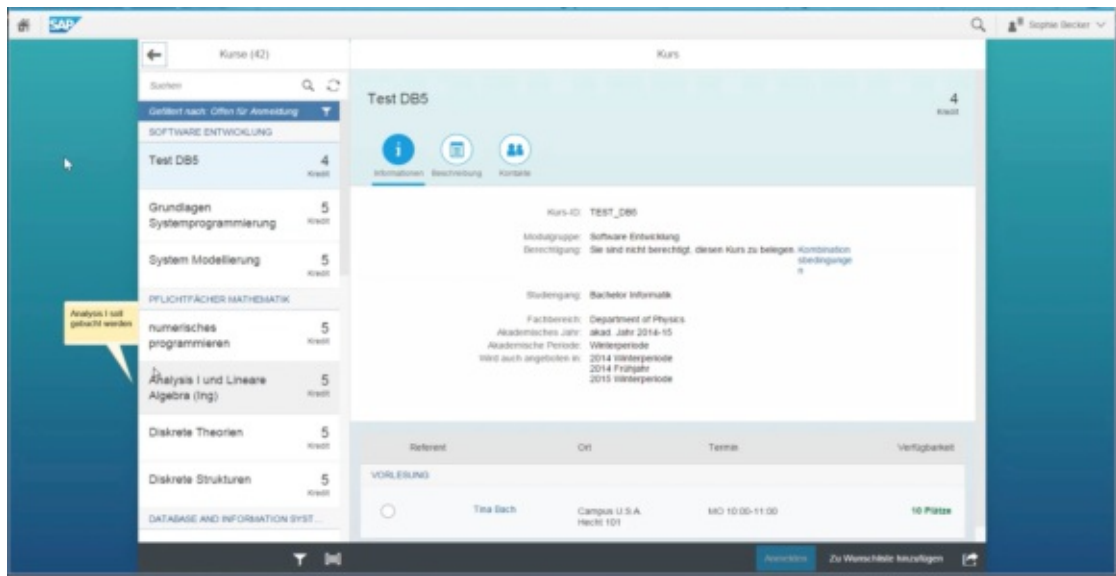


Figure 3.5: List of courses in SAP SLCM

3.3 Campus Information System

CIS is an open source project developed by FH complete[1]. It targets universities of applied science in Austria and is used by institutions such as FH Technikum Wien, FH St. Pölten, FH des bfi Wien or FH Burgenland[2].

We got indirect access to the system by interviewing a student enrolled at FH St. Pölten who is an active user. He showed us around by using his personal account. The session has been audio- and screen recorded.

According to the student, the most frequently used feature is *persönl. LV-Plan* which is basically the timetable (Fig. 3.6). It provides an overview over the schedule for the upcoming couple of days. It also offers an iCal export. However, the content of the export can be delayed, so that students need to check the web view anyway every morning to make sure that they are up to date for the day.

The major issue though is that the calendar does not show actual lectures but room reservations. It therefore happens a lot that the calendar shows mostly irrelevant content. Students have to know whether the entry is an actual lecture or just some irrelevant room reservation.

Other features are a document section where official documents can be generated and downloaded, grades, payments and a list of enrolled courses.

Although there is a mobile view of the platform, the content has been reduced by removing information. One example is that the desktop view shows all takes of an exam, while the mobile view shows only the first grade. When a student had to repeat the exam, the

persönlicher Lehrveranstaltungsplan

Person: [Name]

Semesterplan für WS2018 anzeigen | ICal Export: [Icon]

Navigation: [Icons] KW [] oder gehe zu Datum: 10.09.2018

KW 37/18	1	2	3	4	5	6	7	8	9	10	11	12
Stunde	07:10 07:55	08:00 08:45	08:50 09:35	09:40 10:25	10:30 11:15	11:20 12:05	12:10 12:55	13:00 13:45	13:50 14:35	14:40 15:25	15:30 16:15	16:20 17:00
Montag 10. Sep 18	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10
Dienstag 11. Sep 18	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10
Mittwoch 12. Sep 18	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10	BGK4 VZ LPVP BGK-6 Brotzensteiner SEM1.10
Donnerstag 13. Sep 18												
Freitag												

© Fachhochschule St. Pölten 2010 - 2018 | Matthias Corvinus-Strasse 15, A-3100 St.Pölten
Bestandteil von FH Complete

Figure 3.6: Timetable in CIS by FH Complete

second grade is not shown in the mobile version in order to save space. This approach might force users to switch from mobile to desktop usage.

Another usability issue is that most views offer information per semester, and a drop-down element to select the semester. This appears to be quite cumbersome. One could rethink this approach and consider showing more information at once in order to reduce steps and clicks.

Information is also displayed redundantly: Although there is a calendar view that contains all lecture dates, the dates are also part of the course list. In the course list, each course item has again a section with all respective lecture dates.

3.4 TISS

TISS is the information system used at Vienna University of Technology[11]. I can access it myself since I am an active student. TISS is not only used by students, but also by lecturers and administrative staff. However, this section focuses on the student's view.

TISS consists of 3 main sections: Education, Research and Organisation. The sections are color coded.

After login, students find themselves on a landing page called *Further links and services*, consisting of 3 boxes that contain various links (Fig. 3.7). Only one of the link boxes actually targets students. Most likely the prevalent action on this page is to switch to the education section of TISS.

3. COMPARATIVE ANALYSIS

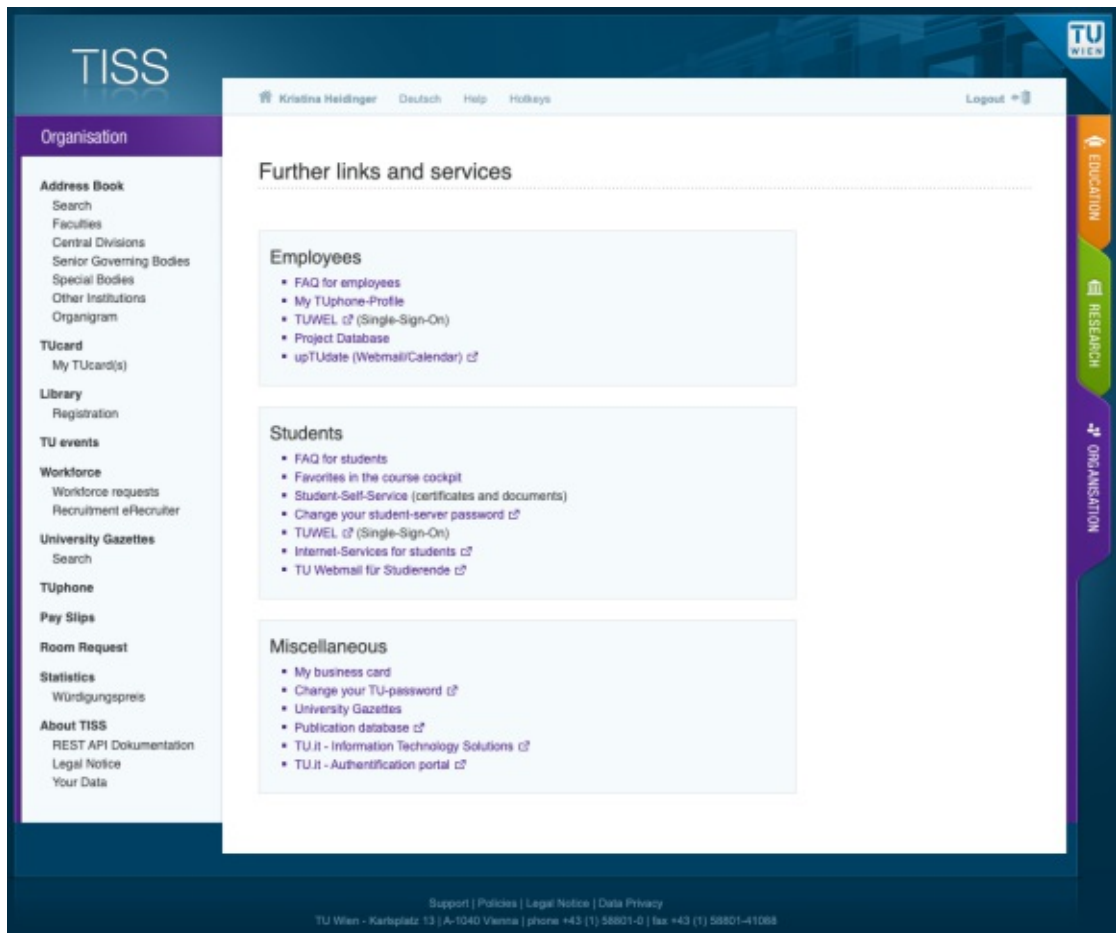


Figure 3.7: TISS landing page after login

The education section has a long list of features including a program overview, courses, favorites, messages, a calendar, grades, a document download section, graduation and mobility programs.

There is very little support for students to plan their semester. They can browse through the list of courses and add them to the favorites list. Once a course is in the favorites, students obtain an overview over the amount of ECTS credits, and whether any registrations, submissions or exams are open or due.

The favorites section has no given structure. Students can group courses and label the groups with titles. Therefore the structure of the section is individual. In my personal experience, most students either group courses by semester or by module to stay on top of things.

