Human Factors Integration for 24 Hour Response Business Process

By

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Human Engineering                  Northern Ireland Electricity
Northern Ireland Electricity

- Power procurement, transmission, distribution and supply
- Supplying electricity across N Ireland - 14,000 square kilometres
- 700,000 customers
- 40,000 km of distribution network
- 86% of the HV distribution network is overhead
- Interconnection with RoI and Scotland
• Moyle Interconnector - 500MW link completed
• N/S Interconnectors - upgraded to 600MW
Northern Ireland Electricity Districts

- Ballyclare
- Lisburn
- Dungannon
- Enniskillen
- Omagh
- Coleraine
- Ballymena
- Ballyclare
- Bangor
- Downpatrick
- Newry
- Belfast
- Craigavon
Introduction to Human Engineering

- Established 1995
- Ergonomics Society Registered Consultancy
- Offices in Bristol but work everywhere
- 16 Professional Staff
- All Senior grade ergonomists are professional members of the Ergonomics Society
Ergonomics vs Human Factors Integration

• Ergonomics seen as a purely physical design discipline

• Human Factors Integration focuses on the analysis and design of work processes. Contributes to…
  ✓ Job design
  ✓ Procedure definition
  ✓ Training solutions
  ✓ Supporting processes of change
  ✓ Support interface usability design
  ✓ And of course … physical ergonomics
IMPACT OF BOXING DAY STORM 1998

- Boxing Day 1998
  - Worst in 70 years
  - 700 HV faults and 3,000 LV faults
  - 162,000 customers off supply
- Extremely negative public reaction
- Frustration of customers not being able to contact us
- Inadequate IT systems and Incident Management processes
24 Hour Response Business

• Objective
  – to achieve world-class performance in providing service to customers during fault situations

• Principles underlying the business
  – Need to introduce new call handling technology
  – Accelerate investment in planned Customer Service IT including new Trouble Management System
  – Purpose designed Incident Centre supported by Incident Teams
  – Skilled workforce dedicated to fault response
  – Comprehensive revision of Company Emergency Plan
CUSTOMER FAULT REPORTING
08457 643643

CUSTOMER

Sx3 CALL CENTRE

CRAIGAVON DISPATCH OFFICE

BT Messaging System
Trouble Analysts

GT-X Call Handling System
Sx3 Call Handler
call details
fault status information

Trouble Management System
Trouble Analysts
Craignon
Fault status Information from field

Local Incident Team

Human Engineering

Northern Ireland Electricity
Human Factors Support

Human factors support was needed to:

- Define the new job roles that were being created
- Specify the new work processes required
- Ensure the usability of the IT interfaces being introduced
- Design the physical layout of the Incident Centre, Distribution Control Centre and Trouble Office
Human Factors Integration Plan

- Job role definition for Trouble Analysts (TA)
- Analysis of information flows during emergencies
- Support to project transition planning
- Usability Assessment of TroubleMan interface
- Training materials for TroubleMan and SwitchMan systems
- Development of operating procedures for the Trouble Office and local Customer Service Centres
- Ergonomic design for Incident Centre (IC), Central Dispatch Office (CDO) and Distribution Control Centre
- Support to development of Company Emergency Plan
Job Role Definition for Trouble Analysts

- Existing Customer Fault Reporting Service function was analysed as baseline for new TA roles
- Specified key skills and aptitudes
- Developed job design for TA and (Trouble Analyst Team Leader) TATL
- Supported decisions on manning levels
Development of detailed Procedures for Trouble Office

- The task analysis data supported the development of detailed operating procedures. These were used as a basis for:
  - Training and familiarisation
  - Support and guidance
  - Back-up methods as new systems became established
  - Procedures for identified unplanned events
Job Role Definition for Trouble Analysts

- Ergonomic design for Central Dispatch Office workstations
Information Flow Analysis

- Analysis of fault data flow between business teams
- Development of CSC best practice model
- Workshop to establish consistency in practice
HFI Support to Transition Plan

- The HFI analysis:
  - Raised the awareness of performance risks during transition
  - Resulted in wider contingency planning
  - Contributed to the development of phased cut-over plan
Contingency Systems for TroubleMan Failure

