

Computers, People, Work and Trust

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The Ariane 5 Launcher



- On June 4th 1996, the Ariane 5 rocket was launched on its maiden flight
- 37 seconds into the lift-off, incorrect control signals were sent to the engines
- 5 seconds later the rocket exploded

What happened?



- An on-board computer and backup computer failed at the same time
- It stopped sending control signals to the engines
- The engines swivelled to extreme positions and this triggered a self-destruct sequence

Computers

- The control computers had operated successfully for many Ariane 4 launches.
- The horizontal velocity of the rocket was higher than expected.
- However there were no program instructions in the computer what to do in this situation.

People

- The people involved in the development team followed the best engineering procedures - use tried and tested components where failure is costly.
- All organisational quality procedures were followed.

ARIANE 5 WAS FASTER THAN ARIANE 4

Work

- Ariane 5 was built by a multinational consortium with engineers from France, Germany, Italy and the UK.
- The design team didn't know about the software assumptions. The testing team didn't know about the engine design and higher speed.

System failure?

- Why did the failure occur:
 - Computer software failure - Yes and No
 - Human failure - Yes and No
 - Organisational failure - Yes and No

IT WAS ALL OF THESE

Trust

- Our economic future is a knowledge-based economy that can only operate successfully with complex computers.
- For these systems to be successful, it is imperative that they are dependable - they must be trusted by the people who rely on them.

System Dependability

- Lancaster is part of the largest grouping in the world of researchers who are concerned with the dependability of *computer-based systems*.



Newcastle, Edinburgh,
York, Lancaster, City

The DIRC assumption

- We will only produce trustworthy computer-based systems if we pay attention to:
 - Computers - the technical systems
 - People - the system users and operators
 - Work - the practical realities of how people using and developing complex systems actually work

Lancaster's contribution

- Bringing together technical researchers from computer science with social science researchers.
- Lancaster is the leading university *in the world* for cooperation between computer science and the social sciences in systems design.

Work in progress

- Building a rich picture of work through understanding work practice
- Communicating human and social factors to computer system designers
- Dependable computer systems in the home

Culture, trust and failure

- By applying methods of social analysis to the social, organisational and cultural factors that affect work practice, we are building a deeper understanding of how systems fail and how people compensate for computer systems failure.

Design communication

- Develop new ways to improve the communications between people in virtual organisations with a particular focus on communicating human, social, organisational and cultural factors to designers and engineers.

Dependable home-based systems

- Understand what elderly users need from computer systems and develop techniques that will allow dependable assistive technologies to be deployed to improve their quality of life

System Dependability

BUILD THE SYSTEM RIGHT

BUILD THE RIGHT SYSTEM