The probably most cumbersome section is the documents section called *Confirmations* (Fig. 3.8). It can be found in the *Student Self Service* menu item. The purpose of the

Student Self Service: 01029120, Kristina Heidinger

Tuition fee | Study data | **Confirmations** | Transcripts | Certificates

New confirmation

Type * **Confirmation of Registration**

! If you aren't able to print the confirmation of enrollment ("Studienbestätigung") after two weeks of transferring your tuition fee please contact the Admission Office ("Studienabteilung").
If your personal data or study data changed please create a new confirmation of enrollment to get a valid document.

Semester * **2020W**

Study * **066 935 - Masterstudium Medieninformatik**

Language * **German**

Create document

Generated confirmations

Type	Study	Date	Language	Creation date	Validation	Validation view count	PDF-document
Confirmation of Registration	066 935	2018W	de	02/20/19, 15:43	<input checked="" type="checkbox"/>	3	PDF
Record of studies	-	2018W	de	07/29/18, 16:40	<input type="checkbox"/>	0	PDF
Confirmation of Registration	066 935	2017W	en	01/03/18, 10:04	<input type="checkbox"/>	0	PDF
Confirmation of Registration	066 935	2017S	de	02/06/17, 12:45	<input type="checkbox"/>	0	PDF
Record of studies	-	2016S	de	05/18/16, 13:40	<input type="checkbox"/>	0	PDF
Erfolg	All studies	04/18/2015 - 04/18/2016	de	04/18/16, 13:39	<input type="checkbox"/>	0	PDF
Record of studies	-	2015W	de	11/20/15, 19:14	<input type="checkbox"/>	0	PDF
Confirmation of Registration	033 534	2014W	de	01/11/15, 19:22	<input type="checkbox"/>	0	PDF
Erfolg	All studies	04/22/2013 - 04/22/2014	en	04/22/14, 14:22	<input type="checkbox"/>	0	PDF
Confirmation of Registration	033 534	2014S	de	02/16/14, 19:03	<input type="checkbox"/>	0	PDF
Record of studies	-	2013W	de	10/15/13, 09:32	<input type="checkbox"/>	0	PDF
Record of studies	-	2013S	de	06/07/13, 01:28	<input type="checkbox"/>	0	PDF
Record of studies	-	2012W	de	10/25/12, 10:14	<input type="checkbox"/>	0	PDF
Erfolg	All studies	03/01/2011 - 10/25/2012	de	10/25/12, 10:12	<input type="checkbox"/>	0	PDF

Figure 3.8: TISS documents download section

section is serving documents that are mostly needed for various authorities. There are 5 types of documents available. However, it's not explained which type of document has what content and purpose. Also, the documents are not just there but need to be generated. Once generated, they are added to the list of previously generated documents and can be downloaded from there.

The list of documents offers 3 types of actions. These actions can be triggered by clicking the respective icon. Unfortunately the action is not really explained, although they can be quite critical. One icon click can deactivate the validation feature of a document, which can be pretty bad once the document has been submitted to an authority. Any related warnings are somewhat hidden in the user interface.

Another main feature, the calendar, also happens to be quite unpopular among students. Even though it is well-structured and offers an iCal export feature, the content of the calendar is related to room reservations rather than actual lectures. It happens quite a lot that calendar entries are irrelevant, for example when a room is booked weekly but the actual lecture is not held as regularly. I personally never used the calendar but always went through the course information and noted all appointments manually. The calendar is also read-only. No appointments can be added, and existing entries can not be edited or deleted.

3.5 U:Space

U:Space is the student information system used at University of Vienna. It is developed by a software agency called Catalysts. The project scope is to develop a modern and usable system that is supposed to replace all legacy systems step by step[12].

We got access to the system by interviewing an enrolled student. He showed us around in a session that has been audio- and screen recorded.

U:Space is integrated with other systems such as u:find which is the course list. In order to sign up for a course, students need to find it in u:find and then get redirected into U:Space for the sign up process. U:find is not context-sensitive, meaning that the start page is always the overview of all available study programs, no matter which program the student is enrolled in. The integration of u:find and U:Space is also somewhat static. After clicking on the respective link in u:find, the student got redirected into U:Space for the sign up process. However, U:Space presented an error message that the sign up period is over. This information is not visible in u:find.

After login, the U:Space start page shows an accordion list of all active or past study programs. Clicking on a study program reveals additional information such as reminders to pay the tuition fee and a progress summary.

U:Space also offers a program overview containing grades and progress indicators. Each module has a traffic lights style indicator (Fig. 3.9). Red means that no progress happened within the module, yellow means that parts of the module have been completed, green

	Voraussetzungen	ECTS	Note
> Modul MK1.1. Geodatenerfassung und -verwaltung	siehe Curriculum	2/15	●●●○
> Modul MK 1.2. Analyse und Modellierung in der Geoinformation	siehe Curriculum	4/15	●●●○
> Modul MK 1.3. Kartographische Gestaltungs- und Entwurfslehre	siehe Curriculum	11/15	●●●○
> Modul MK 1.4. Geo-Multimedia	siehe Curriculum	9/15	●●●○
> Masterarbeit Privatissimum		0/26	●●●○
> Modul MK 1.5. Wahlmodul V	siehe Curriculum	0/15	●●●○
> Modul MK 1.6. Wahlmodul VI	siehe Curriculum	0/15	●●●○
> Abschlussprüfung		0/	●●●○
> Modul MK 2. Spezielle Themen der Kartographie und Geoinformation	siehe Curriculum	3/8	●●●○
> Modul MK 3. Exkursionen	siehe Curriculum	5.5/8	1 ●●●○
> Modul MK 4. Seminare	siehe Curriculum	0/14	●●●○
> Interessensmodul		3/	●●●○
> noch keinem Studienplanpunkt/Modul zugeordnet		/	1 ●●●○

Figure 3.9: U:Space progress overview

means that the module is successfully completed, which is quite useful. However, there is no summary of the overall study progress. Also, the list does not always contain lectures that have not yet been completed. They need to be found in the curriculum.

U:Space also covers mobility services, tuition, managing personal data, document download and various other administrative use cases. There are also video tutorials that inform about features and usage of U:Space.

There is no calendar feature and also no guidance to find lecture theaters in a building, except for institutes who have custom solutions in place.

3.6 LPIS

LPIS (*Lehrveranstaltungs- und Prüfungsinformationssystem*) is used at Vienna University of Economics and Business. It is developed internally. It was presented to us by a member of the development team. We were not allowed to record the session but took notes and received screenshots afterwards.

Students use multiple services in their everyday life: A campus map[16] helps with finding any type of room. *Learn*[4] is the online learning platform where lecture material is available and assignments are handed in. LPIS is mostly for course registration and

Studienplanpunkt	Antritte	Ergebnis	Datum
S Bachelorstudium Wirtschafts- und Sozialwissenschaften (WS12)			
A Studienzweig Betriebswirtschaft - [gewählt] ändern			
Fach Betriebswirtschaftslehre			
LVP Accounting & Management Control III	0 / 5		
LV anmelden			
PRF anmelden			
VUE Accounting & Management Control III	0 / 5		
VUE 1952 Hamr S. (Anmeldung 30.10.2018 12:27)			
PI Betriebliche Informationssysteme II	0 / 5		
PI anmelden			
LVP Marketing	0 / 5		
LV anmelden			
PRF anmelden			
VUE Personal, Führung, Organisation	0 / 5		
VUE 1332 Meyer M. et al. (Anmeldung 12.09.2018 14:00)			
PI Finanzierung	1 / 5	sehr gut	15.06.2018
LVP Beschaffung, Logistik, Produktion	0 / 5		
LV anmelden			
PRF anmelden			

Figure 3.10: Tabs provide nested structure in LPIS

grades[15]. There is also a feature where students can exchange group courses that they signed up for. When no preferred time slot is available, students register for any time slot and try to swap their time slot with another student.

The user interface of LPIS is simple and somewhat old-fashioned (Fig. 3.11). Although most features are available within few clicks, navigating the system requires finding orientation within a large table view where the only visual structure are rows and tabs (Fig. 3.10). Call to action buttons are not very visible as they are mostly links.

3.7 MyStudies

MyStudies is an in-house build solution used at ETH Zürich. Unfortunately we did not get any direct access but received some screenshots for further analysis.

MyStudies appears in a quite conservative design. One of the screenshots shows the enrollment for courses and exams. It seems like one can apply for multiple courses or exams with one button click.

The calendar can be viewed both as a list or as a table. It looks well-structured and shows a warning when lectures overlap. The program overview however is a massive table containing all available information at once (Fig. 3.12).

3.8 Findings

This section provides a summary of findings obtained from reviewing different student information systems. These findings can be seen as a basis for guidelines to designing a student information system.

