Ethnographic Studies of Engineering Design Teams

Presentation Overview

The Jet Engine
Rolls-Royce: a historical view
Rolls-Royce: the new regime
Ethnography: What & How
Ethnography at Rolls-Royce Aerospace
Implications for Human-Centred Systems Design

The Jet Engine: Design Disciplines

Compressor
Turbine
Mechanical
Thermodynamics
Stress
strength-v-weight-v-cost-v-maintainability
Pinnacle of Engineering Design excellence

Rolls-Royce: Historical view

Excellence: Merlin, RB211, 777 engine
Functional organisation corresponds with design disciplines, eg
turbine, compressor, stress, thermodynamics
Engineering Design "Halls" (hallowed)
Full-scale drawings, open plan working
5 - 7 year design cycle

Rolls-Royce: Historical view (pre 1970)

Strengths:
Excellence,
Intellectual capital & design capability

Weaknesses:
lack of control of design process & budgets
slow to market

Threats:
Competition, mainly from USA
rising costs of development
Rolls-Royce: Historical view

The best aero-engine producer in the world
RB211 project: ambitious, innovative, risky
Cash-flow crisis & bankruptcy 1971
Government ownership
re-floated as "Rolls-Royce 1978"

Roll-Royce Aerospace: The new regime (1990s)

Rigidly "gated" 3 year design cycle
Business Process Re-engineering
"Integrated Project Development Teams"
Design decomposed into work packages
"Ownership" and strict project budgeting
Design "knowledge" in computer databases
"Risk sharing" with overseas companies

Consequences of new regime

Time to market drastically shortened
tight budgetary control
BUT suspicions by very perceptive managers:
disquiet amongst senior engineers
loss of intellectual growth?
losses in design quality?
How can we find out how engineers really work?

Ethnography: how & what

"running with the tribe"
origins in Anthropology, now in CSCW reveals:
group beliefs
values
culture
relationships, horizontal and vertical
tacit knowledge about how work works
"making work visible"
bottom-up view of the work system

Examples of ethnographic findings at
Rolls-Royce Aerospace

1. Individuals’ adaptation to new systems
2. Teams & social mechanisms
3. Virtual and distributed teams
4. Knowledge Management
5. Innovation and creativity
6. Use of ICT
Individuals’ adaptations to new work systems

ICT has individualised work
Long term value-added work not counted
More visible planning causes creative tension
Reuse of skilled - v - development of newer staff
The conscientious designer

Teams: social mechanisms for facilitating design

Interpersonal permissions
Evidence & peer evaluation scales
Attribution of opinions & data
Local Exchange Trading Schemes (LETS)
Roles of senior engineers
Team leading as orchestration

Virtual and distributed teams

Reduction of important social mechanism
Would be helped by:
representatives per team from other sites
initial focus on building social permissions
intra/extranet to support, not replace, social links
continued renewal of social links

Knowledge management

Preference for human sources over database
Transactive memory system
Negotiate the question before seeking the answer

Information & Communication Technology

Illumination - v - support
Design issues and data are often equivocal

Conclusions of study

All findings emerged from within R-R
Revealed opportunities for improvement of socio-technical work systems
Scientific culture may not articulate or recognise qualitative issues
Once articulated they are highly appreciated
R-R conscientiously self-examining
Implications for Human-Centred Systems Design

Ethnography: a "radial category"
Who should do it?
When, where and how in systems analysis and design?

Further information

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