Why the Vasa Sank: 10 Problems and Some Antidotes for Software Projects

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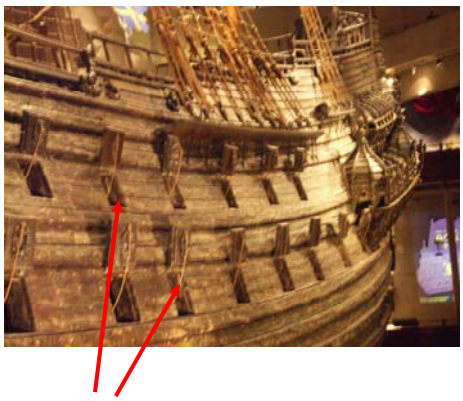
Source : www.vasamuseet.se

- Sweden was at war with Poland
- In January 1625, Sweden's King Gustav ordered the construction of Vasa, a small war ship.
- Ship builders knew how to build 108-foot ships with 1 gun deck.
- A change in warfare tactics in the late 1600s and 1700s.
  - Before, warships fired cannon volleys to cripple their opponent's ship so that they could board and seize it.
  - The objective became to fire broadside volleys and sink the opponent.
- In November 1625, King ordered modification to a 120-foot ship
- King ordered that VASA to be enlarged to 135 feet with 2 gun decks.

Changes in Tactics



Gun Ports

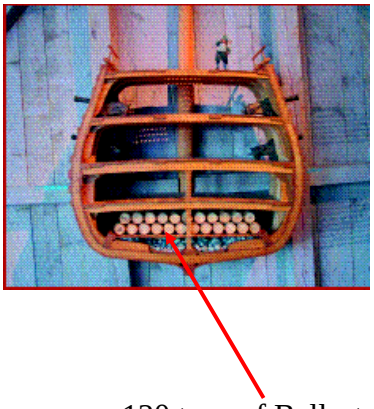
- Before, warships fired cannon volleys to cripple their opponent's ship so that they could board and seize it.
- The objective became to fire broadside volleys and sink the opponent.
- This why the King ordered that VASA to be enlarged with 2 gun decks.

Changes in Requirements and Architecture

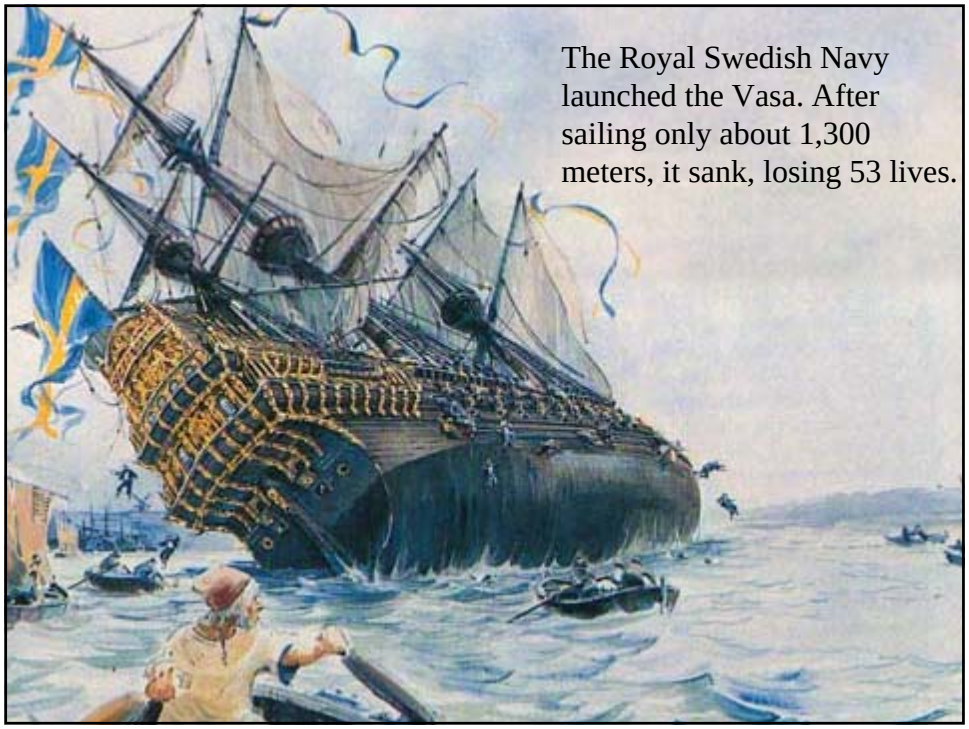
- Architect probably "scaled up" the dimensions of the original 108-foot ship
  - To meet the length and breadth requirements of the 111-foot ship and then scaled those up for the 135-foot
- The keel was already laid for a 111 foot ship, so they could make that change in width only in the upper parts of the ship.
  - This raised the center of gravity
- The upper deck had to carry the added weight of the 24-pound guns in cramped space that had been built for 12- pound guns,
  - Raising the ship's center of gravity.
- The King ordered that the ship be outfitted with hundreds of ornate, gilded, and painted carvings depicting Biblical, mythical, and historical themes
  - The heavy oak carvings raised the center of gravity

