



Towards an Adaptive Human Systems Integration – Reducing the Gap Between Designers and Users

IFATCA DIGITISATION WORKSHOP GENÈVE

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Towards an Adaptive Human Systems Integration

Change is not new in Air Traffic Control



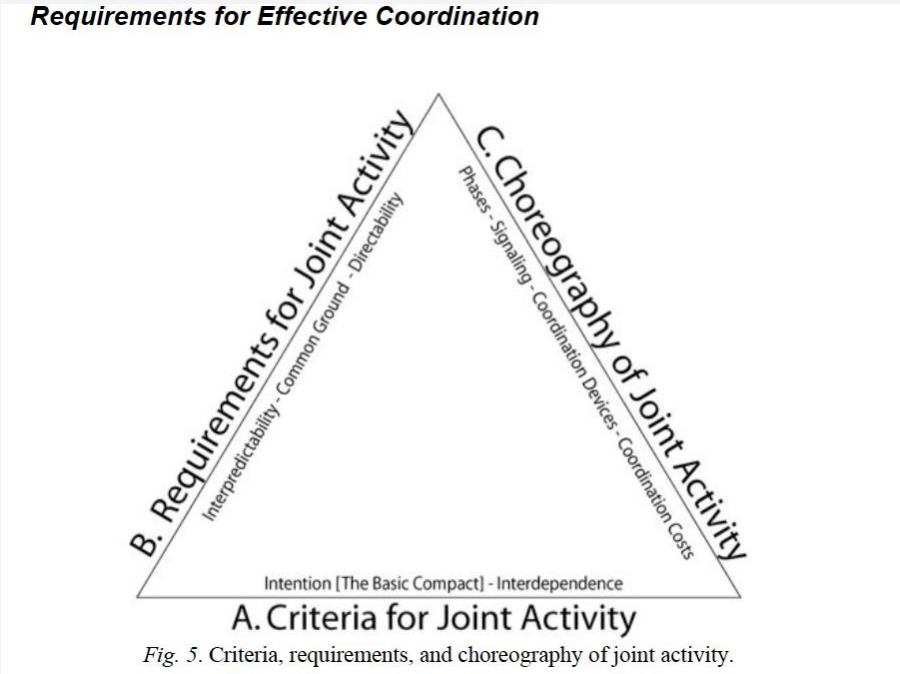
- And in each of these the ‘system’ is ‘heavily reliant on the interdependence between designers, technology human operators
- even if it is ‘two bits of ‘string’...
- Automation is not new , neither is the locus of ‘control’ – manual, ‘supervisory’, full automation
- What these do demand are new competencies, skills and ‘work’

