Process Models: Perspective Process Models (Continue)

Lecture # 6

Lecture by Engr. Sidra

Incremental Model

- The incremental model combines the elements of waterfall model and they are applied in an iterative fashion.

- In incremental model the whole requirement is divided into various builds. Multiple development cycles take place here, making the life cycle a **"multi-waterfall" cycle**. Cycles are divided up into smaller, more easily managed modules.

- The first increment in this model is generally a core product.

- Each increment builds the product and submits it to the customer for any suggested modifications.

- The next increment implements on the customer's suggestions and add additional requirements in the previous increment.

- This process is repeated until the product is finished. **For example,** the word-processing software is developed using the incremental model.

Incremental Model

- In the diagram when we work **incrementally** we are adding piece by piece but expect that each piece is fully finished.

- Thus keep on adding the pieces until it's complete.

- This means that the customer can evaluate the system at early stage in the development to see if it delivers what's required. If not, then only the current increment has to be changed and, possibly, new functionality defined for later increments.

- By developing the software incrementally, it is cheaper and easier to make changes in the software as it is being developed.
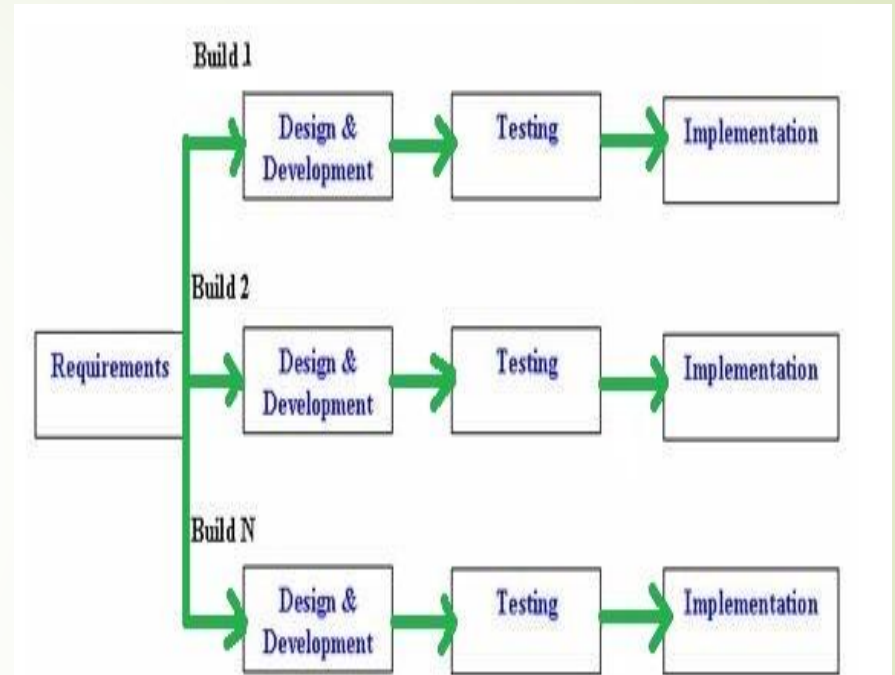
Fig:- Incremental Life Cycle Model

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Incremental Model - Example

- As in the image below a person has thought of the application. Then he started building it and in the first iteration the first module of the application or product is totally ready and can be demoed to the customers.

- Likewise in the second iteration the other module is ready and integrated with the first module. Similarly, in the third iteration the whole product is ready and integrated. Hence, the product got ready step by step.
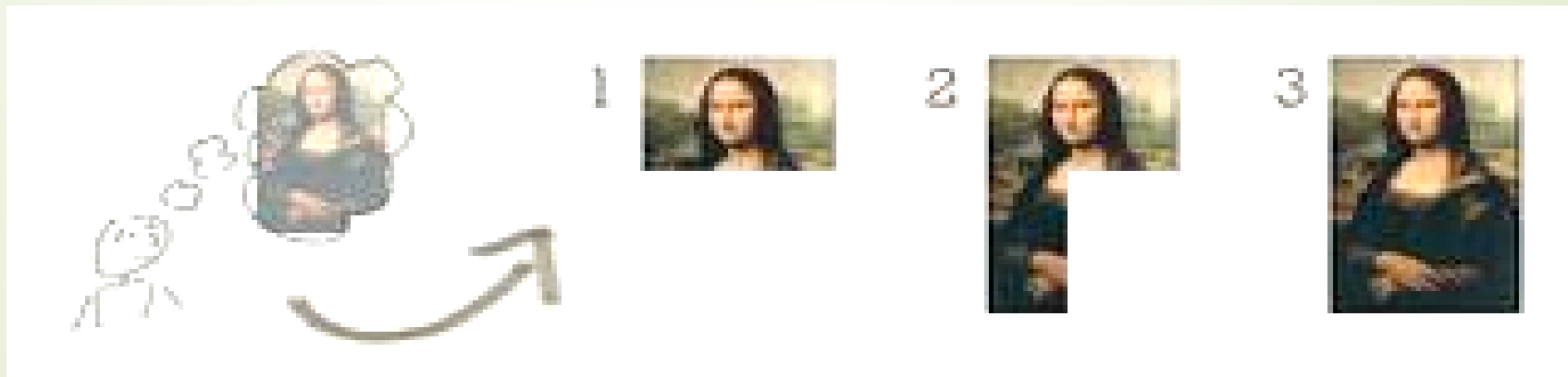
Incremental V/S Waterfall Model

