Software Engineering in Development of Software for LLRF System

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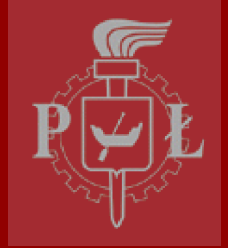
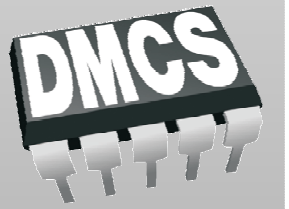


Agenda



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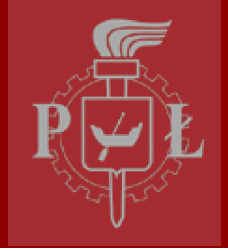
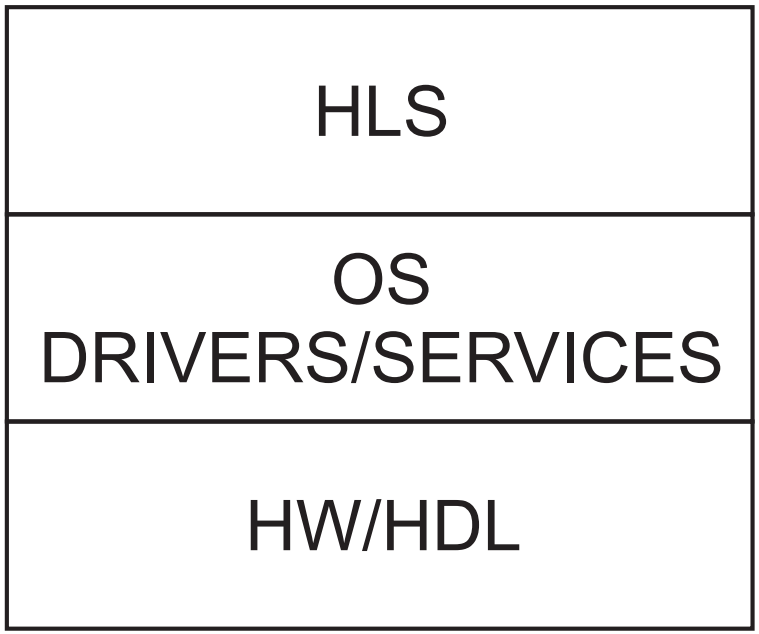
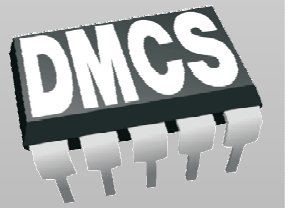


Software Layers





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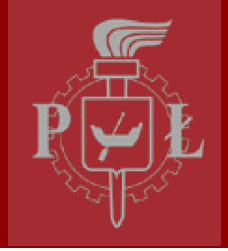
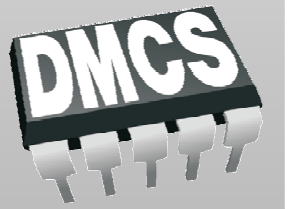


Common Problems with Software Development

- Delivering New Features to Customer Takes Too Long
- Quality Delivered to Customer Is Unacceptable
- Features Are Not Used by Customer
- Software Is Not Useful to Customer