We argue for a Mindset change in the JCHMS guidelines

Type	Flight deck	ATM
Information	✓	✓
Control	✓	✗
Management	✓	✗

Ways of thinking about automation –Billings types of automation

Billings, 1983

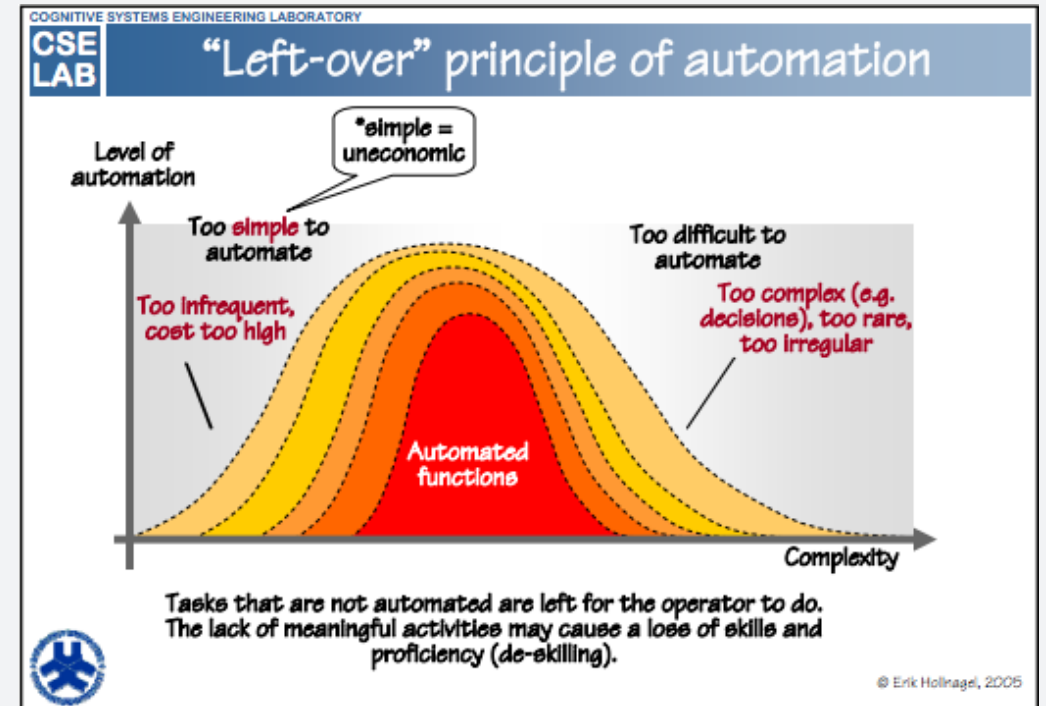


Joint activity – coordination and common ground

Klein et al, 1988

A lens to consider the JCHMS exploration of the current view

- Increasing **complexity, uncertainty** and **surprises**
- Automation – what does it mean?
- Technology also means **humans**
- **Separate** or **Joint**?
- Staying in **control**
- **Responsibility** (accountability) and consequences of ‘change’
- **Radical change** ‘a different lens
- The **efficiency & sustained adaptability** - trade off’s, buffers and what
- **Control** and **adaptability**



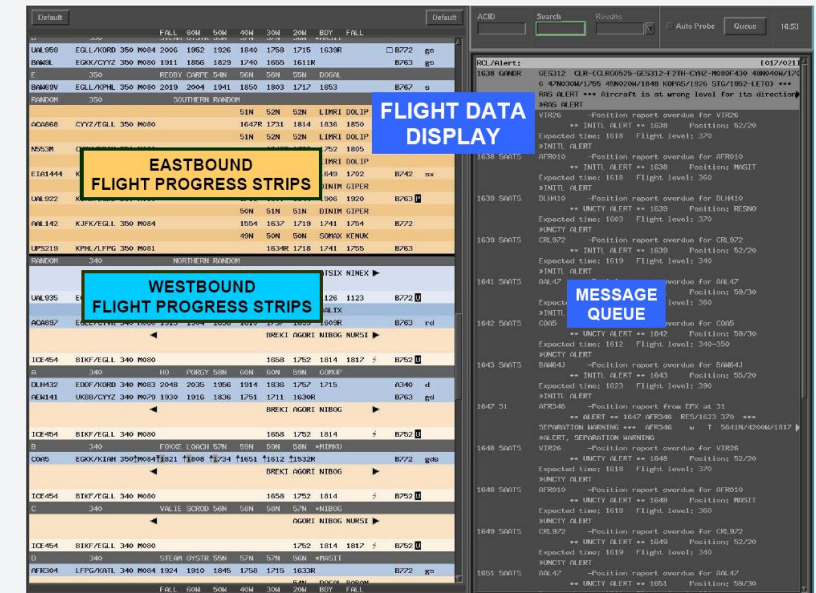
The left over design principle, Ingaki 20

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– Reducing the Gap Between Designers and Users

'the left over design strategy' (Ingaki. 2014)

'There is a need for the human in the system to complete the design' (Rasmussen, 1996)