➤ Compared to the waterfall model, incremental development has three important benefits:

- ➤ The **cost of accommodating changing** customer requirements is reduced.

- ➤ It's easier to get **customer feedback** on the work done during development

- ➤ More **rapid delivery** of *useful* software is possible even if all the functionality hasn't been included.

Incremental Model - Applications

- This model can be used when the requirements of the complete system are clearly defined and understood.

- Major requirements must be defined; however, some details can evolve with time.

- There is a need to get a product to the market early.

- A new technology is being used

- Resources with needed skill set are not available

- There are some high risk features and goals.

Advantages of Incremental model

- It is easier to test and debug during the smaller iteration.

- The customers can respond to its functionalities after every increment.

- Generates working software quickly and early during the software life cycle.

- This model is more flexible – less costly to change scope and requirements.

- Lowers initial delivery cost.

- Easier to manage risk because risky pieces are identified and handled during iteration.

Disadvantages of Incremental model

- Needs good planning and design.

- Needs a clear and complete definition of the whole system before it can be broken down and built incrementally.

- The cost of the final product may cross the cost estimated initially.

- The demands of customer for the additional functionalities after every increment causes problem during the system architecture.

RAD (Rapid Application Development)

- Rapid application development is a software development methodology that uses minimal planning in favour of rapid prototyping.

- The functional modules are developed in parallel as prototypes and are integrated to make the complete product for faster product delivery.

- Since there is no detailed preplanning, it makes it easier to incorporate the changes within the development process.

- RAD projects follow iterative and incremental model and have small teams comprising of developers, domain experts, customer representatives and other IT resources working progressively on their component or prototype.

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RAD (Rapid Application Development)

- The most important aspect for this model to be successful is to make sure that the prototypes developed are reusable.

- Rapid Application Development focuses on
    - gathering customer requirements through workshops or focus groups,
    - early testing of the prototypes by the customer using iterative concept,
    - reuse of the existing prototypes (components),
   - continuous integration and rapid delivery.

RAD Model

- **Business modeling:**
 - The information flow is identified between various business functions.

- **Data modeling:**
  - Information gathered from business modeling is used to define data objects that are needed for the business.

