Key Issues for Building Real Time Operational Decision Support Systems

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September 3, 2009
Outline

1. Introduction
2. Key Issues for Building RTODSS as an IAS
3. Case Study: Iron Ore Pellet Stock Yard Management
4. Conclusions and Future Work
Life cycle of a RTODSS

1. Mental models
2. Spreadsheets
3. Transactional System
4. Optimizational System
RTODSS project failures

- When RTODSS leave the spreadsheets
  - Transitions B and D
- Success depends on how well they interact - same ontology
- Failures are caused by conceptual misfits (Blandford et al., 2007)

Conceptual misfit - text messages for groups of people
Approaches to Building RTODSS

- **Until the 1990’s**
  - Focus on how system components should be divided
  - Little attention to the role of the user as an active decision agent

- **In the 2000’s**
  - User is part of the decision process - Cognitive approach
  - Human agents + computational agents

- **Cogsys + CFlex approach**
  - Intelligence augmentation tool for the user

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\(^b\) Bhargava et al. (1999), Courtney (2001), Beynon et al. (2002), Shim et al. (2002) and Chen and Lee (2003)
Intelligence Augmentation System (IAS) (Fischer, 2006)

IAS

- Cognitive distributed system (Giere and Moffatt, 2003)
- Success depends on how well the agents interact
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Growing needs along the evolution of a RTODSS

- Which information need to be gathered and presented by the system?
- Who are the decision agents that communicate with the system?
- How to coordinate the work of many decision agents?
- How to visualize the main decision variables?
- How to suggest alternatives?
- How to forecast future states of the productive system?
- How to optimize solutions?
- How to deal with uncertainty and imprecision in the decision process?
- What is the role of each decision agent in the decision process?
- Which concepts need to be present in the system and/or interface so it will be free of conceptual misfits?
- How to build the human-computer interaction?
Necessary to address the following issues

- Coordination to synchronize the activities of many decision agents;
- Visualization of past and future states (traceability);
- Anticipation of problems (visibility);
- Automation of mechanical tasks;
- Suggestion of alternatives;
- Reflection of the organization culture in the decision process;
- Augmentation of the human capacity of solving problems instead of trying to substitute human decision makers;
- Connectivity to get real time data;
- Interface representing all concepts manipulated by the decision agents in the decision making process;
- Flexible operation, with human insights incorporated in optimized solutions through the system interface;
- System evolution over time policy.
Necessities mapped onto four attributes

**Key issues - Build methodology**

1. **Ontological interface;**
   - Human-computer interface
   - Common ontology between all decision agents
   - Exosomatic location of mind

2. **Cognitive flow control mechanisms**
   - Interruption: alarms, pop-ups
   - Stimuli: word completion
   - Noninterference

3. **Interfaces with external systems**
   - External computer systems, manual inputs

4. **Evolution mechanisms**
   - Internal and external policies
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Iron Ore Pellet Stock Yard Management

- Problem: the stack piled for a specific client does not have the appropriate quality
- Solution: reclaiming plan - Blend with other piles
- Which ones should be blended and reclaimed?
Iron Ore Pellet Stock Yard Management

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![Diagram showing iron ore piles with numbers and blocks representing different qualities.]

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Iron Ore Pellet Stock Yard Management

- Problem: the stack piled for a specific client does not have the appropriate quality
- Solution: reclaiming plan - Blend with other piles
- Which ones should be blended and reclaimed?
Exosomatic representation
Applying Methodology - 4 attributes considered

- Corrélle
  - Estado de máquina e corrente representados por cores, posição pelas balizas
  - Deve ser possível inserir anotações livres neste espaço acima das pilhas

- Pilhas selecionadas
  - Pilha X, Pilha Y, ...

- Início formação: DD/MM/AA HH:MM
  - Fim formação: DD/MM/AA HH:MM
  - Cliente:
  - Produto:
  - Quantidade:
  - Qualidade média: (SiO2, H2O, -6.3, etc) (desvio padrão, medidas estatísticas)

- Grupos de balizas selecionados
  - Agrupado, Grupo 1, Grupo 2, ...

- Cliente:
  - Produto:
  - Quantidade:
  - Qualidade média: (SiO2, H2O, -6.3, etc) (desvio padrão, medidas estatísticas)

- Core de produtos
  - PFN-STD
  - PBF-STD

- Moto de entrada
  - Mostra as balizas selecionadas para blendagem
  - Arrasta para selecionar em uma pilha, CTRL para selecionar na outra pilha ou na usina

- Usina
  - A moita de balizas selecionada, mostra na usina, mostra a média para blendagem

- Cargas e orientações de embarque:
  - Carga A, Carga B, ...
  - Qualidade:
  - Orientações de embarque:
  - SiO2, H2O, -6.3, etc

- Obs:
  - Os loci de recuperação são conjuntos de lugares, formando janelas superpostas que atendem ao pedido. Mostra-se a janela mais otimizada. Ao pedido do usuário, mostra-se as outras janelas.
  - Juntamente com os loci de recuperação, deve ser fornecida a informação completa de máquinas, atividades e tempos a serem utilizadas na recuperação. Isso pode ser alcançado clicando com o botão direito do mouse sobre a sugestão de brainware.
  - As companhias não serão representadas diretamente, sendo possível acessá-las através de opções de menu, assim como as outras unidades de conhecimento de representação indireta.
  - A opção de otimizar os planos será através de um menu acessado clicando com o botão direito do mouse, por exemplo.
  - O mapa de qualidade é alcançado com um duplo clique sobre a pilha.
System avoiding Conceptual Misfits
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Conclusions and Future Work

Conclusion
- A methodology based on the four key issues helped to avoid conceptual misfits

Future work
- Comparison with other similar systems should be done to highlight the advantages of a RTODSS built based on the four attributes
Bibliography

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