Developing an Implementation Strategy for Workload Control: An Action Research Project

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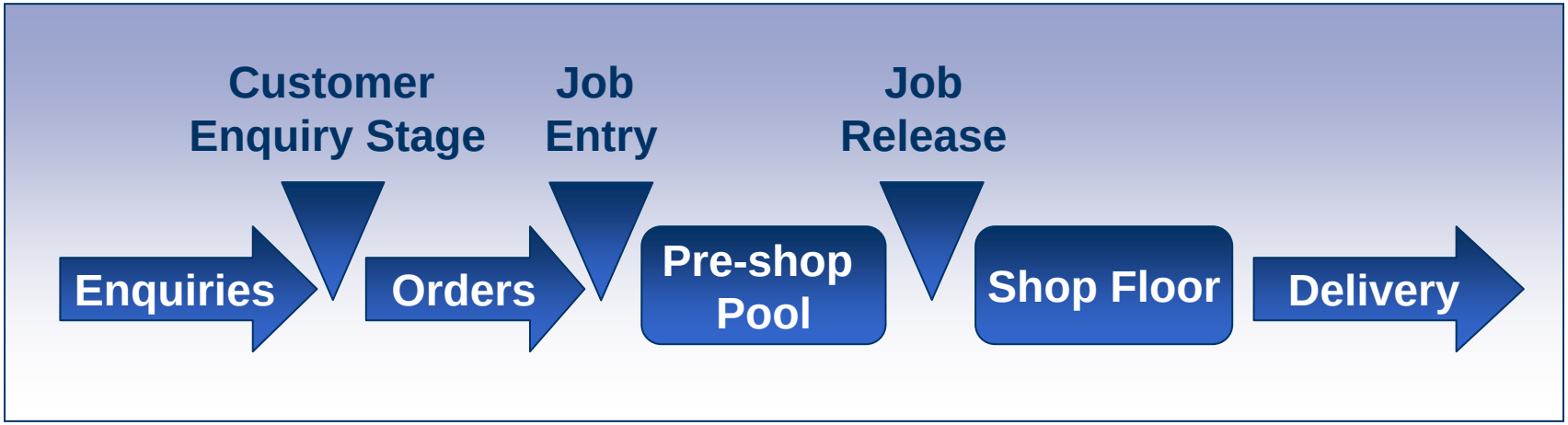
Content