Wirtschaftsuniversität Wien ^{WU} Lehrveranstaltungs- und Prüfungsinformationssystem 

11/7/5/4/1 S K

Einzelanmeldung | Prüfungswoche | Noten | **Anmelde**liste | Exit/Logout

Anmeldungen für Studium im Semester Abmeldungen ausblenden

Veranstaltung / Prüfung				
1952	VUE	Hamr S.	Anmeldung	ABmelden
WS 2018	2	Accounting & Management Control III	30.10.2018 12:27	bis 01.12.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_STUPLA	
P31071	LVP	Neumann G.	Anmeldung	ABmelden
WS 2018	2	Grundzüge der Programmierung	30.10.2018 12:16	bis 15.11.2018 12:00
BaWiSo-12		Prüfungswoche 2. Termin Di, 20.11.2018 13:30 - 15:00	LPIS_GP	
0383	PI	Komori-Glatz M.	Anmeldung	ABmelden
WS 2018	2	Fremdsprachliche Wirtschaftskommunikation II - Englisch	18.10.2018 19:36	bis 05.10.2018 23:59
BaWiSo-12		Hörsaal und Termine	INST.	
0245	AG	Schmidthaler D.	Anmeldung	ABmelden
WS 2018	2	Französische Grammatik für die Wirtschaftskommunikation I	11.10.2018 11:04	bis 08.10.2018 23:59
BaWiSo-12		Hörsaal und Termine	INST.	
1603	PI	Bremberger F.	Anmeldung	ABmelden
WS 2018	2	Angewandte Mikroökonomik	04.10.2018 15:19	bis 05.10.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_STUPLA	
1405	PI	Schmidthaler D.	Anmeldung	ABmelden
WS 2018	2	Fremdsprachliche Wirtschaftskommunikation I - Französisch	03.10.2018 16:27	bis 08.10.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_STUPLA	
1490	PI	Eichinger I.	Anmeldung	ABmelden
WS 2018	1	Grundlagen wissenschaftlichen Arbeitens	03.10.2018 15:56	bis 24.11.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_STUPLA	
0255	LVP	Kastner M.	Anmeldung	ABmelden
WS 2018	2	Marketing	03.10.2018 15:40	bis 18.10.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_STUPLA	
1454	PI	Bech G.	Anmeldung	ABmelden
WS 2018	1	Überzeugend argumentieren und effektiv präsentieren	17.09.2018 15:00	bis 24.09.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_VERID	
1332	VUE	Meyer M. et al.	Anmeldung	ABmelden
WS 2018	2	Personal, Führung, Organisation	12.09.2018 14:00	bis 01.10.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_STUPLA	
4182	LVP	Zoppel M.	Anmeldung	ABmelden
SU 2018	2	Wirtschaft im rechtlichen Kontext - Wirtschaftsprivatrecht I	05.09.2018 09:25	bis 31.08.2018 23:59
BaWiSo-12		Hörsaal und Termine	INST.	
5205	AG	Spitzer M. · Kreiling L.	Anmeldung	ABmelden
SS 2018	1	Repetitorium aus Accounting & Management Control II	14.06.2018 10:58	bis 17.06.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_VERID	
5979	AG	Hohlrieder M.	Anmeldung	ABmelden
SS 2018	1	Auffrischkurs Finanzierung (Finanzmathematik)	09.03.2018 16:39	bis 12.03.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_VERID	
5340	LVP	Novy A. et al.	Anmeldung	ABmelden
SS 2018	2	Zukunftsfähiges Wirtschaften I	12.02.2018 14:01	bis 13.03.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_STUPLA	
4336	LVP	Stimakovits P. · Höltschl E.	Anmeldung	ABmelden
SS 2018	3	Accounting & Management Control II	12.02.2018 14:00	bis 13.03.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_STUPLA	
4067	PI	Garcia Esteban A.	Anmeldung	ABmelden
SS 2018	4	Basiskurs II - Spanisch	29.01.2018 11:21	bis 10.03.2018 23:59
BaWiSo-12		Hörsaal und Termine	LPIS_VERID	

Figure 3.11: Course list in LPIS

3. COMPARATIVE ANALYSIS

Leistungsblick

Es werden nur verfügte Resultate aus Zeugnissen angezeigt.

Zurück

Druckansicht

Kategorie zuordnen

Sprache des Leistungsblicks: Standard

Reglement: Erdwissenschaften BSc 24.02.2016

Legende:
 Sess.: Prüfungssession; bei Semesterleistungen die darauffolgende Session (**S14**: Sommer 2014, **W14**: Winter 2013/14); **Ist**: Durch Zeugnis verfügte Kreditpunkte; **Soll**: Minimalvorgabe gemäss Studienreglement; **Diff.**: Noch zu erbringen; **Gew.**: Notengewicht; **Best**: Bestanden; **NB**: Nicht Bestanden; **Abbr**: Abbruch

	Sess.	Note	Gew.	ECTS-Kreditpunkte		
				Ist	Soll	Diff.
Bachelor-Studiengang Erdwissenschaften				33	155	122
Grundlagenfächer I (reduziert)				3	19	16
Basisprüfung (reduziert)				0	13	13
Zusätzliche Leistungen Basisjahr				3	6	3
329-0030-00 S Praktikum Chemie	W17	Best		3		
Grundlagenfächer II				17	30	13
Prüfungsblock 1				17		
402-0063-00 J Physik I/Physik II	W18	4.3		17		
651-3400-00 S Geochemie I	W18	4	8			
701-0023-00 S Atmosphäre	W18	4.75	4			
Allgemeine erdwissenschaftliche Fächer				10	42	32
Allgemeine erdwissenschaftliche Fächer: Pflichtfächer				10	35	25
651-4271-00 S Erdwissenschaftliche Datenanalyse und Visualisierung mit Matlab	W18	5		3		
651-4143-00 S Geobiologie	W18	4.5		3		
651-3301-00 S Kristalle und Mineralien	W18	5.5		4		
Allgemeine erdwissenschaftliche Fächer: Kompensationsfächer				0	0	
Integrierte Erdsysteme				0	15	15
Vertiefung (reduziert)				0	31	31
Wissenschaft im Kontext				3	6	3
Wissenschaft im Kontext (ohne Sprachkurse)				3	3	
701-0757-00 S Ökonomie	W17	4		3		
Sprachkurse				0	0	
Bachelor-Arbeit				0	12	12
Leistungskontrollen ohne Kategorie				7		
401-0624-00 S Mathematik IV: Statistik	W18	4.25		4		
701-0501-00 S Pedosphäre	W18	4.75		3		
Angerechnete Kreditpunkte aus Vorstudium				25		

Zurück

Figure 3.12: Study progress overview at ETH Zürich

Source	Finding
OSIRIS	Stick to a design system (eg. Material Design[33])
OSIRIS	Design mobile first or offer a responsive frontend
OSIRIS	Make the calendar context-sensitive: Show upcoming lectures at a glance
OSIRIS	Include a map to help students finding the room on campus
OSIRIS, SAP, TISS, U:Space	Show relevant and context-sensitive information on the home page
OSIRIS, U:Space	Visualise study progress
OSIRIS	Keep information structure similar on desktop and mobile versions
SAP	Don't combine too many types of navigation
CIS	Keep iCal version of calendar up to date in near-real time
CIS, TISS	Calendar should show lectures, not room reservations
CIS	Don't cut main features out of mobile version
CIS	Don't limit information that is shown on one page too strictly
CIS	Avoid redundant information
TISS, U:Space	Show actions, if required, eg. open registrations or due assignments
TISS	Double confirm critical actions
LPIS, MyS- tudies	Find a way to properly visualise large amount of information

Table 3.1: Findings from reviewing different SIS



Die approbierte gedruckte Originalversion dieser Diplomarbeit ist an der TU Wien Bibliothek verfügbar
The approved original version of this thesis is available in print at TU Wien Bibliothek.

Comparative Expert Workshop

In order to learn more about good and bad practices in designing student information systems, my colleague Johannes Dostal and I organised an expert workshop. We invited three participants who are experts in the field of user experience design to review the SIS we got access to and have been analysed in the previous chapter.

This chapter introduces the methods used in the workshop and the results. It also includes a discussion whether this method is suitable to review existing systems as part of a redesign process.

The workshop has been audio recorded and notes have been taken.

4.1 Goal

The goal of the workshop was to learn about best practices in SIS design by reviewing different aspects, UI elements and concepts used by SIS that are already used in production by different universities.

4.2 Concept & Idea

The objective of this workshop was to drain knowledge from existing student information systems by reviewing them in a group, given that the workshop participants are experts in the domain of user experience. The hypothesis was that reviewing existing systems with experts will increase the value of gained information, compared to reviewing the systems as done in the section before, or testing them with users who have no advanced knowledge in the field of human-computer interaction. One possible outcome would be that the expert participants were able to step back and give feedback about the systems in a more objective and structured way, based on principles that they embrace in their day to day work.

The workshop was set for 3 hours, having an agenda as seen in table 4.1. After the introduction, participants had both a large table with creative material such as paper, sharpies, sticky notes, adhesive tape or stickers, and also a large whiteboard wall where print-outs of the screens were attached to. They were free to move around and use any of the material during their discussion.

The discussion was structured into thematic 3 parts. Each part contained one type of page, e.g. the start page, from various systems, so that they can be compared at a glance. While one moderator guided the workshop and took care of the schedule, the second host observed the participants, audio recorded the session, took photographs and notes.

10 min	Welcoming participants, introduction round of participants
5 min	Presentation of agenda and workshop goal
45 min	Reviewing and discussing the course lists
45 min	Reviewing and discussing the study program and progress overview
15 min	Break
45 min	Reviewing and discussing the start pages
15 min	Debriefing, summary of major learnings about reviewed systems, closing words

Table 4.1: Workshop agenda

4.3 Participants

The participants of the workshop were:

- Designer and new media artist with degrees in computer science and arts, working for prestigious clients globally
- Senior interaction designer and lecturer
- University professor in human-computer interaction

The participants didn't receive any form of compensation.

4.4 Setup

Prior to the workshop, screenshots of different SIS were printed out in A3 format and sorted into groups. The groups were

- Documents
- Courses



Figure 4.1: Participants discussing screens of different SIS

- Study program
- Start page

Each group contained the respective screenshots of all included SIS, if available. The participants viewed the screenshots group after group.

