cosylab
CONTROL SYSTEM LABORATORY

PHOTON BEAMLINE CONTROL SYSTEM AS A PRODUCT

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Outline:

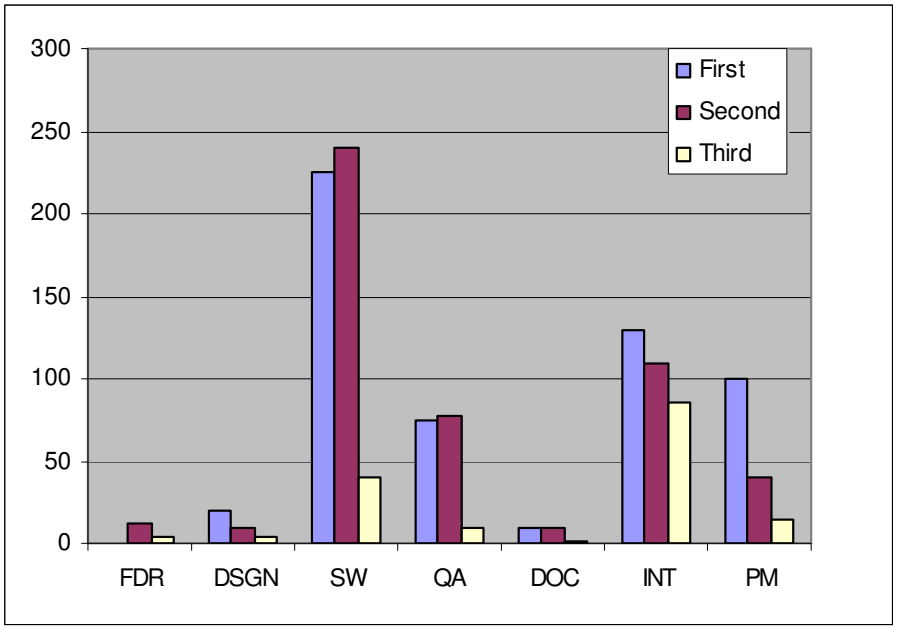
- We call our CS framework a product, since we have optimized all steps in the production process.
- CS is not just software code by a service (specifications/design/integration/support)
- We will take a closer look at 3 projects to see how we managed to reduce effort by a factor of 5.
- Cosylab CS products *(from standard to fully customizable)*
- Conclusions

Introduction

- Cosylab has been developing control systems for optical parts of beamlines since 2003.
- During 4 projects, we have delivered control systems for 8 beamlines.
- Goal is to deliver state-of-the-art control systems:
  - Modular, configurable, extendable
  - Tailored to hardware
  - Machine protection capabilities
  - Suit user needs
  - Documentation
  - Support
- Production process was optimized with every project.

First project

- CS for 3 identical beamlines (MX) for DLS
- Collaboration with a new client.
- Specifications and part of architecture provided by the client.
- Hardware delays, problems with clashing requirements.
- 3 times over budget (mostly covered by us)
- Learned valuable lessons