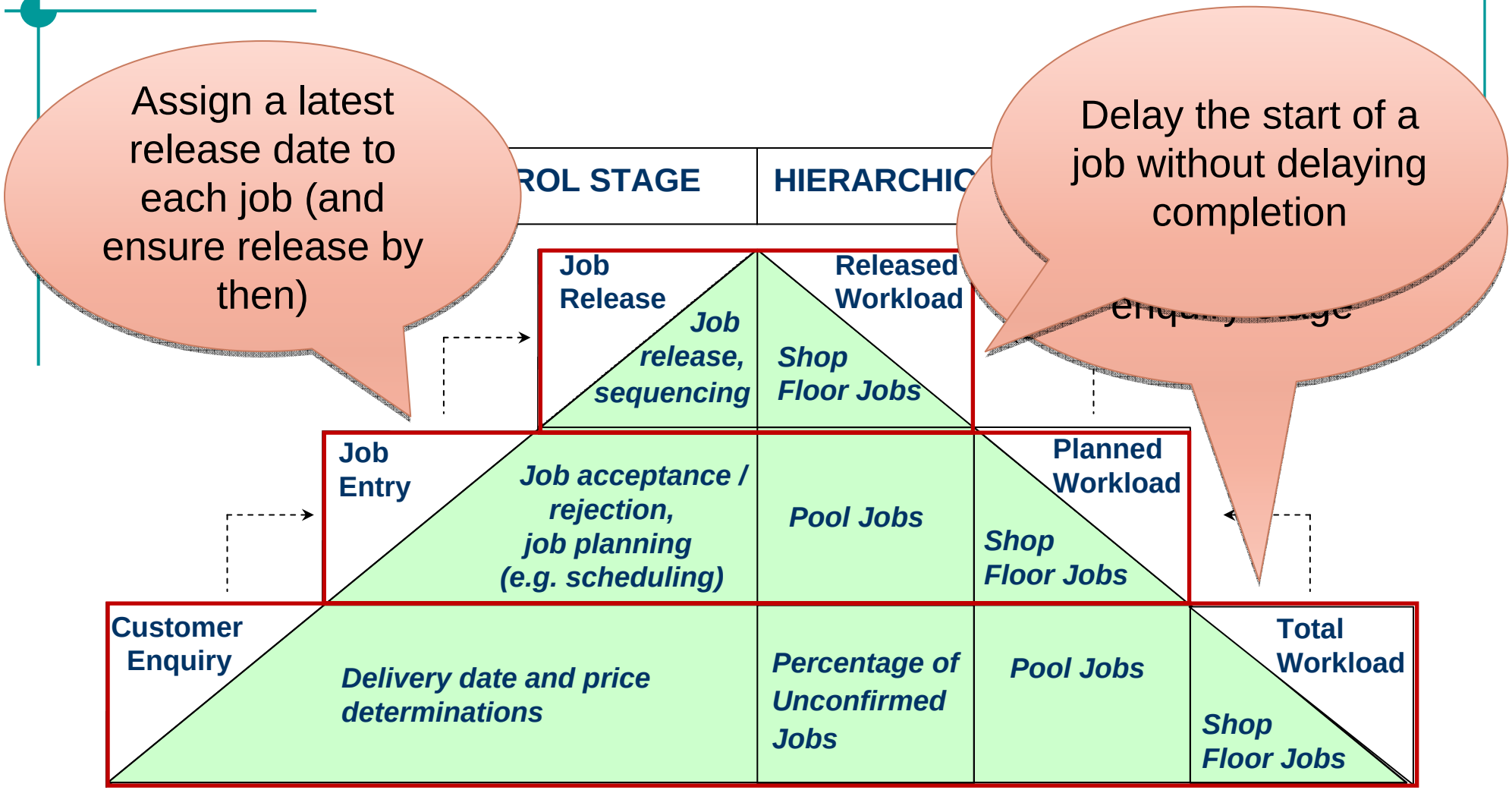
- Introduction to Workload Control (WLC)
- Existing WLC implementation framework
- Research questions
- Company overview
- Implementation insights so far
- Conclusion

Workload Control (WLC)

- PPC concept for manufacturers of customised products
  - e.g. Make-To-Order (MTO) companies
- A pre-shop pool and job release function used to regulate queues and Work-In-Process (WIP)
  - Based on the principle of Input/Output Control (I/OC)
  - An alternative to detailed shop floor scheduling