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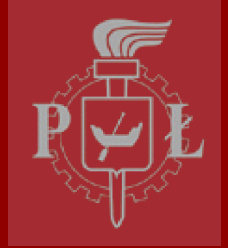
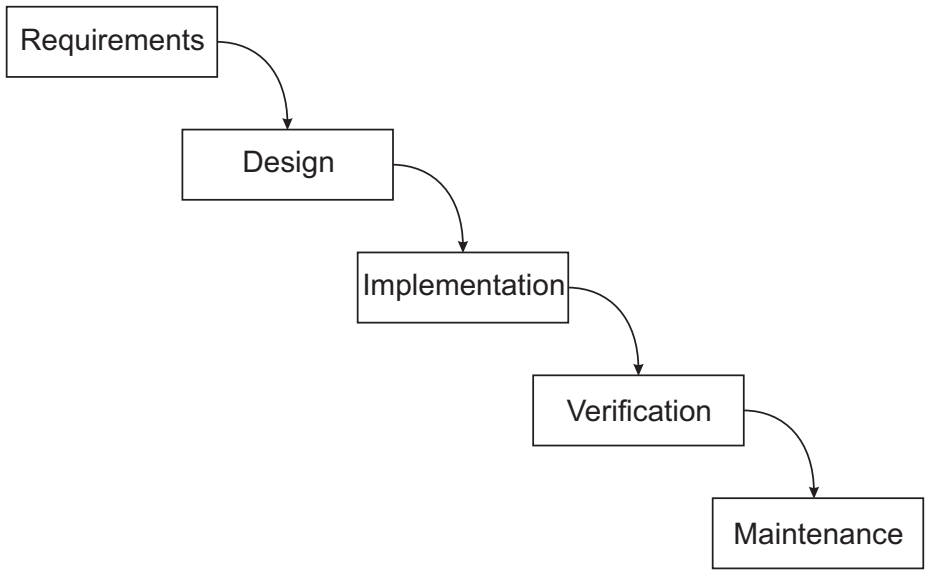
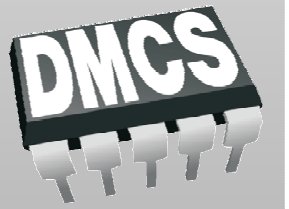


Software Engineering

- The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software
- Software development methodology:
  - Waterfall development
  - Iterative development e.g. agile software development





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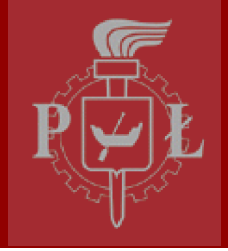

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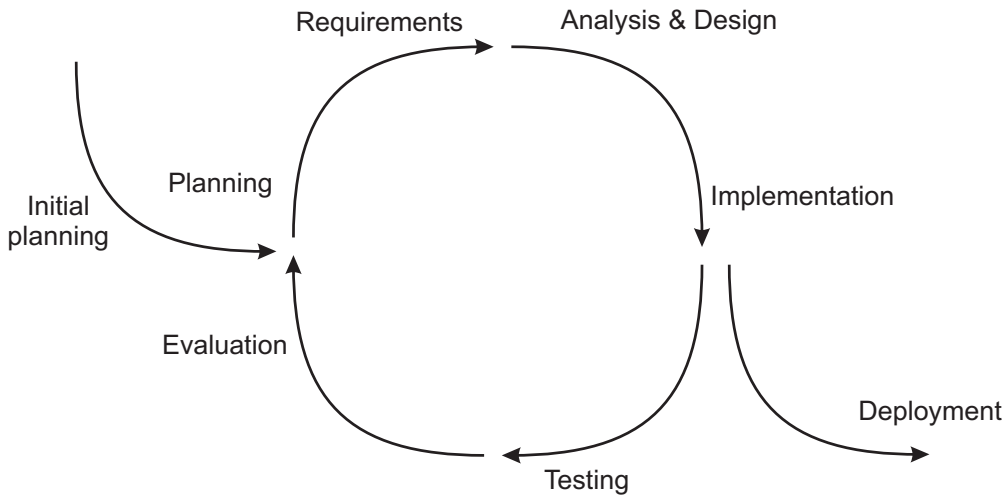

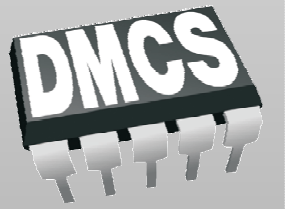

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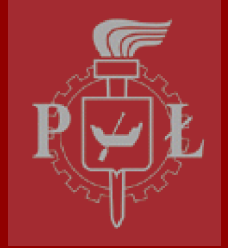
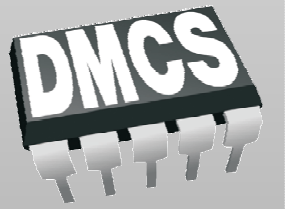
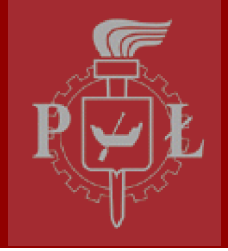