Business Modeling

Data Modeling

Process Modeling

Application Generation

Testing and Turnover

RAD Prototype Model
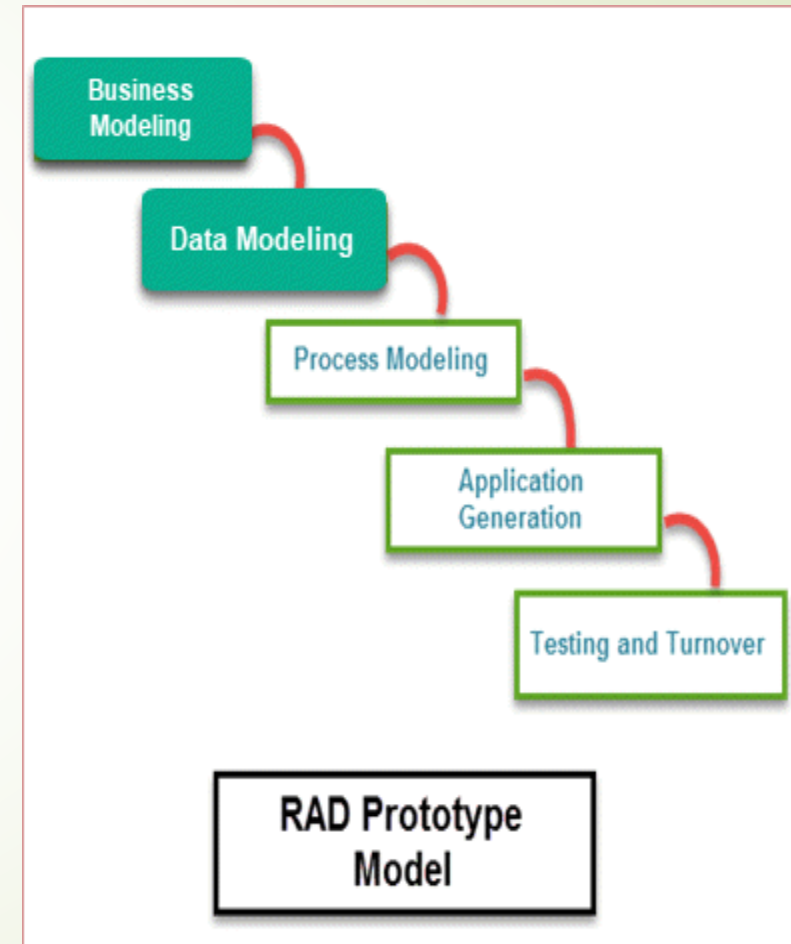
RAD Model

- **Process modeling:**

  - Data objects defined in data modeling are converted to achieve the business information flow to achieve some specific business objective.

- **Application generation:**

  - Automated tools are used to convert process models into code and the actual system.

- **Testing and turnover:**

  - Test new components and all the interfaces
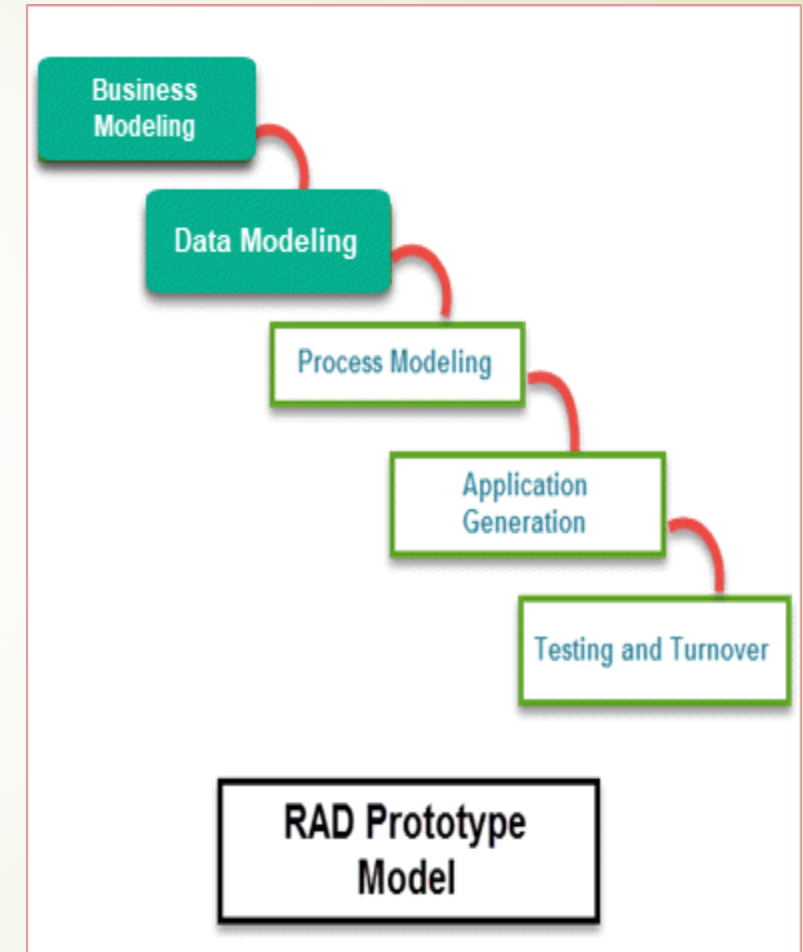
RAD Model - Application

- RAD model can be applied successfully to the projects in which clear modularization is possible. If the project cannot be broken into modules, RAD may fail.

- RAD should be used only when a system can be modularized to be delivered in an incremental manner.

- It should be used if there is a high availability of designers for modelling.

- It should be used only if the budget permits use of automated code generating tools.

- RAD SDLC model should be chosen only if domain experts are available with relevant business knowledge.

- When a system needs to be produced in a short span of time (2-3 months)

- When the requirements are known

- When the user will be involved all through the life cycle

- When technical risk is less

Advantages of RAD Model

- Changing requirements can be accommodated.
- Progress can be measured.
- Iteration time can be short with use of powerful RAD tools.
- Productivity with fewer people in a short time.
- Reduced development time.
- Increases reusability of components.
- Quick initial reviews occur.
- Encourages customer feedback.
- Integration from very beginning solves a lot of integration issues.

Disadvantages of RAD Model

- Dependency on technically strong team members for identifying business requirements.

- Only system that can be modularized can be built using RAD.

- Requires highly skilled developers/designers.

- High dependency on modelling skills.

- Inapplicable to cheaper projects as cost of modelling and automated code generation is very high.

- Management complexity is more.

- Requires user involvement throughout the life cycle.

- Suitable for project requiring shorter development times.