Out-of-Hours Trouble Management Office  Operating Procedures

3.10 Close Event on SC

Development of interim and contingency operating procedures

The Reference Number Enquiry screen, showing the 11 digit SC reference number

SUMMARY CUSTOMER DETAILS screen

The letters CC indicate that the customer has Special Needs

The Reference ENQUIRY on Refno 19994100826
C (to CANCEL)  D (to DISPATCH)  F (to FINISH)  I (to TR)
Name  SN1 TX Designation  Status  Init Date  Time

13th January 2000

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1.1</td>
<td>Check for CC</td>
</tr>
</tbody>
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Check to see whether the customer has Special Needs, denoted by the letters CC shown on the Summary Customer Details screen.

Press the F2 key to print a copy of the screen, whether or not CC is displayed.
TroubleMan Usability Assessment

- Task analysis of interaction with TM software
- Usability assessment based on fundamental principles and job support needs
- Review of technical documentation
- Development of issues register

**Diagram:**
- Task Analysis
- Usability testing
- Documentation review
- Trouble Analyst roles and responsibilities
  - Creation and population of an Issues Database
  - Functional Usability
  - General Usability
  - Usability Audit
TroubleMan User Guide

- Extract from TM User Guide for NIE
- Catered for levels of experience
- Navigation procedures
- Trouble shooting tips
Development of Training Materials for Trouble Management

- Development of Training Materials
- Local and Central offices
- Levels of escalation
- Operational modes (in/out hours)
- Defined information flows
- Team interactions
D. Partial Restoration

20. Review Event Status

- Select **Partial Restoration List** from the WorkAgenda File dropdown menu.

  The most recent Event has changed to **DSP** status.

  The original Event has changed to **DTR** status.

  You can see that the resource is now attached to the most recent Event.

- Select **In Progress List** from the WorkAgenda dropdown menu.

  The most recent Event is shown on the **In Progress List** as it now has **DSP** status.

  - Select the Event.
  - Select the "Resource" icon on the Viewer.

  You can see the resource is now attached to the most recent Event.
Human Factors Design for IC

- Task analysis of roles
- Development of floor plan using link analysis
- Development of comprehensive job role definitions and training materials
- Emergency response guide books for each role
- Creation of Incident Centre Administrator role
Development of Company Emergency Plan

- Development of first draft from existing materials and IC plans
- First revision was based on operating experience and improved usability
- Second revision following 2001 Snow Storm lessons and further usability enhancements

Plan defines modes of operation, information flow, systems and responsibilities
Northern Ireland Electricity Emergency Plan

Dispatch Mode 1 (in- and out-of-hours)
Northern Ireland Electricity
Emergency Plan

Information Flow Diagram for Dispatch Mode 2 Conditions
In-hours
Northern Ireland Electricity
Emergency Plan

Information Flow Diagram for Dispatch Mode 3 Conditions
In-hours
HFI Support to DCC Design

- Physical ergonomic design of Distribution Control Centre workstations
- Design of workstation layout
- Design of DCC floor plan
Development of Training Materials for DCC

- Task analysis of old and new system
- Generation of procedures to accommodate new system
- Development of DCC training materials
Value Added by HFI

- Detailed and objective assessment of job and process requirements
- Helped to create more effective work facilities through improved layout of office and design of desks
- Facilitated specification of operational procedures
- Made explicit the need for training materials
- Directly influenced enhancement of usability of system and plans
- Supported analysis and planning of contingency measures during change
- Improved morale of staff by involving them in the analysis work
Areas where HFI was less effective...

- Over-estimated time required for transition
- Under-estimated skill/technical knowledge required for certain key roles
- Over-emphasised the need to distribute resources, the current mode of operation relies upon greater centralisation
- Initially developed overly complex training material
Conclusions

HFI supported:

• the project in defining job, personnel and training requirements more comprehensively and objectively
• the development of detailed procedures for work processes, communications, and more intuitive training materials
• It helped to ensure that system interfaces were more usable, and that (commercial off-the-shelf) products supported the organisation’s needs

Operating experience has:

• Validated much of the impact of the HFI analysis
• Gained wider organisational support for HFI