Commercial Projects vs Software Development for High Energy Physic Experiments

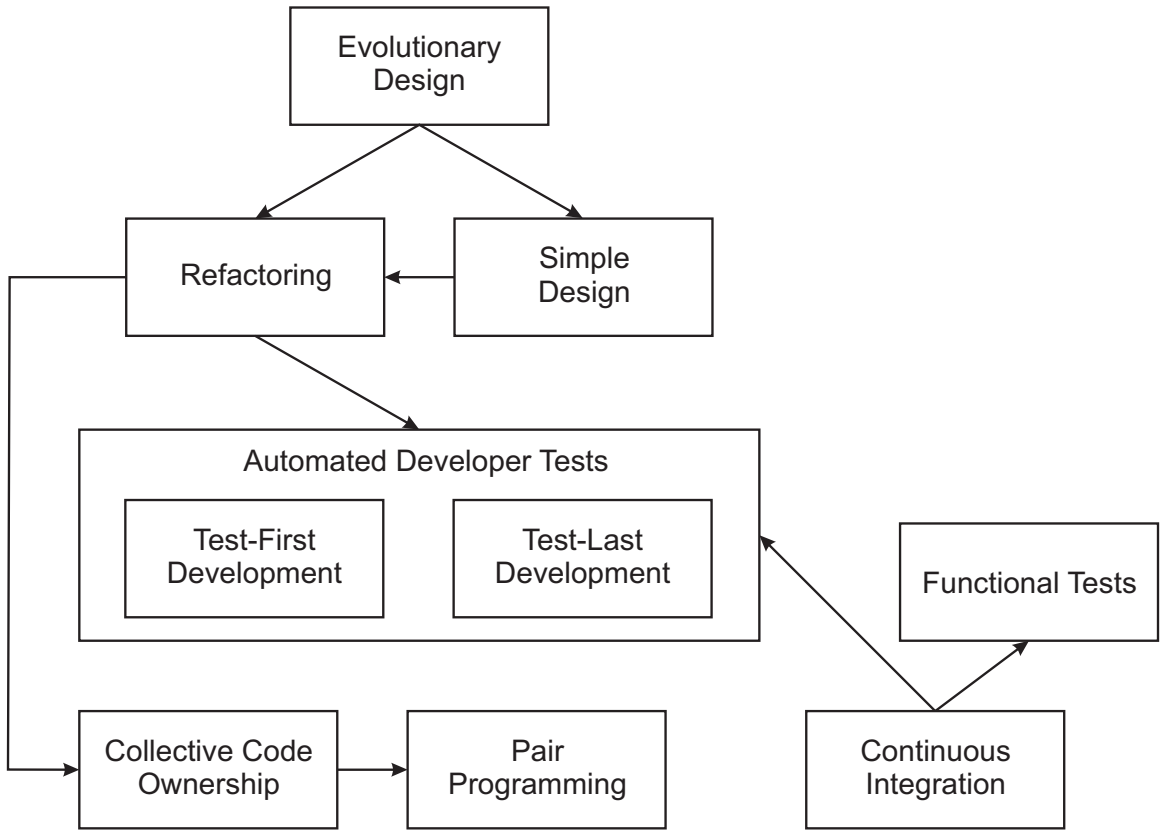
- team composed of several persons
- requirements can be changed but in the last stage of development are fixed
- small influence of environment on developed system

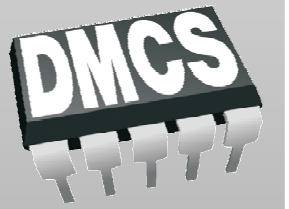
- team composed of one or two person
- requirements can be changed all the time
- big influence of environment on developed system