They first got a couple of minutes to check out the screenshots by themselves and have then been asked to discuss them together. This has been repeated for each group.

The following section lists the findings for each group that have been discussed by the participants.

Please note that not all SIS had all features, or they might have them but we couldn't access them. Therefore each group only contained screenshots of those SIS that were available to us.

4.5 Results

This section is a summary of what the participants mentioned regarding the screenshots that they reviewed.

4.5.1 Documents

The documents section of a SIS usually offers documents for download that students need for different authorities or for employers.

TISS

The first impression of TISS was that the system looks very powerful. A lot of information is shown at once. There is a document validation feature that produces many icons in the user interface. It drew the participants' attention and has been heavily discussed. They first asked themselves why validation is needed at all, and whether everything shouldn't be validated anyway. They stated that *validation* might not be the optimal wording after they discovered that validation does not mean that the document contains valid information, but it is rather a tool for third parties who want to confirm the authenticity of a document. They understood that it is a safety mechanism, but mentioned that one could simply include a custom QR code in the document that leads to a different website, meaning that the mechanism can be easily avoided. In general, the validation feature makes heavy usage of icons on the page that are dominant and draw a lot of attention.

The second major point of discussion was the list of documents (Fig. 3.8). It was not obvious why documents need to be generated and are not simply there. It was also not obvious that the shown table actually contained documents.

The header row of the table uses different text colors. The reason behind this is unclear. The participants assumed that the table is sorted by the two columns that have coloured headers. If this is the case, it is not clear why the table can be only sorted by these two columns. There is also no filter feature that could come handy once the list of documents becomes very long.

There are two call to action buttons on the page, with different design. The second button at the bottom of the page has a brighter color and does not look clickable. Being on the very bottom of the page, it is also quite far away from the other UI elements connected to the action.

Another feature that would be nice to have and that is available in U:Space is to filter by study program, or to generate documents only for one program if a student is enrolled into multiple study programs.

The participants concluded that the page represents the technical structure of the system, while other platforms such as CIS represent the student's view in a better way.

U:Space

U:Space generally looks quite empty on the first sight, and less appealing than TISS. As opposed to TISS, users can download documents by study program. Unfortunately, one can see only the most recent version of a document. When an authority needs an older version, the student can not download it to hand it in.

CIS

CIS reminds of an application that runs locally on a computer, not of something on the internet. The documents are already available and don't need to be generated by the user as in TISS. CIS lacks a validation feature. However, this makes the entire page more concise. The participants discussed whether a validation feature is needed at all.

4.5.2 Courses

These screens usually deal with all courses-related information. Students can view available courses, enroll in or quit a course.

TISS

TISS provides a favorites feature. Most students use it to set up a list of courses that they are currently enrolled in. The participants criticised that the list rows can be rearranged, but not with drag and drop, but with single clicks to move a row one step up or down, which might be quite cumbersome to use.

Some abbreviations used in the table are not clear, such as *Abges* or *Anm*. Also, some information is displayed with icons instead of proper information. For example, a completed course is indicated with a thumbs up icon, where the grade would be more useful instead. Icons seem to be used quite inconsiderately in general. Some exams show unlimited amount of available seats, which is most likely not true. However, having so many types of icons in use, there is no status indicator for the course that would indicate whether a course is enrolled, in progress or the student is registered for the exam.

The participants discussed whether it is useful that the list of courses needs to be set up manually. There is no automated mechanism that puts completed courses in a separate place or any other type of life cycle management. However, the entry in the list is always the most recent version of the course and not the one that has actually been added to the list in the past.

There is also a search feature that unfortunately does not indicate whether it searches through the favorites list or all courses in general.

OSIRIS

OSIRIS has the visually most appealing design. It immediately shows that (in the example of the screenshot) approximately one fourth of the study program is already

completed.

However, as good as the platform looks at a first glance, the structure of the master and detail views has some downsides. When no detail page is shown, only half of the screen real estate is used. Also, the hamburger menu does not behave in a predictable way. A user can not guess where the menu will appear on the screen. Furthermore, typography and colors are not used consistently. For example, the same color is used both for progress and also for courses that need to be achieved in the future.

Content wise, it is not clear enough which courses the student is actually enrolled in. This offers room for improvement.

U:Space

Most discussions related to the courses section of U:Space happened around visual details. The table could be multi-line to have everything more compact and to avoid whitespace. There are also too many lines and outlines that could be avoided by using alternating colors. There were also discussions about unclear affordances of icons such as the checkmark and the eye icons. The participants found the archive section useful because it clearly separates active courses from past ones, even though they disagreed with the naming *Archiv*.

The major disadvantage is that the view is read-only. A student can find all needed information but can not change anything. They need to go somewhere else, perform an action, and return back in order to check whether something changed.

LPIS

The course list of LPIS seems to be the worst of all platforms. According to typography, the lecturer is the main point of information. The first column contains irrelevant information and the sort order is also not clear. The *ABmelden* button is also interesting because it tries to emphasize the difference to *Anmelden*. Students seem to confuse it often, which is an issue that could be solved in a more effective way.

MyStudies

The participants mentioned that it could come very handy that a student can register for multiple exams at once.

SAP

SAP offers a similar amount of information as LPIS but generates a lot more whitespace. Also, the view is obviously filtered for *Offen für Anmeldung* (open for enrollment), but the call to action button *Anmelden* (Sign up) is inactive for some unclear reason.

CIS

The alternating shades of grey in the list view are perceived as ugly and over-structured. However, the participants liked that the rows can be expanded and collapsed for a better overview.

4.5.3 Study Program

TISS

Regarding TISS, there was some confusion around *STEOP*. It means *Studieneingangs- und Orientierungsphase* and describes the first couple of courses that need to be completed before a student can enroll in any other course of the program. This circumstance does not seem to be explained in TISS very well. The participants stated that because this is such a crucial aspect of the studies, it should be displayed prominently with something like a progress indicator. The way it is done now is simply confusing. Also the counterpart, meaning lectures that require a completed *STEOP*, are just marked with an arrow which is not very intuitive.

The list of courses within a study program is not very well structured. Sometimes a course appears multiple times without any explanation. There are also quite many headings (chapter, module, course) for not as much content.

However, a student needs to find their own study program in the list of all available programs every time. The participants stated that once a user logs in, the system knows about the user and should be able to recall which program the student is enrolled in, what amount of courses they completed and what should be done next.

U:Space

U:Space has a traffic light indicator showing whether a module is to be done, in progress or completed. This is however not explained. The participants also criticised that the usage of color codes without further explanation is not accessible. However, they appreciated that there is any progress visualisation at all.

What is missing is some form of total progress visualisation, since the traffic lights only exist for modules. There is no sum of completed credits. The strict structure of the page raised the question whether a university wants to support studying after a plan, or whether students should be able to take responsibility for their studies.

MyStudies

The spreadsheet character of the page feels reassuring. It is very well structured. Typography could be improved and it reminds of a bank account statement, but the *Soll* and *Diff.* columns (target and difference) are very convenient.

LPIS

The five levels of indentation in the table are frustrating to look at and also not comprehensible.

Although it is convenient to see the amount of exam attempts, it is quite arrogant to assume by design that one won't make it on the first attempt anyway.

4.5.4 Start Page

The participants agreed that the start page of a SIS must be extremely personalised and customizable. It should display context-sensitive and relevant content about what is important right now. It also should raise awareness about what is coming up in the near future, such as submissions, deadlines or exams.

There could also be a secure messaging feature where students can communicate, but also lecturers can reach students quickly to reach out about changes or other important content. These messages can have an expiration date, for example when they are about a room change. However, there needs to be a restrictive policy about which types of messages are allowed and students should be able to swipe messages away, which indicates that they don't want to receive any more messages of this type.

The start page should also contain a list of courses. Any immediately relevant actions can be done directly from the start page, for example by adding registration buttons or a link to the tuition payment, where needed.

A calendar is not really required since one wants to use one's own calendar and not a different, closed system, but it can be a nice to have feature to show it on the start page as well.

It would be also convenient if students could add content to their start pages themselves, for example reminders or a to do list.

Once the time comes to plan the next semester, the start page should also reflect and support that.

The ultimate goal of a start page is to have piece of mind, knowing that one did not forget about anything.

The *Today* section of OSIRIS is a good example because it shows information that is relevant for this given day. While OSIRIS managed pretty well, U:Space shows a banner that pushes important content to the bottom of the screen and below fold.

4.6 Findings

Similar to the previous chapter, this section summarizes findings from the comparative expert workshop that could be seen as guidelines to designing a student information system, in no particular order:

- Don't make secondary features such as a document validation the heaviest on perception
- When using large tables, think of basic table interactions such as sorting, filtering and rearranging
- Be visually consistent with buttons and stick to Gestalt principles[28]
- Generally try to design from a user's perspective, not from a system' perspective
- Be clear about the meaning of abbreviations and icons
- Visualise the status of courses and communicate clearly which courses a student is currently enrolled in
- Don't rely on color codes, and generally design in an accessible way[21]
- Offer automated life cycle management of courses, don't rely on manual interaction only
- Visualise overall study progress, including information about what is completed and what is still to do
- When using large tables, design them as simple to obtain information from them and to interact with them as possible
- Avoid read-only information, support relevant actions close to the displayed status information
- Double confirm critical actions such as quitting a course
- Support bulk actions where applicable, e.g. register for multiple exams at once
- Communicate blockers and requirements for courses clearly, show status and progress
- Be context-sensitive in general, leverage information that is known once a user is logged in
- Offer a customizable and context sensitive start page to help students to achieve peace of mind, knowing that they did not forget about anything important

4.7 Method Review

Setting up a comparative expert workshop to find out about advantages and flaws of an existing design has not yet been covered much in related literature. This section reviews my experience with this quite uncommon research method, listing advantages and disadvantages.