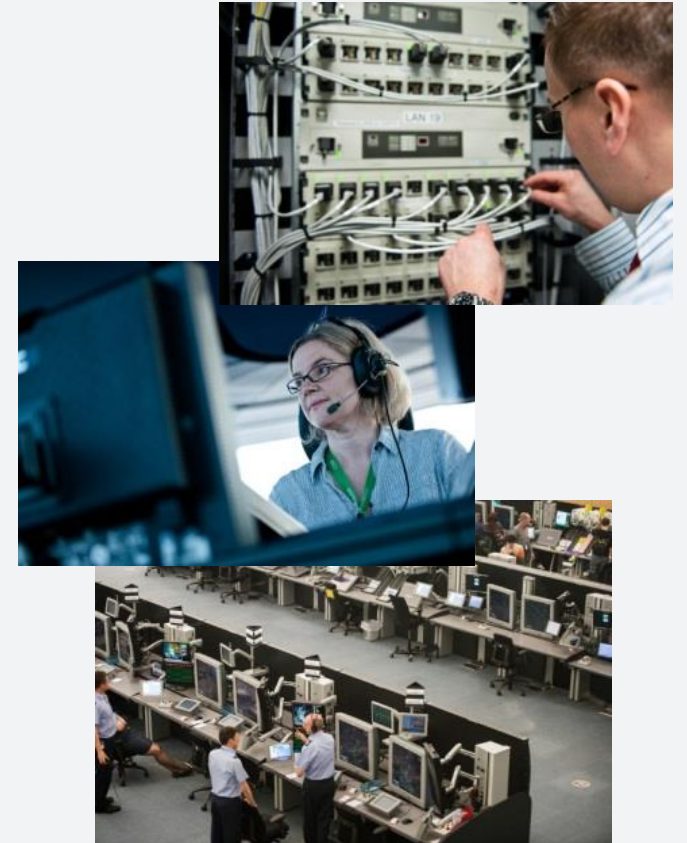


JCHMS considers : the **Amplification and Speculation** as potential pathways for JCHMS

Reducing the gap between designers and users

The 'Joint View'

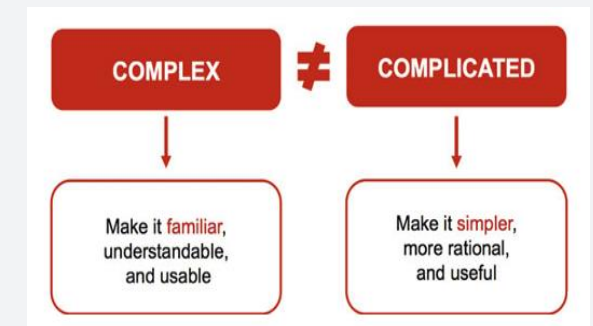
- Technological designs often underperform
- We talk of social-technical systems – is it time now for what Boy refers too as ‘social-cognitive systems’? (Boy, 2020)
- Is there a place for ‘substitution’ in the future?
- Ahhh, we return to **amplification** and **speculation**



Two different Mental Model – drawing on Klein

- How do we create designs to work with complexity as opposed to limit ourselves because of complexity – that manages (influences) adaptation for coping with uncertainty surprise's?
- That are able to adapt, have flexibility and agility?
- Woods & Hollnagels Joint Cognitive System's (2005) assumes that
 - the human stays in control
 - We design for the human to build an understanding and for their to be Common Ground

	Capabilities	Limitations
The designers view	How the system works: by its parts, connections, causal relationships, process and control logic.	How the system fails: Common breakdowns and limitations (e.g., the limitations of the human)
The users view/JCA	How to make the system work: Detecting anomalies, performing workaround and adaptations.	How the users get confused: Complexity and false interpretations.



Design for collaboration between technology and humans

- To what extent is the design for ATM, as complex ATM system an exercise in conflicting values, as Land suggests?
- The JCHMS guidelines propose a pathway that **navigates the space between designers and users**, as well as the multiplicity of others
- We must embrace **complexity, uncertainty** and **surprises** as opposed to a of philosophy of designing them 'out' or of elimination
- The role and function of the **human practitioner** is recognised, as is their **contribution** to sustain **adaptability, adaptive capacity & resilient performance**
- And becomes a **design philosophy**
- The human has **meaningful** control that enables **authority**
- This may also embrace true 'radical change'

The future holds challenges and significant potential

Questions? observations?

Fig 1. The basic model of operation