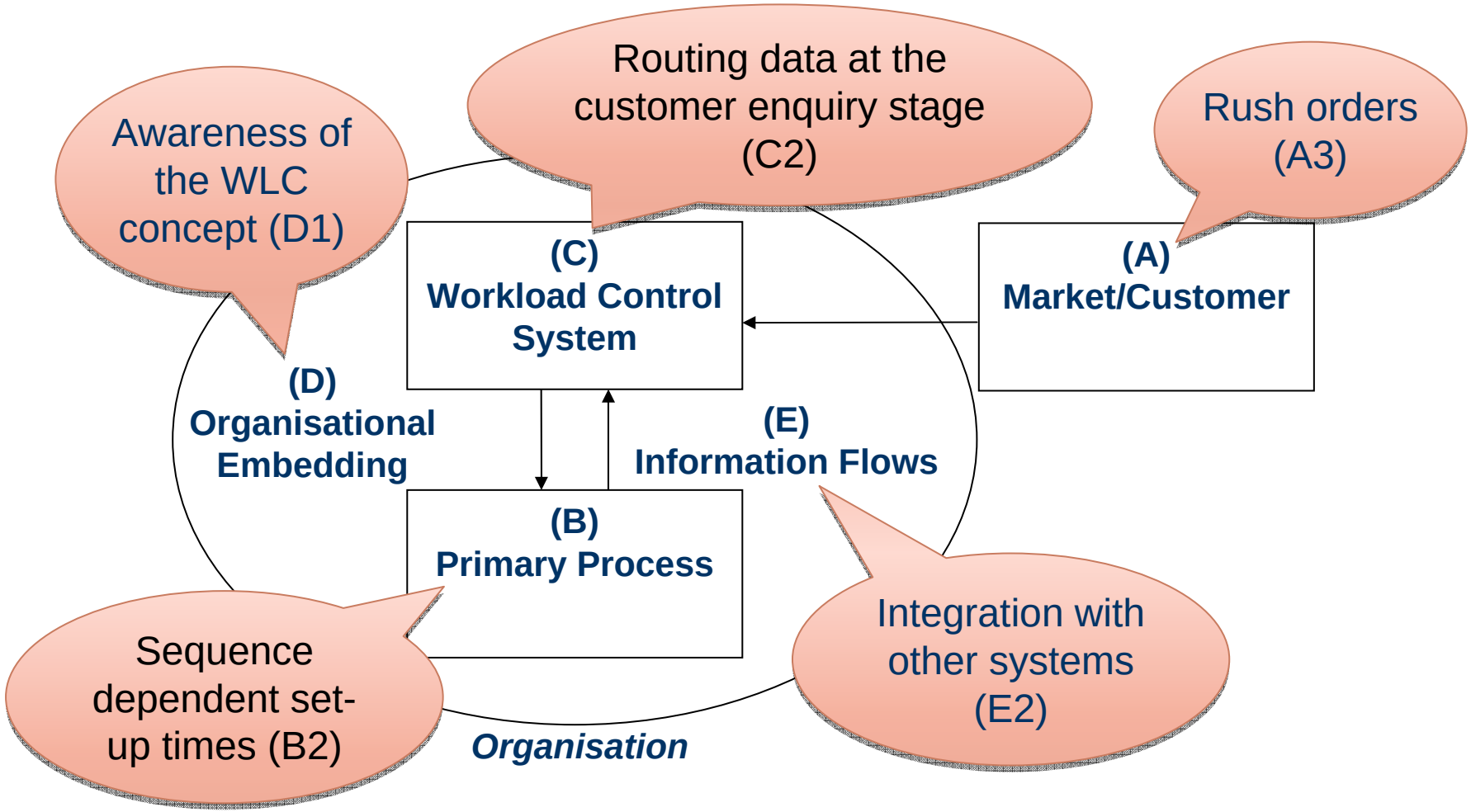
Hierarchical WLC Approach



WLC: State-of-the-Art

- Value of the method demonstrated through simulation
  - e.g., reduces (and stabilises) WIP and lead times
- But few implementations in practice reported
  - Implementation process remains a 'black box'
- Recent contribution made by Hendry *et al.* (2008):
  - Comparative case study analysis of WLC implementations
  - Identified 17 implementation issues (5 categories, A-E)
  - But concluded that the implementation requirements of WLC require further research

WLC Implementation Framework



Hendry *et al.* (2008)

Research Questions

RQ1. Can emerging WLC implementation frameworks be used to successfully embed the concept within organisations?

RQ2. Can a WLC system be implemented in practice and achieve performance improvements, as seen in previous simulation studies?

Action Research: Company Overview

Company Size	SME (32 employees, £1.5m/yr turnover)
Market	Precision engineering company; bespoke products; aerospace, commercial and food industry
Shop Configuration	General job shop
Type of Production	Make-to-order … “repeaters, strangers and aliens”

Action Research: Company Overview

A Reality:

- Limited IT and information management
- Naturalistic decision-making; “constantly fire-fighting”
- Small family firm; “wearing several hats at once”
- Upstream end of supply chains; compete on flexibility – “the answer is yes, now what’s the question?”
- Prioritization based on “who shouts the loudest” and social capital

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Action Research: Progress to Date

INITIAL ASSESSMENT OF FIT

- Company needs
- Applicability of Workload Control
- Information availability within the company
- Project commitment and support

