



Software Engineering I

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The background features a light gray gradient with a large, faint gear logo in the center. The gear has Persian text around its inner circle: 'دانشگاه صنعتی اصفهان' (University of Technology of Isfahan) at the top and 'دانشکده مهندسی' (Faculty of Engineering) at the bottom. Scattered across the background are numerous realistic water droplets of various sizes, some with highlights and shadows, giving a fresh and clean aesthetic.

Chapter 7

Moving To Design(I)

Steps(I)

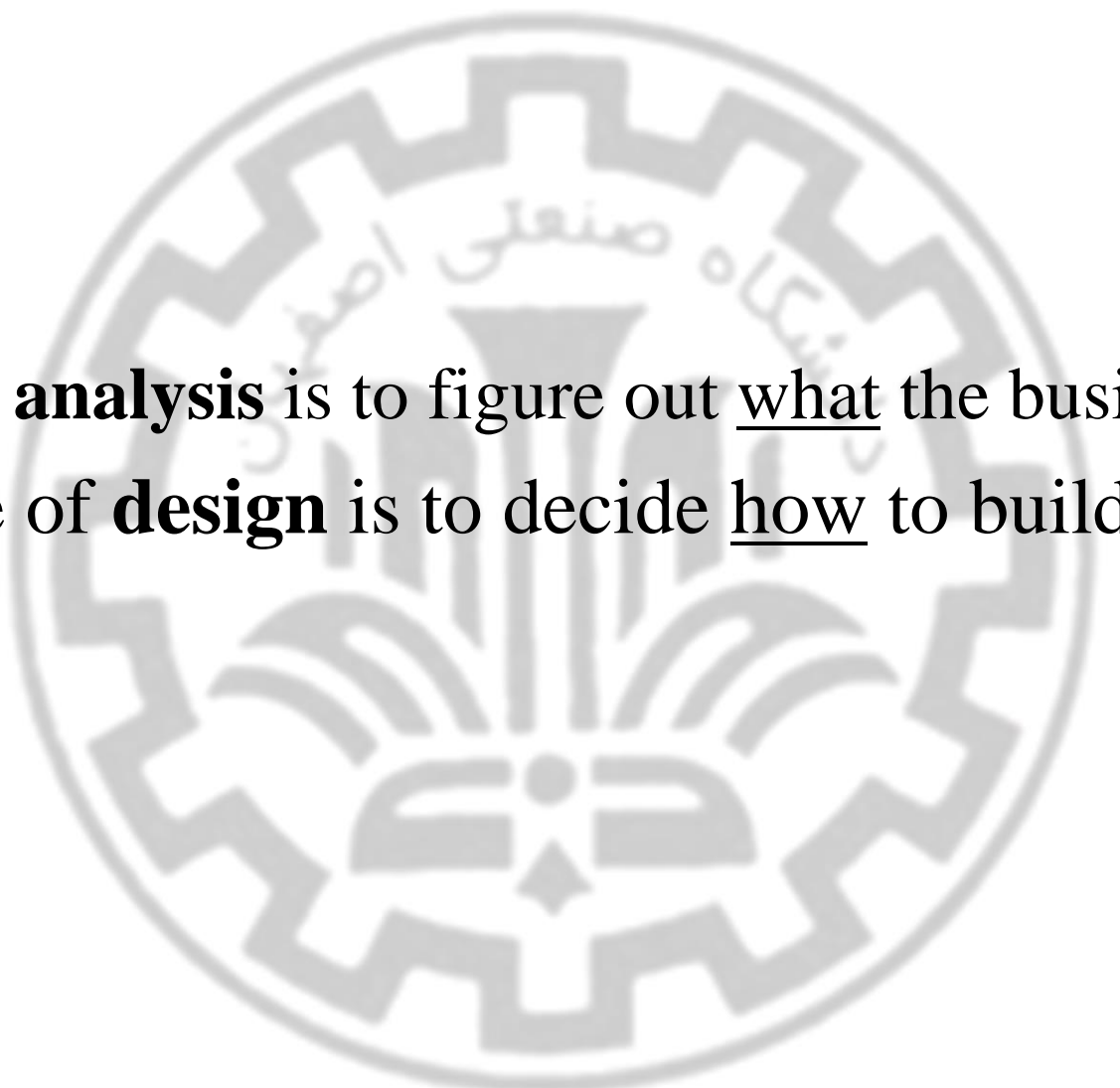
1. Preparing proposal
2. Requirements determination
 - User story
3. Abstract Business Process Modelling
4. Analysis
 - Functional Modelling
 - Structural Modelling
 - Behavioral Modelling

Steps(II)

5. Design

- Optimization
- Database Management
- User Interface
- Physical Architecture





The purpose of **analysis** is to figure out what the business needs are.
The purpose of **design** is to decide how to build the system.

- اینجا ما داریم how رو جواب میدیم ینی چگونه سیستم رو بسازیم

Introduction

- The major activity that takes place during *design* is evolving the set of analysis representations into design representations.
- Throughout design, the project team carefully considers the new system with respect to the current environment and systems that exist within the organization as a whole.
- Major considerations in determining how the system will work include environmental factors, such as integrating with existing systems, converting data from legacy systems, and leveraging skills that exist in-house.
- Although the planning and analysis are undertaken to develop a possible system, the goal of design is to create a blueprint for a system that can be implemented.