Flexibility Practices





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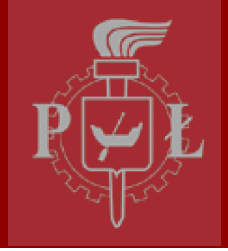
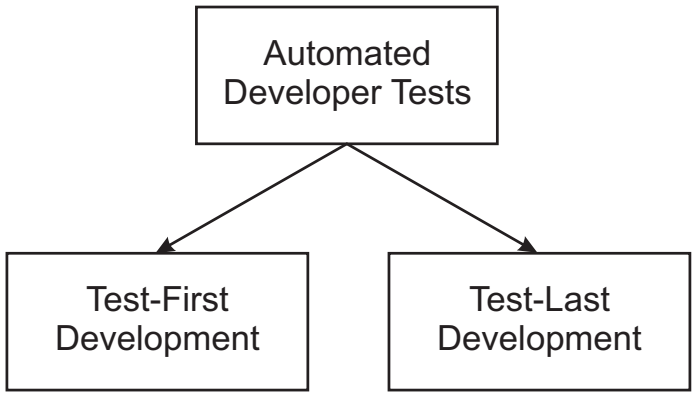
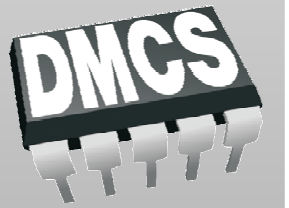


Automated Developer Tests

The Automated Developer Tests pattern is a set of tests that are written and maintained by developers to reduce the cost of finding and fixing bugs - thereby improving code quality and to enable the change of the design as requirements are addressed incrementally.
The Automated Developer Tests pattern improve project testability.





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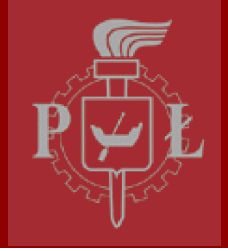
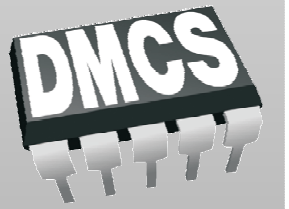
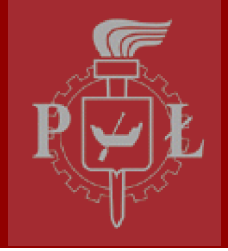


Test-Last Development

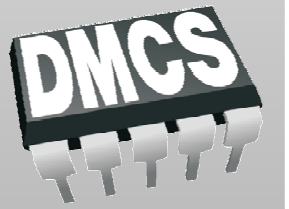
- The practice of Test-Last Development involves writing tests after writing the code to support the requirements for a particular task.
- Tests exercise the system after it has been built.





Test-First Development

- The Test-First Development practice involves writing tests before writing the production code that will support and eventually pass that test.
- Tests resulting from this practice tend to reflect a developers understanding of requirements because there is no design at its inception.



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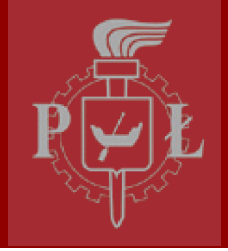
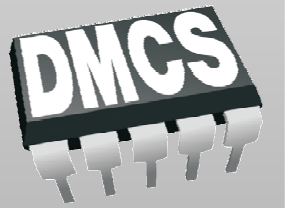


Refactoring

Some problems are a natural result of software development.

- Software gains entropy over time.
- Quick fixes quickly build up a design makes code more difficult to understand and modify.
- Requirements are added and modified, and the current design is no longer a good solution to the problem.
- Code duplication is almost inevitable to avoid changing working code and possibly introducing a bug.
- Software development is a learning process, therefore design decisions with todays knowledge can be better adjusted.



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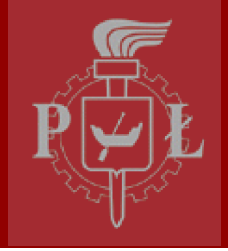
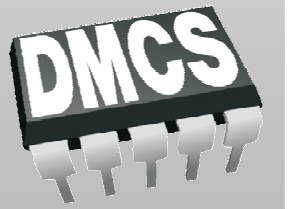
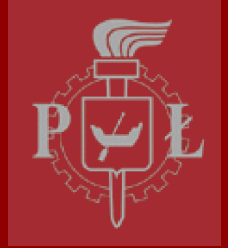


Summary

- Software engineering methodology can be used to increase software reliability and limit amount of time required for bug fixing.
- Software engineering is utilized with success with commercial software projects why do not use this approach in HLP experiments.





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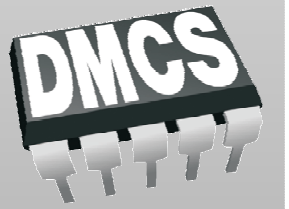

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