4. COMPARATIVE EXPERT WORKSHOP

First, the participants focused a lot on the design flaws of the presented screens. However, it was not straight forward to find out how these issues could be solved best.

The group was also quite homogeneous, meaning that it consisted of experts only. In hindsight it would be perhaps helpful to include the student's perspective as well to enrich discussions.

I had the impression that it was hard to actually leverage the expertise of the participants because the discussion naturally focused on UI elements, colors and superficial aspects, very similar to any other UX workshop[24] with less educated participants.

In the last group of discussed screens, the start page, the group mostly deviated from evaluating the shown screens and started a general discussion about how the start page of a SIS should be like. The line between evaluating and designing is very easy to cross in this type of workshop.

In general, I would conclude that the findings are of similar quality to the findings generated by reviewing the systems as done in the previous section. The expertise of the participants did not automatically lead to deeper insights. This might be improved in future iterations of comparative expert workshops.

Putting Redesign into Practice

In this chapter, the previously described theoretic foundations of redesign are being put into practice by applying them to TISS, the student information system used at Vienna University of Technology[11]. Even though it is a system that handles countless workflows of a large number of different user groups effectively already for a decade[26], there might be a section or two that is not designed in an optimal way and causes its users to struggle.

It has therefore been subject to a number of projects, term papers and theses of students specialising in the field of Human-Computer Interaction. This thesis aims to seamlessly continue previous work, evaluate what has been done and add significant value to the improvement of TISS.

Hence, this chapter reflects methods and results of work that has already been done in the past. Since this thesis focuses on the students' perspective, this section contains only the parts of previous work that deal with the students' sections of the platform. Insights regarding lecturers' features will not be covered.

5.1 Previous Work

A group of undergraduate students invested effort into analyzing the main pain points of TISS and suggesting designs in order to improve the user experience[17]. One of the involved students then continued the project in his bachelor thesis and developed a prototype based on the findings[26]. The following section provides details on what has been done.

5.1.1 Applied User Research Methods

Surveys The student group conducted two surveys that have been sent out to students and lecturers, respectively. The survey resulted into 119 complete datasets from students

and 401 complete datasets from lecturers. It consists of a quantitative (multiple-choice questions) and a qualitative part (open questions). The survey also contained the 10 questions for the System Usability Scale[20].

Interviews Qualitative interviews have been conducted with 11 lecturers and 19 students in order to enrich the knowledge gained from the previously mentioned surveys. They have been analysed qualitatively, partially after Mayring[34].

Mockups Pain points that have been discovered from the research methods mentioned above, have later been targeted specifically. Dedicated student groups focused on selected pain points and delivered ideas and concepts in order to resolve them. Some of the proposed solutions were further converted into screen mockups so that they can be validated in usability tests at a later stage.

Results

Strengths The surveys and the interviews conducted by undergraduate students revealed that in general, TISS fulfills the basic user needs well. Students mentioned that exams, grades and lecture information can be found easily on the platform. They also mentioned that it is clear how enrolling into courses works. Also the favorite feature and the „Student Self Service“ section have been mentioned in a positive manner. Lecturers generally liked the documentation and support around TISS. Both are consulted when something does not work out as expected, and issues are usually resolved in a pleasant way.

Weaknesses The study revealed a couple of pain points that occur to students while using the TISS platform. These weaknesses are listed below:

Start Page TISS consists of 3 sections that are designed as tabs: *Education*, *Research* and *Organization*. At this time, the start page when logging into TISS is a page called *Further links and services* that is located within the *Organization* section. However, this is not the section that is used by students most, and the content of the page is too general. Students usually switch to the *Education* tab immediately. This might be an issue for new students as they first need to find out where to find the desired lecture-related content.

In general, students complained that the most used features of TISS require too many steps in order to navigate to their entry points.

What the start page should contain according to interviewed students are an overview of lectures that are relevant in the current semester and an overview of already completed lectures in context of all required courses needed to fulfill the degree.

The screenshot shows the 'Favorites' section in the TISS system. It contains two tables of course data, each with a search bar and a 'Daily until past semester (2019W)' filter.

Table 1: Theorien der Medieninformatik

Title	E	ECTS	Reg	Group	Exam	Passed	Links	Actions
Cognitive foundations of visualization 187.A04, VL, 2019S	+	2.0	3.0					
Communication and Media Theories 187.333, VL, 2019S	+	2.0	3.0					
Design Studies 187.A07, VL, 2019S	+	2.0	3.0					
Introduction to the evaluation of visualization 187.A04, U.E., 2019W	+	2.0	3.0					
User Research Methods 187.A08, VL, 2019W	+	2.0	3.0					
User Research Methods Project 187.A08, PR, 2019W	+	2.0	3.0					
Total		12.0	18.0					

Table 2: Technologien und Anwendungen der Medieninformatik

Title	E	ECTS	Reg	Group	Exam	Passed	Links	Actions
Accessible Internet 187.A08, U.E., 2019S	+	2.0	3.0					
Accessible Internet 187.A07, VL, 2019S	+	2.0	3.0					
Assistive Technologies 2 187.A08, VL, 2019S	+	2.0	3.0		27			
Assistive Technology 1 187.A08, VL, 2019S	+	2.0	3.0		29			
Beyond the Desktop 187.A07, VL, 2019W	+	4.0	6.0					
Building Interaction Interfaces 187.A08, PR, 2019W	+	4.0	6.0					
General Design 187.A02, VL, 2019S	+	4.0	6.0					
HCI in Health Care		2.0	3.0					

Figure 5.1: Favorites feature in TISS, containing real data from my own account

Favorites The favorites are one of the most essential features of TISS used by students (Fig. 5.1). Students generally like the feature. However, the study identified some patterns in usage that could be addressed in the design of the platform.

Most students use the favorites to either create a category for each semester, or to split courses into a current, a planned and a completed category. What both patterns have in common is a section dedicated to the current term. This could raise the question why the feature is named *Favorites* and not something like „My studies“.

Navigation One of the main pain points of the navigation is the fact that the content shown after login is not relevant enough. Moreover, some aspects of the platform's structure are not intuitive or inconsistent. For instance, clicking the heading *Course Cockpit* navigates to the first subpage, while clicking the heading *Mobility Services* navigates to a page that is not even listed as a subpage in the navigation menu.

Location Services A new feature has been introduced quite recently: Every available room is listed in TISS with its own page containing both the usage calendar and also visualisations for finding the room on the campus and within a building. This feature is highly appreciated by students, especially newcomers. However, the information is quite spread across TISS and the pages don't contain any information about accessibility of the rooms.

Calendar Students generally value the existence of a calendar. However, The TISS calendar does not actually show the lectures but rather the room reservations. This leads to inconsistencies and even incorrect information from time to time. Also, students miss a way to personalise the calendar, eg. change colors.

Search TISS offers two types of searches. However, none of them contains a filter for course types, neither in the search itself nor in the search results. Also, students need to know the exact name of a course in order to find them in the search, since there is no similarity feature within the search algorithm. Moreover, considering that the search is one of the most used features on the platform, it is slightly hidden behind a single menu entry in the navigation.

Documents Documents such as confirmations required from authorities can be generated in a dedicated section of the platform. In order to do that, the student must select the document type from a dropdown menu, and specify the timeframe and language. After generation, the document appears in a list below. Existing documents can not be deleted.

Main pain points mentioned by students are the fact that documents can only be sorted by date and type. The feature also requires too many steps in order to receive the desired file. The least convenient feature is the validation. Each document in the list has a validation checkmark and icon. Performing a „validation“ not only refreshes the validation link in the document, but also updates the entire document to match its newest state. The way how the feature works is nontransparent to the user.

Integration Most courses require the usage of both TISS and TUWEL. TUWEL is the e-learning platform used by Vienna University of Technology, based on the Moodle platform[5]. Students often mention that both systems can be merged so that only one platform remains where documents, slide decks and other information can be found.

Various Other Issues The major usability issues that came up in the study during surveys and interviews have been mentioned in the section above. Apart from these, a few minor issues have also been identified by the authors:

- The course detail pages do not always show full details by default
- There is no tutorial for beginners
- There is no search in the list of study programs
- Notifications are sometimes missed because of the large number of forums and news feeds, and there is no native notification feature such as pop-ups or push notifications
- The favorites should always be shown after login



Figure 5.2: TISS redesign prototype[26]

- The first come first served principle applied for exam registration is perceived as unfair, since students can „cheat“ using scripts or bots
- There seem to be bugs within the documents section that sometimes groups the list by program, and sometimes by semester

5.1.2 Prototype

The study described above has been continued in a bachelor thesis[26]. The author focused on the process of planning a semester. He based his work on the weaknesses described before and converted the learnings and suggestions for improvement into a prototype. The prototype has then been evaluated qualitatively with 8 students using thinking aloud sessions[43] and interviews. The obtained data has been analysed using the *Handbook of Practical Program Evaluation*[36].

