Unit 3: Case Study London Ambulance Service CAD System

Objective

- To provide a context for the course by examining in detail a case study of system development.
- The case study is the London Ambulance Service Computer-Aided Despatch (CAD) System.

Normal Accidents

- <Perrow's Story>
- systems fail systemically
- the answers to such failures are also systemic!

Context

- move towards decentralised management and cost centre accounting
- lack of prior investment?
- severe resource pressures
- political concern over cost effectiveness
- public concern over service quality
- poor labour relations

The LAS CAD system is

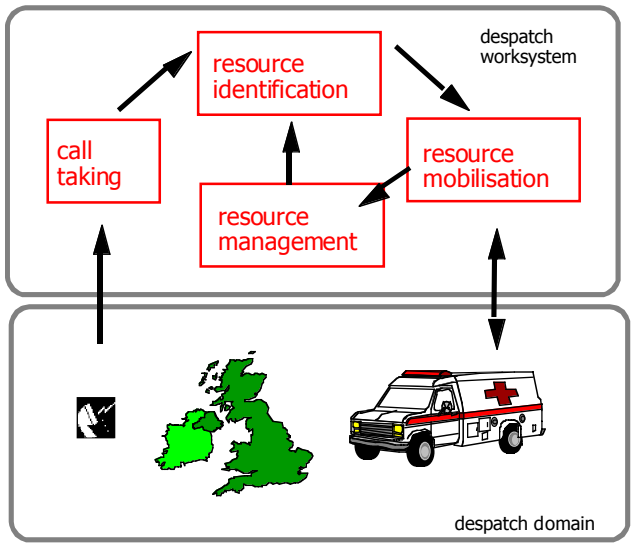
- large
- real-time
- mission-critical
- data rich
- embedded
- distributed
- mobile components

Development

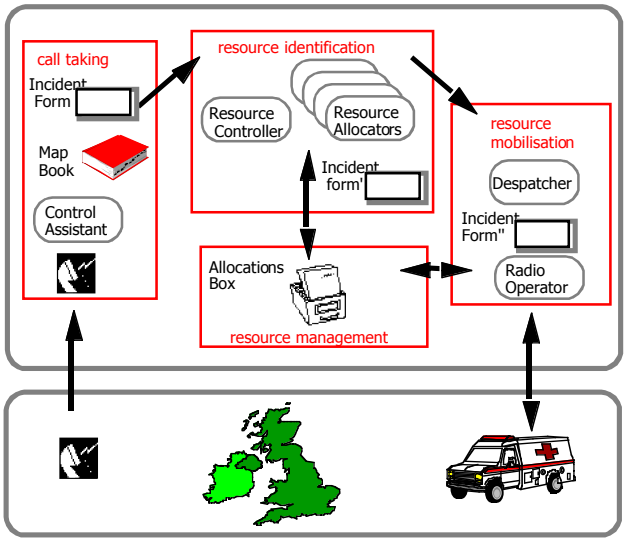
- through craft
- by way of loosely defined management procedures
- using skilled and experienced staff

or not as the case may be!

Despatching Systems



The Manual Despatching System



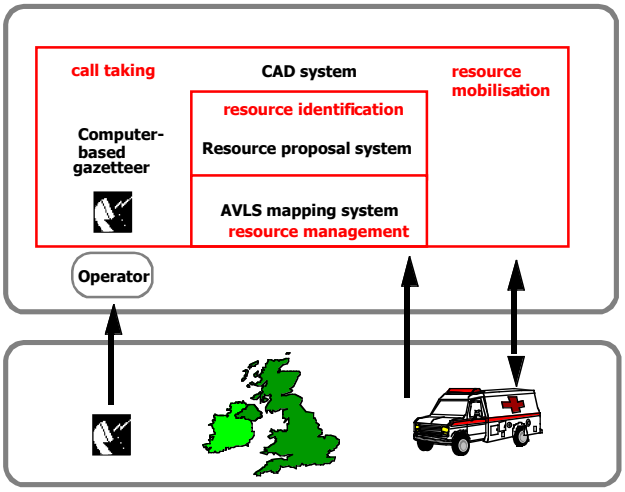
Computer-Aided Despatching System

- Concept:
  - totally automated system
  - one assistant to manage entire incident

Computer-Aided Despatching System

- System components:
  - Computer Aided Despatching (CAD) software system
  - Gazetteer and mapping software system
  - Communications interface (RIFS)
  - Radio system
  - MDTs: Mobile Data Terminals in ambulances
  - AVLS: Automatic Vehicle Locating System

Computer Aided Despatching system:



How the Computer Aided Despatching System was Procured

- Earlier procurement abandoned
- Adoption of an extant system?
- Systems Requirements Specification (SRS) developed by contractor analyst with the Systems Manager
  - highly detailed
  - very precise
  - highly prescriptive

How the Computer Aided Despatching System was Procured

- SRS accompanied by specification of revised
  - organisational structures and
  - working practices
- Fixed timetable
- Fixed cost

How the Computer Aided Despatching System was Procured

- 17 suppliers responded
- Proposals evaluated by analyst and Systems Manager, viz:
  - functional requirement
  - load and response time
  - ease of use
  - resilience
  - flexibility

How the Computer Aided Despatching System was Procured

  - delivery by timetable
  - cost
  - additional features
- One proposal met functional, cost and schedule requirements.
- Supplier invited to prepare full Systems Design Specification (SDS)

An Epitaph?

