

Software Requirements Engineering (SE2001)



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PROTOTYPING

Prototyping

It is the technique of constructing a partial implementation of a system so that customers, users, or developers can learn more about a problem or a solution to that problem.

Prototyping - 1

- ❖ An initial version of the system under development, which is available early in the development process
- ❖ A prototype can be a subset of a system, and vice versa, but they are not the same.

Prototyping - 2

- ❖ In hardware systems, prototypes are often developed to test and experiment with system designs
- ❖ In software systems, prototypes are more often used to help elicit and validate the system requirements. There are other uses also

Prototyping - 3

- ❖ It should be easy for a prototype to be developed quickly, so that it can be used during the development process.
- ❖ Prototypes are valuable for requirements elicitation because users can experiment with the system and point out its strengths and weaknesses. They have something concrete to criticize.

Types of Prototyping

- ❖ Throw-away prototyping
- ❖ Evolutionary prototyping

Throw-away Prototyping - 1

- ❖ Intended to help elicit and develop the system requirements.
- ❖ The requirements which should be prototyped are those which cause most difficulties to customers and which are the hardest to understand. Little documentation is needed.

Throw-away Prototyping - 2

- ❖ Determine the feasibility of a requirement
- ❖ Validate that a particular function is really necessary
- ❖ Uncover missing requirements
- ❖ Determine the viability of a user interface

Throw-away Prototyping - 3

- ❖ Writing a preliminary requirements document.
- ❖ Implementing the prototype based on those requirements.
- ❖ Achieving user experience with prototype.
- ❖ Writing the real SRS.
- ❖ Developing the real product.

Evolutionary Prototyping - 1

- ❖ Intended to deliver a workable system quickly to the customer.
- ❖ The requirements which should be supported by the initial versions of this prototype are those which are well-understood and which can deliver useful end-user functionality.

Evolutionary Prototyping - 2

- ❖ Documentation of the prototype is needed to build upon.
- ❖ This process repeats indefinitely until the prototype system satisfies all needs and has thus evolved into the real system.

Evolutionary Prototyping - 3

- ❖ Evolutionary prototype may not be built in a 'dirty' fashion.
- ❖ The evolutionary prototype evolves into the final product, and thus it must exhibit all the quality attributes of the final product.

Comparison of Prototyping

	Throwaway	Evolutionary
Development approach	Quick and dirty. No rigor	No sloppiness. Rigorous
What to build	Build only difficult parts	Build understood parts first. Build on solid foundation
Design drivers	Optimize development time	Optimize modifiability
Ultimate goal	Throw it away	Evolve it

Prototyping Benefits - 1

- ❖ The prototype allows users to experiment and discover what they really need to support their work.
- ❖ Establishes feasibility and usefulness before high development costs are incurred.

Prototyping Benefits - 2

- ❖ Essential for developing the 'look and feel' of a user interface. Helps customers in 'visualizing' their requirements.
- ❖ Forces a detailed study of the requirements which reveals inconsistencies and omissions.

Prototyping Costs

❖ Training costs:

- Prototype development may require the use of special purpose tools.

❖ Development costs:

- Depend on the type of prototype being developed.

Prototyping Problems

❖ Extended development schedules:

- Developing a prototype may extend the schedule although the prototyping time may be recovered because rework is avoided.

❖ Incompleteness:

- It may not be possible to prototype emergent system requirements

Additional Benefits of Prototyping

- ❖ Developing a system prototype is worth the investment in time and money
- ❖ Real needs of the customers will be reflected in the requirements set
- ❖ Rework will be reduced
- ❖ Defect prevention

Developing Prototypes

- ❖ Conventional system development techniques usually take too long, and prototypes are needed early in the elicitation process to be useful.
- ❖ Rapid development approaches are used for prototype development.

Approaches to Prototyping

- ❖ Paper prototyping
- ❖ 'Wizard of Oz' prototyping
- ❖ Executable prototyping

Paper Prototyping - 1

- ❖ A paper mock-up of the system is developed and used for system experiments.
- ❖ This is very cheap and very effective approach to prototype development.
- ❖ No executable software is needed.

Paper Prototyping - 2

- ❖ Paper versions of the screens, which might be presented to the user are drawn and various usage scenarios are planned.
- ❖ For interactive systems, this is very effective way to find users' reactions and the required information.

‘Wizard Of Oz’ Prototyping - 1

- ❖ A person simulates the responses of the system in response to some user inputs.
- ❖ Relatively cheap as only user interface software needs to be developed.
- ❖ The users interact through this user interface software and all requests are channeled to the a person, who simulates the system’s responses.

‘Wizard Of Oz’ Prototyping - 2

- ❖ This is particularly useful for new systems, which are extensions of existing software systems, and the users are familiar with the existing user interface.
- ❖ The person simulating the system is called ‘Wizard of Oz’.

Executable Prototyping - 1

- ❖ A fourth generation language or other rapid development environment is used to develop an executable prototype.
- ❖ This is an expensive option and involves writing software to simulate the functionality of the proposed system.

Executable Prototyping - 2

- ❖ 4GLs Based Around Database Systems Are Useful For Developing Prototypes, Which Involve Information Management.

Executable Prototyping - 3

- ❖ Visual programming languages such as Visual Basic or ObjectWorks.
- ❖ These languages are supported by powerful development environments, which include access to reusable objects and user interface development utilities. Support for database-oriented applications is not that strong.

Executable Prototyping - 4

- ❖ Internet-based prototyping solutions based on WWW browsers and languages.
- ❖ Here, we a ready-made user interface and Java applets can be used to add functionality to the user interface.

Comments on Prototyping

- ❖ Prototyping interactive applications is easier than prototyping real-time applications.
- ❖ Prototyping is used better to understand and discover functional requirements, as compared to non-functional requirements.



THANK YOU

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