Setup

As already suggested in the TISS Design Report[17], the favorites feature has been renamed to *Mein Studium* (can be translated to *my studies*). As in the live version of TISS, categories can be added by the students. The prototype enhanced the existing feature by a drag and drop functionality. Also, compared to the current version of TISS, categories within the favorites can be folded and unfolded in order to respect screen real estate. A new category is automatically created at the beginning of each semester. These default categories can not be deleted by the user.

Courses that have not been added to a category yet are saved in the inbox. This is a new feature introduced with the prototype.

Not only categories, but also courses within a category can be folded and unfolded. Once a course is unfolded, it reveals details about the course, such as upcoming events, a course description and a news feed.

The prototype also contains a second page dealing with the selection of courses. This page has not been elaborated in the same level of detail as the *my studies* page. Basically, students can filter courses by study program, semester and module and add these to the inbox mentioned above.

Results

The prototype has been validated in thinking aloud sessions[43] and interviews with 8 students of Vienna University of Technology. The sessions lasted for approximately 30 minutes. The participants were asked to perform a defined set of tasks divided into two scenarios. After the thinking aloud session, the participants were interviewed about their experience in general and concerning specific features of the prototype.

All students communicated a general positive perception of the prototype. They especially liked the quick way to add multiple courses to the *my studies* section.

However, the evaluation revealed some drawbacks. The biggest pain point was the inbox feature. It was not clear enough what the inbox is and how the feature is supposed to work. Participants suggested to rename the feature in order to communicate the functionality in a better way. Also, during usage of the feature, more feedback has been requested about what is going to happen, e.g. in form of pop-ups or hover text.

Apart from that, individual issues occurred. One participant generally disagreed with the way categories work, since he or she rather organizes the study program by topics or course types than by semesters.

In general, participants had diverging opinions about the degree of automation that the system is supposed to offer. While some students prefer a system that does most of the planning work automatically, others rather perform these tasks in a more manual fashion. However, the creation of default categories was widely accepted.

5.2 Redesigning TISS

This section puts all pieces together and applies the findings from the previous sections in order to propose a redesign of the TISS platform. The redesign is performed from a mobile perspective. The respective desktop versions are out of scope of this thesis.

The redesign process covers all relevant platform components that have been covered in the previous sections, such as a start page, a course overview over the current term and a study overview and progress page.

5.2.1 Screen Mock-ups

The following Mock-ups have been created in Sketch[7] using the Spark UX Library[10].

Start Page

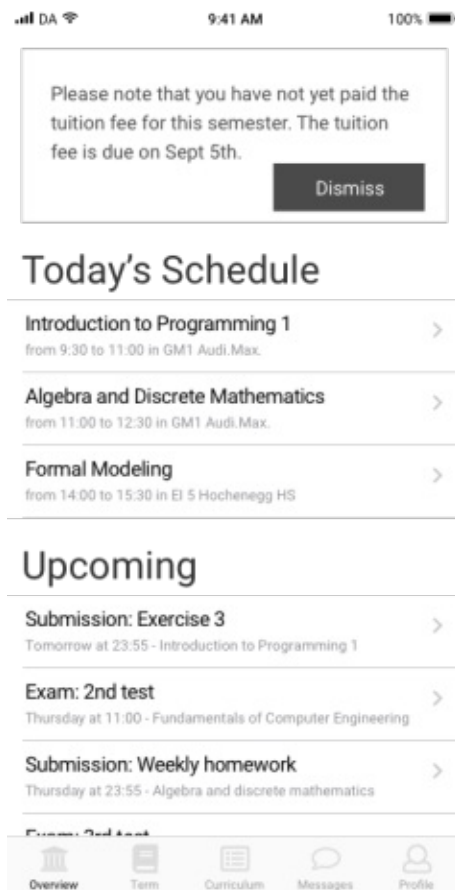


Figure 5.3: Start page of TISS prototype

The start page (Fig. 5.3) is divided into two sections. The upper section is an overview of the current day, listing all lectures that take place on that day. A list element consists of the lecture title, and the time and location as a subtitle. The element is clickable and leads to a detail view containing additional information about the lecture.

The lower section is named *Upcoming* and shows all types of events that await the student in the near future. It is a reminder about submissions, homework assignments, exams, registrations and similar actions. The goal of this section is to help the student to stay on top of things and not forget about anything important.

This section is also designed as a list, showing a title and a subtitle, the subtitle containing information about the related lecture and the due time. Each list item is clickable and leads to a detail view that provides additional information about the related event or assignment.

Information that is particularly urgent or critical can be displayed as an alert on top of the page. In this example the tuition fee is due soon and has not yet been paid.

Missing the payment would have critical impact since it prevents a student from continuing their studies. The warning can be dismissed with a button click. Once dismissed, it won't reappear again.

The start page is designed in a dynamic and context-sensitive, but still simple way. It's goal is to provide the most relevant information at any given time, leaving out any irrelevant elements that might clutter the page.

Courses Overview

The courses overview (Fig. 5.4) shows which courses the student is currently enrolled in. It offers status information about the current term at a glance. All enrolled courses appear in the list by default. No further action or manual adding is required. There is an option to manually add a course though, in case the automated process has not been reliable or any other agreements have been made with the director of studies that can not be detected by the system.

Each list element has the name of the course as title. The subtitle contains information about the course type, the credits and the name of the lecturer. List items are clickable and lead to a detail view that contains additional information about the course.

In order to highlight the most relevant content and to add status information, the page is separated into 3 sections: Active courses, completed courses and failed courses. Active courses are on top of the list since they are most likely to require any action. The status of completed or failed courses can not be changed anymore, so they can stay available at the bottom. The student can always come back to these list items to view details about these courses as well.

Once an active course is completed or the student fails the success criteria, it automatically moves to the respective section of the page.

In general, the view adapts to each term. Once a new term starts, all courses of the previous term disappear from the page and are replaced by the newly relevant courses. Courses that the student has been enrolled in in previous terms can be accessed through the curriculum (Fig. 5.5).

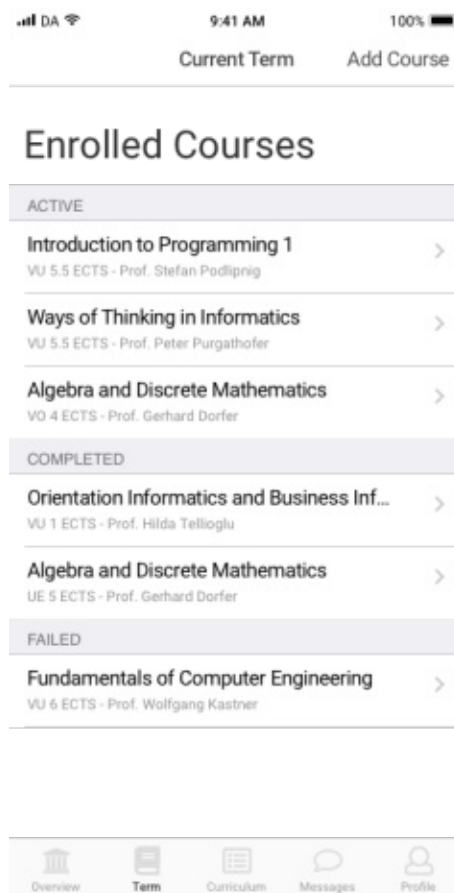


Figure 5.4: Courses overview in TISS prototype

Curriculum

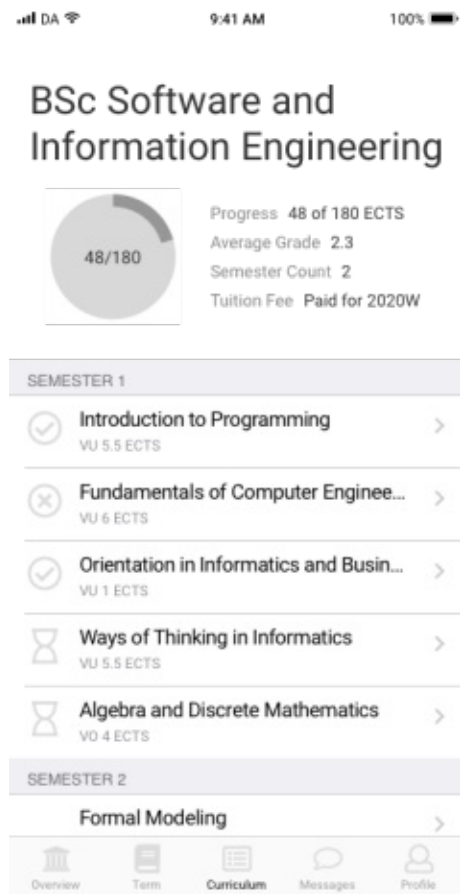


Figure 5.5: Curriculum overview in TISS prototype

This page provides a general overview over the progress within the study program. It has a summary widget at the top of the page. The widget contains both an indicator and a summary. The indicator shows how many credits the student already achieved versus the total amount of credits that are required in order to complete the program.

The summary contains information regarding the progress in terms of credits. It also shows the average grade, the semester count and whether the tuition fee has been paid for the current semester, indicating the enrollment status of the student.

After the summary, the page basically lists the curriculum. Each semester has a separate section. A section contains all courses that need to be completed within the respective semester. The list items consist of the course title and the number of credits. Each list element is clickable and leads to a detail view of the course.

