

System Design and Management Final Report

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Abstract—This article is the summary of a course named System Design and Management given on the spring semester of 2022. The author aims to write down what he has learnt from the course and his reflection on what could be done better if there is another chance.

Index Terms—system, design, course, reflection

I. INTRODUCTION

SDM223 is a course given in School of System Design and Intelligent Manufacturing. SDM223 aims to develop students' analytical and innovative skills, and the ability to use system thoughts and methods to address complex problems. At first few weeks, students will learn about the definition, classification and development history of systems. Then, this course will introduce the basic procedures of system analysis and design and presents some commonly used system evaluation methods, i.e., the methodology of systems engineering. When students grasp the basic knowledge of System Engineering, they would be introduced to some small projects and use what they have learnt into their practice.

II. THE PROCESS OF INTRODUCING THE KNOWLEDGE IN OUR PRACTICE

A. Preparation

The first step of developing a system is to define the system in the enterprise view. However, for a system developed by a team consists of students, it is a better choice to start from the business management view.

3 管理 员 ¹	学生 or 学院? ² Super 管理员 ³	特定 ⁴ 两种方案可选: ⁵ 每年由各个年级学生自发组织的运营 (站旁组之美) ⁶ 由学院老师运营 ⁷	3.1: 系统可以提供一种方便、快速、易学习的管理方式。 ⁸ 3.2: 系统的管理尽量不通过代码来管理。 ⁹
4 学院 ¹⁰	感兴趣吗? 愿意参与、使用吗? ¹¹	学生和老师的沟通交流, 同步信息, 减少误会 ¹² 分享日常的平台, 通过对话的方式宣传 school 生活 ¹³ 公告栏 播放活动、讲座等等 ¹⁴	4.1: 系统可以提供一种新的交流方式以便不同学生老师之间交流。 ¹⁵ 4.2: 系统能够提供一些和 SDIM 相关的文字或图片视频信息。 ¹⁶ 4.3: 系统可以让用户了解一些特定的消息。 ¹⁷

Fig. 1. Early Stage Needs Definition

In the first several weeks, the developing team consulted a hand of professors, students and staffs working in SDIM, asking for what they want this system to achieve if implemented. To be noted, needs are what the system designers should concern in concept-building level, and finding out needs are vital for the development of the project. See figure 1.

B. Analysis Under Constraints

Once the needs of stakeholders been found, it comes to the stage of figuring out how the system looks like roughly. But before this, we must realize that there are some constraints exist:

- The budget is limited under two thousand yuan.
- The developing time limit should be less than 13 weeks.
- The system should protect users' private information and intellectual property.
- The technologies and skills needed for developing this system should be grasped easily.

After we know the limitation, our developing work is "inside the box". The next thing is to design the system in a high level and gradually divide it into several sub-systems. See figure 2

2.2需求Requirement (functional) 设计			
说明对本系统的主要输入输出项目、处理的功能性能要求。详细的说明可参见附录C。			
模块	子功能	子功能	描述
登录界面	游客登录界面		
	用户登录界面		
	管理员登录界面		
在线展示(主界面) (针对游客、普通用户、管理人员)	浏览文章缩略图	文章缩略图显示	
		编写者头像及昵称显示	
		文章标题显示	
		进入他人空间按钮显示	
	详细浏览文章	详细展示文章内容	
		展示文章发布信息	
		收藏文章	
		显示历史评论	
		发布评论	
	分类索引查找		
	搜索查找		
	系统外观展示		
	热门文章展示		
	进入文章发布界面		
	进入个人空间		
	进入他人空间		
用户系统、用户设置 (针对普通用户和管理员)	设置用户信息	用户密码设置	用户头像设置

Fig. 2. Translate Needs into Requirements

During this process, we introduced top-down approach to help figure out the compounds of the system. The top-down approach, or in other words, the top-down view, is a developing concept which checks the system from scope to details. The top-down approach has four steps in sequence:

- 1) Understanding the system as a whole, i.e., observe it in the largest scope.
- 2) Analyze the system-level requirements based on system-level needs.
- 3) Divide the big system into smaller sub-systems. Make sure the assemblies together can achieve the function of the higher level system.
- 4) Repeat the dividing process until reaching a complete understanding of the system.