"there is no evidence to suggest that the full system software, when commissioned, will not prove reliable"

LAS Chief Executive

Implementation

- System implemented piecemeal over 9 months
  - Phase 1. Call taking software and gazetteer with printed forms
  - Phase 2. Resource proposal software takes details from calltaker software, and tracks vehicle locations, but allocation remains manual
  - Phase 3. Full implementation

Collapse of the system I

- call traffic load increased
- AVLS not keeping track of location and status of units
- ambulance crews could not use MDTs
- ambulance crews failed to notify status
- Because database increasingly incorrect
  - units were being despatched non-optimally
  - multiple units were being assigned to some calls

Collapse of the system II

- large number of exception messages
- un-responded exception messages generated repeat messages
- lists scrolled off the top of the screens
- public repeated un-responded calls
- AVLS no longer 'knew':
  - which units were available,
  - which calls were attended to
- system ground to halt

Collapse of the system III

- Entire system descended into chaos:
  - e.g., one ambulance arrived to find the patient dead and taken away by undertakers
  - e.g., another ambulance answered a 'stroke' call after 11 hours, and 5 hours after the patient had made their own way to hospital

Collapse of the system IV

- CAD system partly removed
- Part-manual system seized up completely 8 days later
  - operators used tape recordings of calls
  - then reverted to a totally manual system.
- Chief executive resigns

What Had Gone Wrong?: concept and design

- False assumptions
  - perfect accuracy and reliability of total hardware system
  - perfect location and status information
  - perfect quality and reliability of communications
  - absolute cooperation and competence of all operators and ambulance crews

What Had Gone Wrong?: concept and design

- No systems view
  - operators 'out of the loop'
  - attempt to change organisation through technical system (3116)
  - ignored established working practices
  - no use made of prior staff skills

What Had Gone Wrong?: procurement process

- LAS ignored specialist advice on cost and timescale
- Procurers insufficiently qualified and experienced
- SRS was:
  - excessively prescriptive (inflexible)
  - incomplete
  - not consultative
  - not formally signed-off

What Had Gone Wrong?: procurement process

- Standing financial instructions distorted selection process
- Supplier credentials mis-understood
- Supplier's original proposal was 'hardware led'
- Lack of consultation with users

What Had Gone Wrong? project management

- Confusion over who was managing the project.
- Selected methodology unfamiliar to stakeholders
- methodology not properly exploited
- supplier unqualified and inexperienced for size of job
- poor change control
- no effective or independent QA process
- supplier mis-lead client about progress

What Had Gone Wrong?: systems testing and implementation

- software untested under realistic loads
- software untested as an integrated system
- inadequate staff training
- implementation approach was 'high risk'
- no back up

What Had Gone Wrong?: systems testing and implementation

- errors in despatching proposals (due to software error)
- slow response times
- lack of robustness: lock-ups of workstations and MDTs
- system commissioned with known serious faults:
  - 2x status- 2 PIR (Project Issue Report) faults
  - 44x status-3 PIR faults
  - 35x status-4 PIR faults

What Had Gone Wrong?: poor user interface design

- poor MDT interface for ambulance crews, e.g.,
  - difficult syntax
  - no fit with working practices
  - poor feedback

What Had Gone Wrong?: poor user interface design

- poor control room operator interface, e.g.,
  - graphical user interface traded ease of use for performance
  - failure to identify duplicated calls
  - lack of prioritisation of calls
  - vital messages irretrievably scrolling out of view
- loss of verbal communications

What Had Gone Wrong?: communications and software design

- Technical communications
  - insufficient capacity
  - failure to predict effect of unreliability on behaviour of crews
- Software system
  - Unsuitable selection of unproven development tool
  - System designed for functionality rather than speed
  - Operating environment not well matched to hardware capacity given users' actual operating behaviours
  - No dedicated network management

The Inquiry and beyond

- established out of political outrage and public clamour
- fails to reconsider some of the basic assumptions (not just how but what)
- to date - computer-based gazetteer (as part of staged programmed for automation)

Key Points

- Systems fail systemically.
- Good software engineering is not a luxury. If you fail to use known good practice expect to answer to a Public Inquiry.
- In real applications there is a collision of social, human & technical systems.