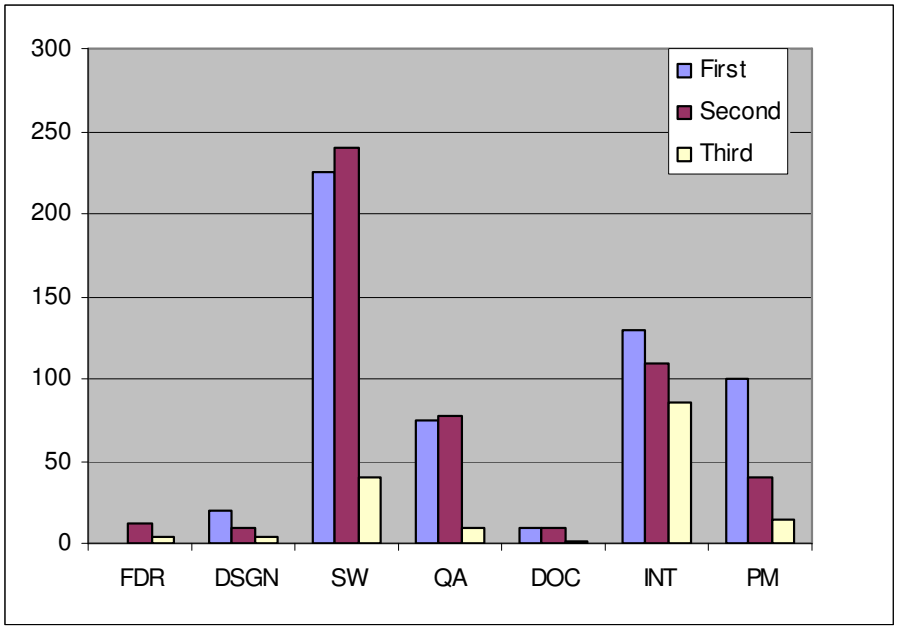


Lessons learned

- Management procedures and interactions with other players need to be explicitly defined.
- Specifications need to be communicated directly with the final users.
- Scope needs to be well defined and all changes need to be tracked.
- Hardware needs to be available during software development.
- The effort was significantly larger that previously envisaged (mostly due to integration and testing with the actual hardware, management).

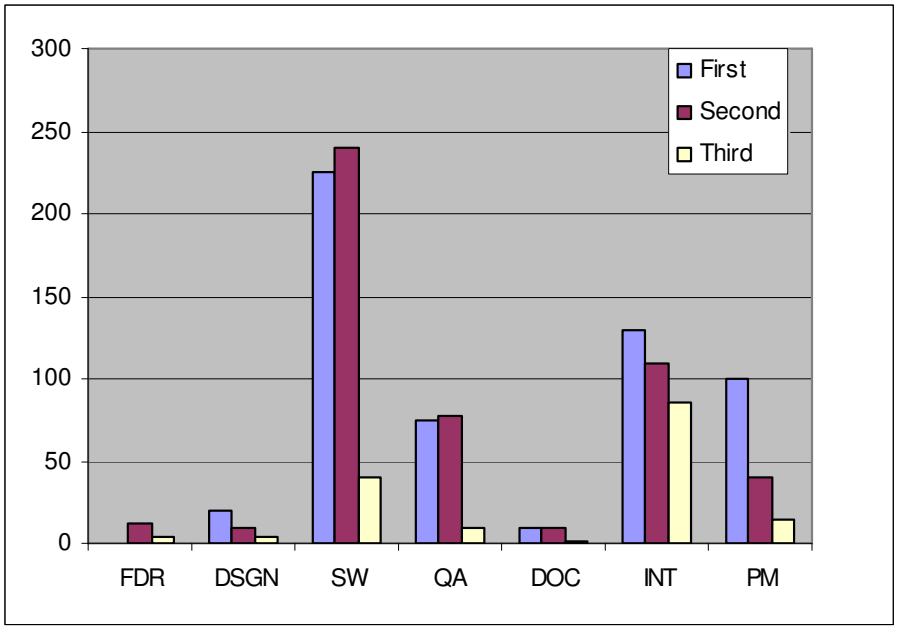
Second project

- CS for PX and PD beamlines at ASP in collaboration with well known client.
- Due to problems encountered during the first project, more time was spent in initial phase to define how project will be handled.
- Stringent procedures resulted in **60 % decrease of management effort**.
- Due to different hardware, the **design, software development and QA phases required similar effort**. Higher standards were introduced and documentation was rewritten.
- Less hardware delays **reduced integration time by 40 %.**
- **Effort estimates were within 10%.**



Third project

- CS for PX2 and SAXS/WAXS beamlines at ASP in collaboration with a well known client.
- Since thrust was established during the previous project, **project management was reduced by 60%.**
- Similar hardware was used as in the second project and modules required only to be reconfigured.
- Some modules were developed (**15% of previous project effort**).
- Hardware was available almost throughout integration, thus **reducing integration by 25 %.**
- Effort estimates were on the ball and there were only minimal risks during the project.