Another feature of the curriculum page are the status indicators for each course. The course list elements have a symbol each, indicating whether the course is completed (checkmark), failed (cross) or still needs to be done (no symbol) or currently in progress (hourglass). This offers a quick

overview over what is still missing in order to complete the degree. The usage of a filter function could be considered as well, but would need to be validated with users first.

Messages

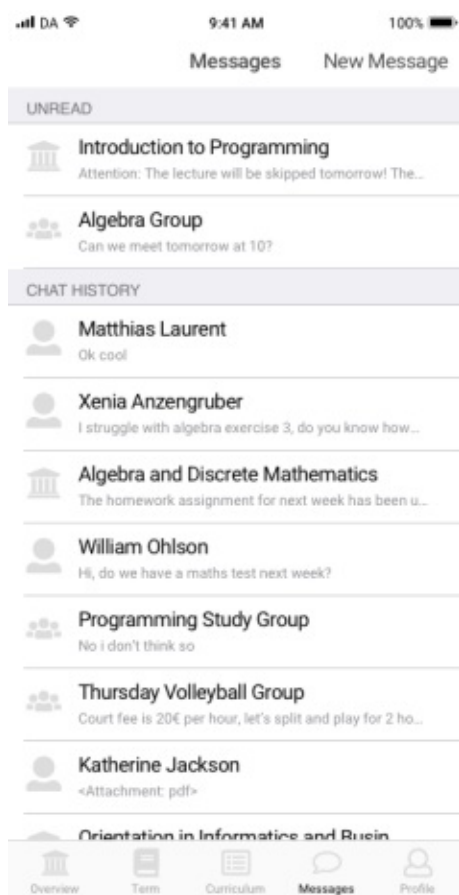


Figure 5.6: Messages section in TISS prototype

The messages page facilitates communication both between students, but also from institution to student. There are therefore different types of messages that can all be received in this section of the application.

Chat

Chat messages are one-on-one communication and can be sent to any person that has an account in the system. This can be other students but also staff members. To avoid spam or other unwanted messages, it can be considered to add a feature where individuals can be blocked, so that no messages can be received from them anymore.

Similar to well-known instant messaging applications such as WhatsApp[14], one person can create a chat group and add multiple other individuals to it. All group members will then receive all communication that is sent to the group chat. Groups can be formed around lectures, such as study groups, but also for purposes that are not directly related to studies, such as leisure activities. People should of course be able to leave groups or mute them when they become too verbose.

Lecturers can send messages to all participants of a course they are teaching, for example to announce homework assignments, to send out complementary reading or to

communicate any changes to the schedule.

System messages differ from the previously mentioned message types, because they are not particularly sent out manually by a person, but rather generated by the SIS itself. They can remind of an exam registration that just opened, remind students to complete their tuition fee payments or announce changes related to theatre rooms, just to name a few examples.

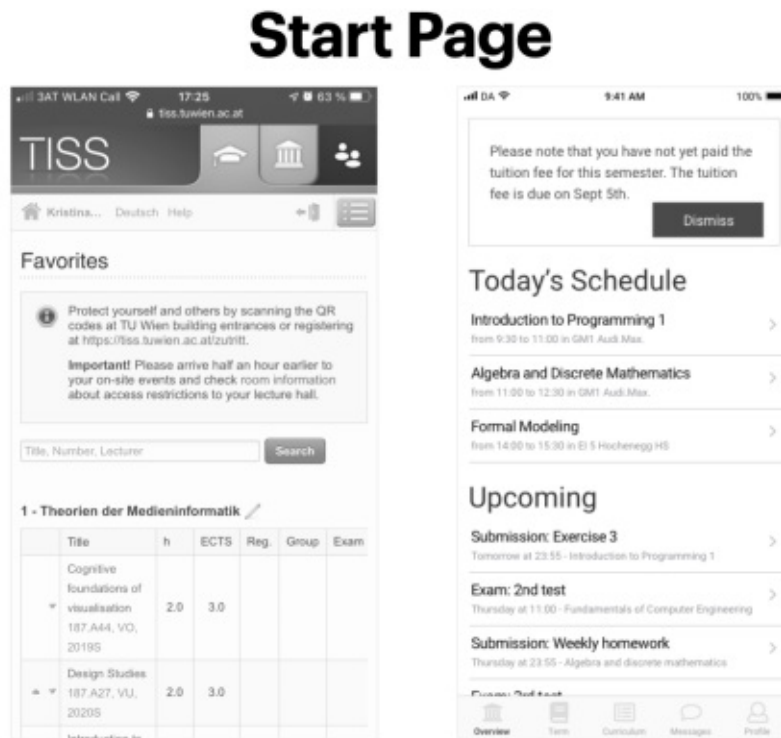


Figure 5.7: Evaluation setting

5.2.2 Qualitative Evaluation

The previously described mockups have been qualitatively evaluated with 7 students of the Faculty of Informatics at Vienna University of Technology. Unfortunately, meeting the participants in person was not possible due to the restrictions related to the ongoing Coronavirus pandemic. Therefore, participants have been recruited through the Discord server that is very commonly used by students for communication. The evaluation sessions took place in video conferences. However, 2 participants did not feel comfortable with taking part in a video call. They have been given the chance to give their feedback and discuss it with me in a chat instead, where I shared the mockups with them.

The evaluation sessions took 30 minutes each, and were structured as follows: First I introduced myself and my thesis project. Then I explained what they can expect to happen during the session. Afterwards I showed them the mockups one by one. They were displayed on the screen next to a screenshot of TISS showing the same content. Colors have been removed from the screenshot for easier comparison with the mockup. Figure 5.7 shows an example of how the screens were presented to the participants.

The feedback sessions started as unstructured interviews where the participants were

5. PUTTING REDESIGN INTO PRACTICE

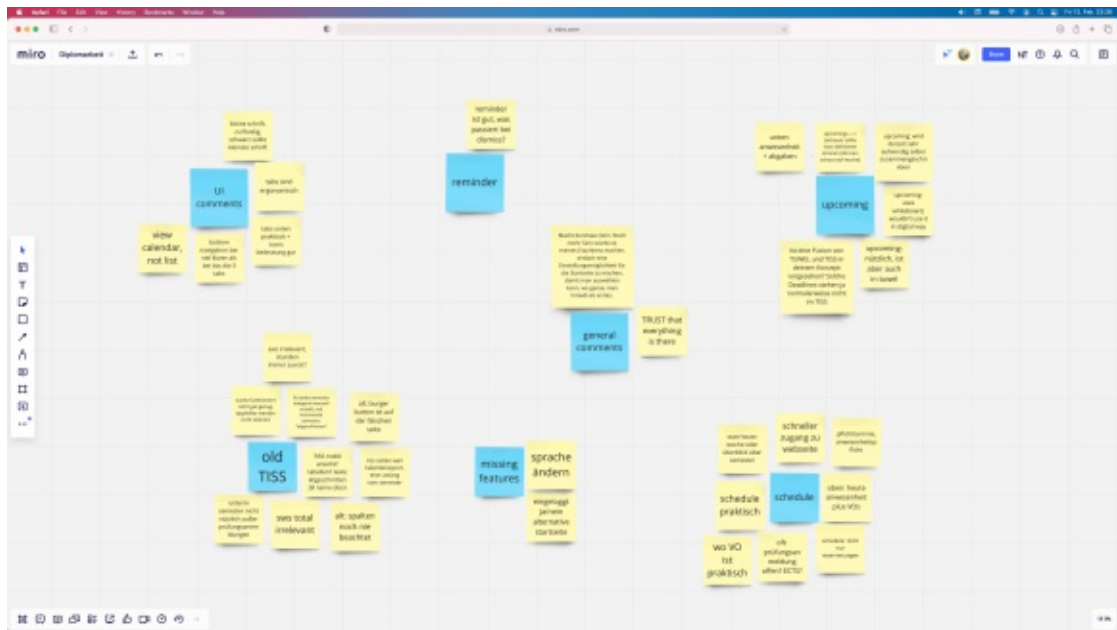


Figure 5.8: Thematic Analysis

asked to talk aloud loud and share what comes to their mind while observing the screens. The sessions were later intended to turn into participatory design[39] discussions, where the roles of the interviewer and interviewee blur and new ideas are elaborated together.

I was taking notes during the sessions. A thematic analysis has then been performed on the interview notes data. Figure 5.8 shows the analysis being work in progress.

The following section describes the results of the evaluation sessions. "TISS" generally refers to the current live version of TISS, while the redesigned version will be referenced as "mockups".

Start Page

Most participants mentioned drawbacks that come with the current version of TISS: Course information is primarily based on *SWS*, which is an entirely irrelevant legacy metric for students. They care mostly about *ECTS* instead, which is only shown in a secondary position.

The current start page is mostly used in a way where students manually create categories for each semester and populate them with courses they have planned for that specific semester. Other than that, there is no real benefit in using TISS during the semester. Most relevant information is in TUWEL (the e-learning platform). The calendar would be useful. However, it does not show real appointments but rather room reservations, so students don't really rely on it too much. Moreover, one participant said that the hamburger menu icon should be on the other side of the TISS screen.

Tables seem to be a repetitive pain point in TISS, especially in the mobile view. They don't fit on the screen and are cumbersome to use.

The reminder in the top section of the mockup was perceived as useful. However, it was not clear from the mockup what will happen when a user dismisses the alert.