With the guidance of top-down approach, we developed a set of operational concept. The most important function we have designed for the system is the article-release sub-system. See figure 3

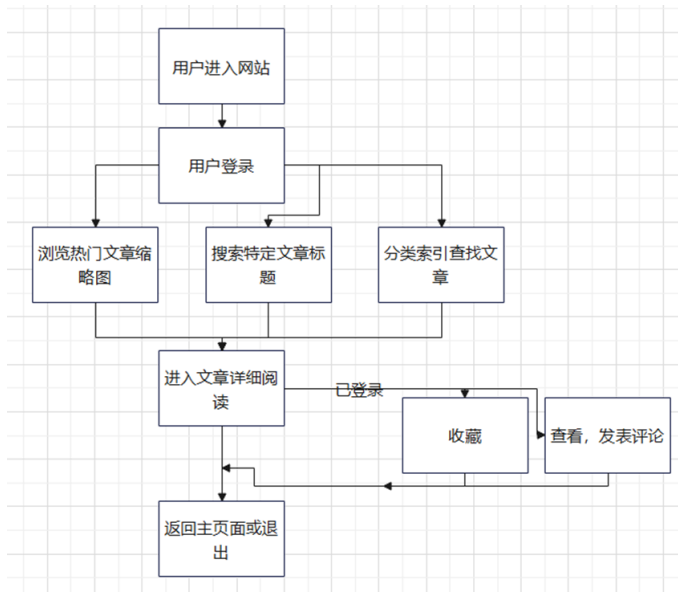


Fig. 3. The flow chart of releasing a article.

You might have noticed that the flow chart far is from the end of work. There are several sub-functions included in the flow chart need to be defined further. Repeatedly, we checked the next lower level of the system and implemented the sub-functions work flow diagram.

III. THE OUTCOME OF THE PROJECT

After 15 weeks work(two weeks exceeded than our plan), the system was approximately completed. See figure 4: That is

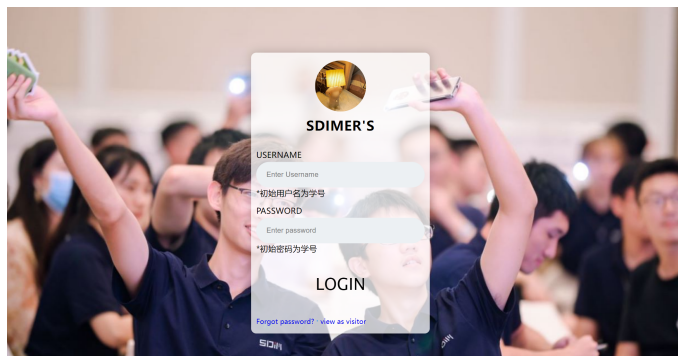


Fig. 4. Login page of the system

the login page of our system. The system(or say the website) is written in PHP, HTML, CSS, JavaScript and the server is set remotely. It is a great achievement for 5 students who had no relative experience on developing online website. Under the instruction of Systems Engineering, and with the management tools like Gantt chart, the development was more appropriate than we had expected.

IV. REFLECTION

Although the system was completed ultimately, there were many mistakes we made in the developing process.

- 1) Little time is paid on life-cycle analysis. In most of the time, we considered utilization stage and made effort to realize it. Other important stages, such as acquisition stage, are ignored by us. It results on incompleteness of concept design.
- 2) We did not take requirement management into consideration. SDIM is a fast-growing school, and it is possible that we meet some other new needs in the future. However, we did not design a mechanism of adjusting the system as easy as possible to benefit futuristic maintenance and development.
- 3) Although we develop RBS(Requirements Breakdown Structure), we did not follow its instruction to conduct the development. Instead, the developing tasks were some bit arbitrary, which effected our developing efficiency greatly.
- 4) Tasks allocation is confusing. The website development is made up of two aspects: the front-end and the back-end. In the real developing process, although we had allocated tasks to members at the beginning, it turned out to be a mess especially in the second half of the development.

V. CONCLUSION

It is a good try to use systems engineering methodology in development. Compared to the former project conducted in last semester, it was much more successful and ordered. From this experience, I have realized the importance of systems engineering which is really helpful for analyzing issues, finding out solutions and developing systems. I would like to show my great appreciation to Prof. Wang, the lecturer of the course, for introducing us to this sphere.