مهمترین فعالیتی که داریم اینه که مدل های انالیز باید تبدیل بشن به مدل های دیزاین کاری که داریم توی فاز دیزاین انجام میدیم--> یکی افزودن جزئیات فنی و یکی دیگه هم محیط رو ما سوار میکنیم ینی اینجا می گیم معماری ما چی باشه ینی محیط رو داریم مشخص و برای مدل ها سوار میکنیم ینی سیستم چگونه باید با در نظر گرفتن عامل های محیطی کار کنه

پس هدف دیزاین میشه ساخت اولیه سیستم برای اینکه بتونه پیاده سازی بشه

Introduction(Cnt'd)

- An important initial part of design is to examine several design strategies and decide which will be used to build the system.
- Systems can be built from scratch, purchased and customized, or outsourced to others, and the project team needs to investigate the viability of each alternative.
- At the same time, detailed design of the individual classes and methods that are used to map out the nuts and bolts of the system and how they are to be stored must still be completed.
- Techniques such as CRC cards, class diagrams, contract specification, method specification, and database design provide the final design details in preparation for the implementation phase, and they ensure that programmers have sufficient information to build the right system efficiently.

مهمترین و پایه ترین کاری که توی فاز دیزاین انجام میشه بحث verification , validation اون مدل های تحلیل است

مسئله ای که است که ما اول مطمئن بشیم اون دیاگرام انالیزها درست هستن و بعد استراتژی دیزاین رو تعیین بکنیم تا این مرحله متوجه شدیم چه فرایندهایی و چه سرویس هایی و .. دارن و بسته به این که اون سیستم چجوری باشد می تونه استراتژی های متفاوتی داشته باشه

Introduction(Cnt'd)

- Design also includes activities such as designing the user interface, system inputs, and system outputs, which involve the ways that the user interacts with the system.
- Physical architecture decisions are made regarding the hardware and software that will be purchased to support the new system and the way that the processing of the system will be organized.

Verifying and Validating the Analysis Models

- Balancing Functional and Structural Models
- Balancing Functional and Behavioral Models
- Balancing Structural and Behavioral Models

سه نوع مدل داشتیم:

این سه تا باید بررسی بشن و هیچ گونه عدم ناسازگاری نباید بینشون باشه

Balancing Functional and Structural Models

- First, **every class** on a class diagram and every CRC card must be associated with **at least one use-case**, and vice versa.
- Second, **every activity or action** contained in an activity diagram and every **event** contained in a use-case description should be related to one or more **responsibilities** on a CRC card and one or more **operations** in a class on a class diagram and vice versa.
- Third, every **object** node on an activity diagram must be associated with an instance of a class on a class diagram and a CRC card or an **attribute** contained in a class and on a CRC card.
- Fourth, every **attribute** and **association/aggregation** relationships contained on a **CRC** card (and connected to a **class** on a class diagram) should be related to the subject or object of an **event** in a use-case description.

Balancing Functional and Behavioral Models

- First, the **sequence and communication** diagrams must be associated with a **use case** on the use-case diagram and a **use-case description**.
- Second, **actors** on sequence diagrams, communication diagrams must be associated with **actors** on the use-case diagram or **referenced** in the use-case description, and vice versa.
- Third, **messages** on sequence and communication diagrams, **transitions** on behavioral state machines must be related to **activities** and **actions** on an activity diagram and **events** listed in a use-case description, and vice versa.

Balancing Structural and Behavioral Models

- First, because **behavioral state machines** represent the life cycle of complex objects, they must be associated with **instances (objects) of classes** on a class diagram and with a **CRC** card that represents the class of the instance.
- Second, **communication and sequence** diagrams contain objects that must be an **instantiation** of a class that is located on a class diagram.
- Third, **messages** contained on the sequence and communication diagrams, **transitions** on behavioral state machines must be associated with **responsibilities** and **associations** on CRC cards and **operations** in classes and **associations** connected to the classes on class diagrams.
- Forth, the **states** in a behavioral state machine must be associated with **different values of an attribute** or set of attributes that describe an object.

Evolving the Analysis Models into Design Models

- The analysis activities defined the functional requirements and ignored nonfunctional requirements.
- In contrast, the primary purpose of the **design** models is to increase the likelihood of successfully delivering a system that implements the functional requirements in a manner that is affordable and easily maintainable. Therefore, in systems design, we address both the functional and nonfunctional requirements.

برای بحث مدل های طراحی ما فانکشنال ریکویرمنت ها رو بررسی می کنیم و خیلی درگیر نان فانکشنال ها نمیشیم ولی توی دیزاین همون طور که به فانکشن ها می پردازیم به نان فانکشنال هم می پردازیم

مسئله ای که این است ک این نان فانکشنال اهمیتشون خیلی زیاده و هزینه تغییراتشون خیلی بالاست

Evolving the Analysis Models into Design Models(Cnt'd)

- From an object-oriented perspective, system design models simply refine the system analysis models by adding system environment (or solution domain) details to them and refining the problem domain information already contained in the analysis models.

هم خود مدل تحلیل رو ریزتر میکنیم و هم محیط رو اضافه میکنیم

دل های طراحی ما علاوه بر اینکه جزئیات بیشتری به اون مدل های تحلیل اضافه می کنن لایه های دیگه هم در نظر میگیرن و محیط رو به سیستم اضافه می کنن



Is the current representation of the evolving system optimal?

A good design is one that balances trade-offs to minimize the total cost of the system over entire life time.

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پس می‌خوایم به سمتی برویم که کل هزینه سیستم در طول دوره زندگی اون سیستم مینیمم بشه

Reference

- **Dennis, Wixon, Tegarden**, “System Analysis and Design, An Object Oriented Approach with UML”, 5th Edition, 2015.