System Tests

- The King had ordered that the Vasa be ready by 25 July and "if not, those responsible would be subject to His Majesty's disgrace.
- Pre-launch Stability Test
  - Having 30 men run from side to side
  - After 3 traversals, test was halted because the ship was rocking violently. The ship would have capsized if tests were not halted
- Shipbuilder, were not present during the stability test and were unaware of the outcome.
- The ship could not be stabilized because there was no room to add ballast under the floorboards
  - It would have needed more than twice that amount to stabilize



120 tons of Ballast



Are the problems of the VASA relevant to Software Development ?

Vasa Project's Problems also common to Software Projects

1. Excessive schedule pressure
2. Changing needs
3. Lack of technical specifications
4. Lack of a documented project plan
5. Excessive innovations
6. Excessive secondary innovations
   - Need to accommodate to constraints of the technologies used, addition of derived requirements to support primary requirements
7. Requirements creep
8. Lack of scientific methods
9. Ignoring the obvious
   - e.g. Ignoring the results of the tests: ship was dangerously unstable
10. Unethical behaviour
    - when it became obvious the ship was not seaworthy, those with authority to stop the launch did not do so.

Can you propose Antidotes to these problems ?

Antidotes to Problems

1. **Excessive schedule pressure**
   - Objective estimates
   - More resources
   - Better resources
   - Prioritized requirements
   - Descoped requirements
   - Phased releases
2. **Changing needs**
   - Iterative development
   - Change control/baseline management
3. **Lack of technical specifications**
   - Development of initial specifications
   - Event-driven updating of specifications
   - Baseline management of specifications
   - A designated software architect

Antidotes to Problems

4. Lack of a documented project plan
- Development of an initial plan
- Periodic and event-driven updating
- Baseline management of the project plan
- A designated project manager

5 & 6. Excessive and secondary innovations
- Baseline control
- Impact analysis
- Continuous risk management
- A designated software architect

7. Requirements creep
- Initial requirements baseline
- Baseline management
- Risk management
- A designated software architect

Antidotes to Problems

8. Lack of scientific methods
- Prototyping
- Incremental development
- Technical performance measurement

9. Ignoring the obvious
- Back-of-the-envelope calculations
- Assimilation of lessons learned

10. Unethical behaviour
- Ethical work environments and work cultures
- Personal adherence to a code of ethics
- The ultimate effect of the work should be to the public good.

VASA in Figures

Length
Total length including bow-sprit - 69 metres
Length of the hull - 61 metres
Length of the hull between prow and stern - 47.5 metres

Width
Maximum width - 11.7 metres

Height
From keel to the top of the main mast - 52.5 metres
Height of the stern - 19.3 metres

Depth
4.8 metres

Displacement
1,210 tons

Sail area
1,275 square metres

No. of sails
10 - of which six have been preserved

Armament
64 guns, including:
24-pounders - 48
3-pounders - 8
1-pounders - 2
Mortars - 6

Crew
445 men, including:
Seamen - 145
Soldiers - 300 (not on board when the Vasa sank)