PRE-IMPLEMENTATION

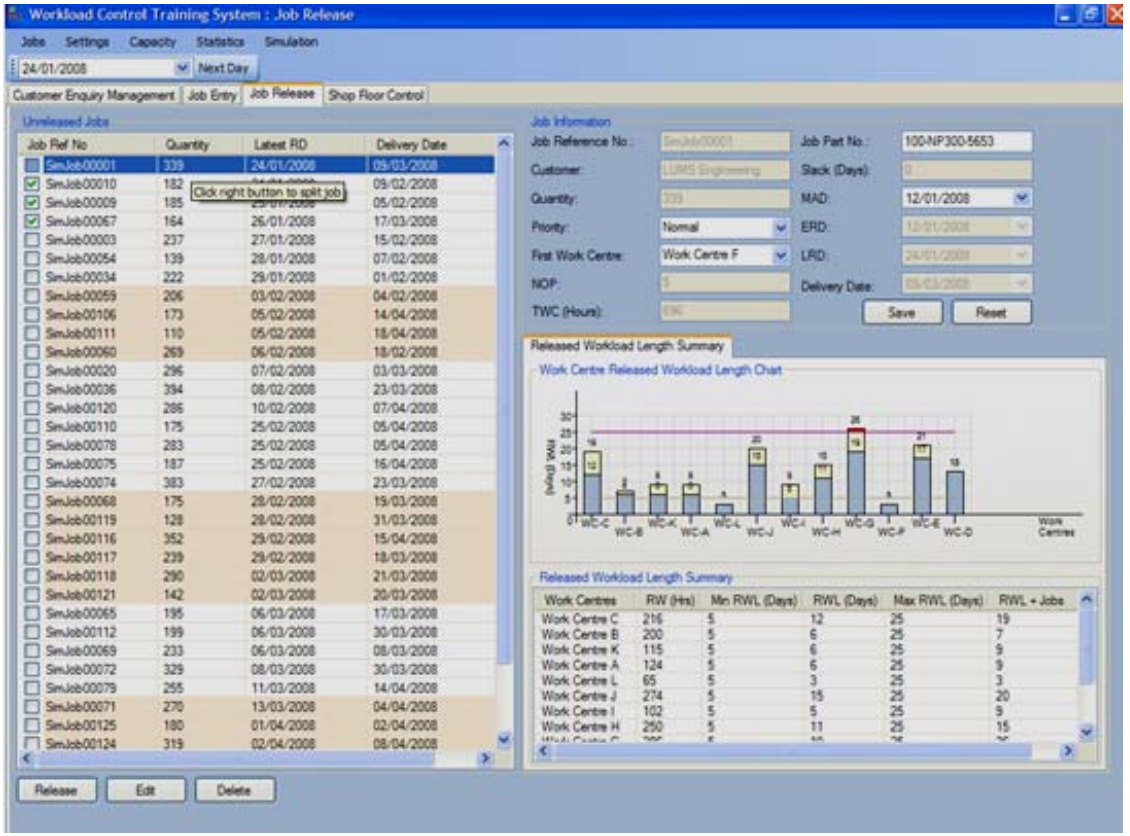
- Data collection and analysis
- Business process alignment with WLC system
- Training and awareness (internally and externally)
- Parameter setting process
- Populating the WLC system with job information

FULL IMPLEMENTATION

EVALUATION & LONGITUDINAL STUDY

Decision Support System for WLC

Unreleased jobs in the pool



Released workload chart

Original 17 Implementation Issues

Category	17 Key Implementation Issues	
A. Market/Customer		Characteristics of order quotations (A1)
		Uncertainty at the customer enquiry stage (A2)
		Rush orders (A3)
		Seasonality and volume growth (A4)
		Hybrid production (A5)
B. Primary Process		Assembly requirements (B1)
		Sequence dependent set-up times (B2)
		Alternative shop floor routings (B3)
		Industry-specific process (B4)
C. WLC System		WLC-related start-up issues (C1)
		Incomplete routing data at customer enquiry (C2)
		Time-span-dependent critical resources (C3)
D. Organizational Embedding		Awareness of the concept of WLC (D1)
		User visibility (D2)
		Support of task structures (D3)
E. Information Flow		System-related start-up issues (E1)
		Integration with other systems (E2)

[see conference proceedings]

12 of Original 17 Issues Encountered

Category		17 Key Implementation Issues
A. Market/Customer	✓	Characteristics of order quotations (A1)
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Issues encountered "✓"

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	✓	Support of task structures (D3)
E. Information Flow	✓	System-related start-up issues (E1)
		Integration with other systems (E2)

- Little planning undertaken at the customer enquiry stage.
- Unrealistic due dates from influential customers.