The purpose of the *today's schedule* and *upcoming* sections of the mockup have been understood very well. The schedule section has been perceived as very useful, but under the very important condition that it shows reliable and correct data, instead of just room reservations. The students confirmed that they log into TISS from time to time to find out about the location of a lecture or any other lecture-related information. This use case is covered very well in the schedule section. However, one student suggested to change the *today's schedule* into a weekly or semester schedule for better planning.

As a feedback to the *upcoming* section in the mockup, students explained how they manage to retain overview. All of them have a manual list where they manage all important submissions, deadlines and exam dates. One student showed me a whiteboard in their room that is fully dedicated for this purpose. Unsurprisingly, they welcomed the automation that the *upcoming* section would bring to their planning. The major related concern was that most of the information is not yet in TISS but rather in TUWEL, and that this functionality would either double the effort or would not work at all because of the missing integration of the two systems. Generally, participants mentioned that they would need to trust the application that all relevant information is there and no important deadline is missing. It is to be considered how this amount of trust can be earned.

Curriculum Overview

While looking at the TISS version of the curriculum overview, the participants were reminded of different issues they have with using it. First, it usually takes a while to find it at all because there is no shortcut in TISS to the curriculum of the enrolled program. Users need to go through the list of all study programs to find theirs, and then navigate to the curriculum.

One pain point that was mentioned by almost all participants is that the view defaults to the module view, while the semester view is much more relevant. The first thing most students keep doing when they are on the page is to switch the view to the semester view. The participants suggested to make the semester view the default.

They also suggested to remove the *Prolog* course from the list because it is only relevant before starting the study program, and after that never again.

What also annoys users is that the whole view has the scope of a specific semester, meaning that course descriptions can not be read when the course has not yet been added for a specific semester. Moreover, the view defaults to the current semester until the very last day of it, and then automatically switches to the new semester on its first day. This offers room for improvement because usually students plan the upcoming semester

before the current semester ends, what forces them to switch to the new semester every time they view the page. The participants suggested to either save the selection or make the switch earlier.

Regarding the new design, the progress widget on top of the screen was perceived as very useful and motivating by the majority of participants. Unfortunately, TISS lacks any indication of study progress. They immediately came up with additional design ideas such as adding an *in progress* indicator to the circular chart, or adding the number of accomplished modules to the metrics next to the chart. One person mentioned that the tuition fee note is redundant because of the warning that is shown on the start page. Another person mentioned that the grade and semester counter metrics are not only irrelevant but might also be demotivating and frustrating. Interestingly, the impact of UI elements on motivation and stress have been pointed out repeatedly throughout the sessions.

The icons on the left side of the list items were fully understood by all participants except one. They were perceived as intuitive and useful because they show at a glance what still needs to be completed.

The courses list itself was subject to longer discussions. Especially the question whether the list should be composed in a fully automated way, or students should administrate it manually, was not straight forward to answer. It is very common that students study at their own pace and don't reach the expected study performance. Also, some programs offer many ways of specialisations through alternative modules or elective courses, so all participants had a hard time to trust that the system would be able to manage their personal curriculum in a correct and reliable way. This issues should definitely be tackled in a future design iteration. It was also unclear whether *semester* refers to one semester in the curriculum, or one semester from a student's point of view.

Although a detail view for the respective courses was not in scope of the mockup, participants asked frequently about where they would land when they tap on a row representing one course. Since I was not able to answer the questions, I asked them to suggest a solution that would suit them best. They mentioned multiple aspects that they would find useful such as a brief hard facts section containing the lecture mode and the ECTS credits. Apart of that, they suggested personalised content, for example their grades and now many exam attempts they made and their progress in the course. They also suggested a section for student-made content where students can review the course from their own experience, leaving useful information for future course participants. They also mentioned that the content can differ between completed and ongoing courses. For completed courses, a link to the certificate might be useful, while the courses that are in progress can show different types of information.

The participants also mentioned some missing features, for example the support of multiple study programs at the same time, or reflecting the module structure of a study program.

When talking about their personal habits, some participants mentioned that they don't

trust the system and have their own version of the curriculum overview on paper or in a spreadsheet.

Courses Overview

In general, the split into 3 sections was commented to be very useful. However, almost all participants felt reluctant about the *failed* section. The wording itself is demotivating and frustrating. They suggested to use *discontinued* or *other* instead. They even asked if the whole section can be hidden, and only be shown on active demand.

As in the previous section, discussions evolved again around the list being auto-generated or composed manually by students. They mostly prefer to administrate it manually so that they can remove courses that they quit or create categories for a more personal overview. One participant mentioned that it would feel good to manually drag and drop a course into the *completed* section once they successfully pass the criteria.

Similar to the *curriculum overview* screen, the detail view of a course was not in the scope of the mockup, but has been subject to discussions. Students would expect for example information about upcoming deadlines or links to the distance learning video streams.

The participants did not really agree on what information is relevant to display in one course list item. One mentioned that the only relevant information is whether they are enrolled in the course or not. Some cared about the lecturer's names, others did not.

One mentioned missing feature is another status that represents courses that are completed but certificates have not yet been issued. Also, the inconsistency of using *semester* and *term* has been pointed out by one participant.

Messages

The proposed messaging feature was unfortunately highly unsuccessful. All participants explained that there are more than enough communication tools in place already, and effort should be invested into reducing them instead of adding a new one.

Additionally, the students mentioned that they had security concerns when communicated through an unencrypted channel provided by the university. One person imagined that professors don't want to be personally contacted anyway but rather use mailing lists that are forwarded to their tutors.

One (female) participant talked about having been contacted in a personal, creepy and intrusive way through the messaging functionality in the e-learning platform TUWEL. This experience illustrates how fatal it would have been to roll out the suggested messaging feature and how valuable it was to talk to potential users before.

Findings

To summarize the evaluation, all participants preferred the redesign over the existing design of TISS. However, some flaws remain untackled such as the question how much of the available structure should be auto-generated by the system, and how much of it should be administered manually by students, how the system can guarantee correct and reliable information, and how uncomfortable information (such as failed courses) can be presented while minimizing the amount of stress and frustration that it causes. Also, messaging in general remains an issue that needs to be thought through in detail and tackled separately.

CHAPTER 6

Conclusion

The objective of this thesis was to propose a redesign of TISS, the student information system used at Vienna University of Technology, based on state of the art redesign methods.

However, only little focus has been laid on redesign in literature, and distinguishing it from design in general. A promising cognitive theory of design has been described by Liikkanen, Laakso et al. [30] where design is understood as a process of knowledge construction. Designers hold a certain amount of knowledge and keep adding pieces to it through design and research methods.

After looking at successful and unsuccessful redesign projects covered by literature, success factors were identified that successful projects had in common, such as working in cross-disciplinary teams and combining multiple user research methods in a certain pattern. The identified method pattern inspired the path that was followed in this thesis.

In reference to the *knowledge construction* theory, a certain amount of knowledge has already been available by having a system in place that is used in production for several years, and also previous work that was done to understand the problem space around the usage of TISS from a student's perspective. New bits of knowledge have been added during this thesis:

First, a comparative analysis was performed in order to learn from other student information systems that are in place at different universities. By looking at these systems in detail, more knowledge could be gathered about good and bad design practices specific to student information systems.

Additionally, a comparative expert workshop has been run to understand the problem space from a different angle. Experts have been invited to share their comments about the student information systems reviewed in the previously mentioned comparative analysis, in order to contribute new pieces of knowledge to the redesign project.

6. CONCLUSION

In chapter 5, all gathered knowledge from literature, previous work such as interviews and a prototype, the comparative analysis and the expert workshop has been processed into a redesign proposal that was sketched out in four major mockup screens and qualitatively evaluated with students. All participants preferred the redesigned version over the currently existing version. However, some flaws have been discovered during the evaluation sessions that should be tackled by a future design iteration.

To conclude, the presented approach was suitable to inform a redesign of TISS. However, there are numerous design and ideation methods available that can contribute to a project by generating additional pieces of knowledge, meaning that the proposed approach might not be the only one that can deliver good results. When starting a redesign projects, the involved designers need to evaluate what knowledge is already available and what methods are suitable to enrich it by new knowledge.

List of Figures

2.1	answerbag.com homepage on Feb. 19th, 2020	8
2.2	Skype's redesigned mobile application[3]	9
3.1	OSIRIS desktop and tablet version	16
3.2	OSIRIS mobile version	17
3.3	Study progress visualisation in OSIRIS	18
3.4	Dashboard in SAP SLCM	19
3.5	List of courses in SAP SLCM	20
3.6	Timetable in CIS by FH Complete	21
3.7	TISS landing page after login	22
3.8	TISS documents download section	23
3.9	U:Space progress overview	25
3.10	Tabs provide nested structure in LPIS	26
3.11	Course list in LPIS	27
3.12	Study progress overview at ETH Zürich	28
4.1	Participants discussing screens of different SIS	33
5.1	Favorites feature in TISS, containing real data from my own account	43
5.2	TISS redesign prototype[26]	45
5.3	Start page of TISS prototype	47
5.4	Courses overview in TISS prototype	48
5.5	Curriculum overview in TISS prototype	49
5.6	Messages section in TISS prototype	50
5.7	Evaluation setting	51
5.8	Thematic Analysis	52

List of Tables

2.1	Socio-technical Phenomena	4
2.2	Team setup in project teams	14
3.1	Findings from reviewing different SIS	29
4.1	Workshop agenda	32

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