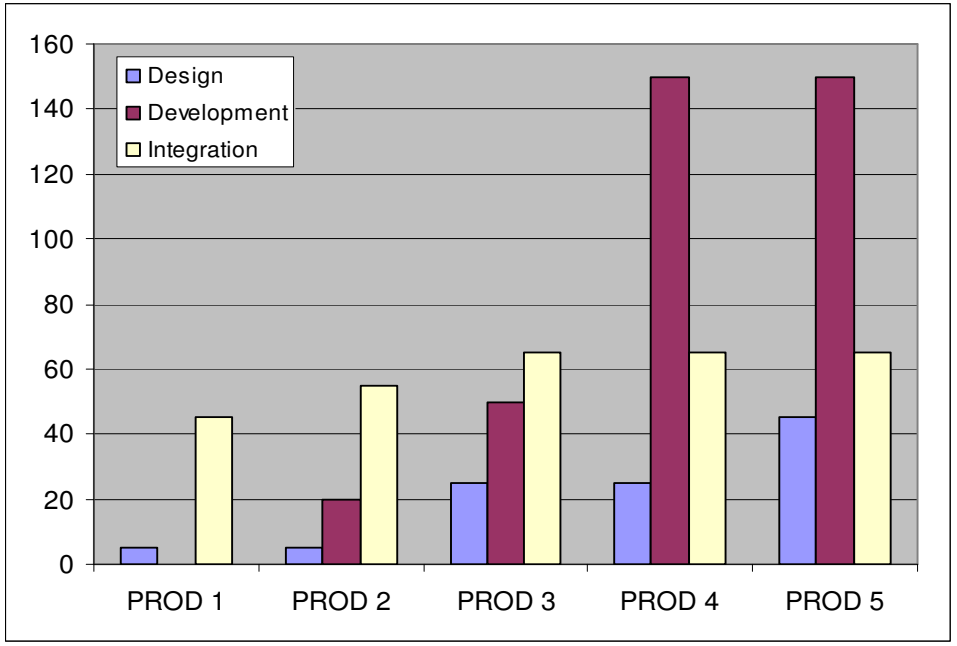


How far we have come

- The total **effort was reduced by a factor of 5.**
- From underestimating effort by a factor of 3 we can now estimate effort correctly within a couple of %.
- The CS is now completely configurable and can be recycled for future projects.
- Complete thrust was established with the hardware manufacturer thus making software integration easier.
- Most of the risks were removed and we are totally confident in our work.

CS products

- CSL has a standard solution (PROD 1) based on EPICS that can be delivered with minimal effort.
- Apart from the standard solution, CSL can deliver also more customizable control systems.
- PROD 2: STD with some development work.
- PROD 3: Non standard solution with already existing motor control.
- PROD 4: Non standard solution and motor control needs to be developed.
- PROD 5: Non standard solution with high customer involvement.



Conclusions

- During 3 projects, CSL has developed a state-of-the-art control system for photon delivery beamlines that can be adapted for future projects at minimal cost.
- Although CS are getting more advanced with each project, the effort is decreased by using well tested and configurable building blocks.
- We estimate that the effort for the next beamline project will be only 10% of the effort for the first project.
- Due to experiences with control system solutions used in accelerator facilities world wide, the customer is ensured that the control system is developed in a most effective way.

CS production cycle at CSL

- Specifications
  - Users should be included to avoid changes at later stages
- Design and prototyping
  - Design needs to be confirmed with hardware
- Implementation/Test procedures/Documentation
  - Build from modules
  - Every module has its test procedures and documentation
- Integration/Testing/Debugging
  - Control system is tested on the actual hw.
  - Most issues have to do with missconfiguration.
- Customer acceptance/Support
  - A 1 year warranty with support is given after acceptance.