How can unrealistic and unspecified due dates be handled throughout the order process? (Through gradual change)

Issues encountered "✓"

6 New Implementation Issues Identified

Category		23 Key Implementation Issues
A. Market/Customer	✓	Characteristics of order quotations (A1)
	✓	Uncertainty at the customer enquiry stage (A2)
	✓	Rush orders (A3)
		Seasonality and volume growth (A4)
		Hybrid production (A5)
B. Primary Process	✓	Assembly requirements (B1)
		Sequence dependent set-up times (B2)
	✓	Alternative shop floor routings (B3)
	✓	Industry-specific process (B4)
	✓	Uncertainty after the order release stage (B5*)
C. WLC System	✓	WLC-related start-up issues (C1)
	✓	Incomplete routing data at customer enquiry (C2)
		Time-span-dependent critical resources (C3)
	✓	Output control management (C4*)
D. Organizational Embedding	✓	Awareness of the concept of WLC (D1)
	✓	User visibility (D2)
	✓	Support of task structures (D3)
	✓	End-user choice and involvement (D4*)
	✓	Accommodating functionality requests (D5*)
	✓	Timely implementation procedure (D6*)
	✓	Performance measurement and review (D7*)
E. Information Flow	✓	System-related start-up issues (E1)
		Integration with other systems (E2)

Issues encountered "✓"

New issues "*"

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D. Organizational Eml...	✓	Awareness of the ...LC (D1)
E. Infor...		

- High precision engineering and custom production leads to scrap and rework
- Overproduction also sometimes evident

Uncertainty after the order release stage (B5*)

How can the WLC concept be made flexible enough to cope with uncertainties after jobs have been released to the shop floor?

Issues encountered "✓"

New issues "*"

Response to Implementation Issues

Key Issues	Concept	Implementation Strategy
A2: Uncertainty at the customer enquiry stage		✓
A3: Rush orders	✓	
B4: Industry-specific processes	✓	✓
B5*: Uncertainty after the order release stage	✓	
D3: Support of task structures		✓
D5*: Accommodating functionality requests		✓
D6*: Timely implementation procedure		✓
D7*: Performance measurement and review		✓

Response to Implementation Issues

Key Issues	Concept	Implementation Strategy
A2: Uncertainty at		
A3: Rush orders		
B4: Industry-speci		
B5*: Uncertainty a		
D3: Support of task sim		
D5*: Accommodat		
D6*: Timely impler		
D7*: Performance		

"orders for replacement parts are very important – there are huge costs involved in keeping aircrafts on the ground"

- Reserve capacity for rush orders with tight due dates (Hendry *et al*., 2008)
- But here, arrival rate of rush orders is too unpredictable

Conduct rush order '*impact analysis*' at the job entry stage

- Find a realistic due date (e.g., by forwards scheduling)
- Determine the knock-on-effect of a rush order (e.g., delay to other jobs or extra capacity required)

Insights from Use of WLC to Date

- Too soon to assess impact of WLC on performance (RQ2); however, information system improves:
  - **Traceability:** provides an audit trail – important, e.g., in aerospace sector
  - **Responsiveness:** more information readily available for responding to customer queries
  - **Decision making:** support provided for daily planning meetings (e.g., information fed-back before orders released)
  - **Problem diagnosis:** improved understanding of shop floor constraints (e.g., distribution of workload on the shop floor)

Insights from Use of WLC to Date

- Too soon to assess impact of WLC on performance (RQ2); however, information system improves:
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  - Respons respond
  - Decisior meeting
  - Problem constraints (e.g., n of workload on the shop floor)

"We don't tend to do much planning unless we're pretty sure we're going to win an order. Our strike rate can be as low as 20% … we'd be wasting 80% of our time"

- Ongoing Issues:
  - Data entry at the customer enquiry stage
  - Ensuring all work is planned using the system

Conclusion

- Enhanced existing implementation framework (RQ1)
  - 12 issues previously identified by Hendry *et al.* encountered; other 5 may yet emerge (or be relevant elsewhere)
  - A total of 23 implementation issues identified (from 17)
  - Conceptual refinement

Conclusion

- Enhanced existing implementation framework (RQ1)
  - 12 issues previously identified by Hendry *et al.* encountered; other 5 may yet emerge (or be relevant elsewhere)
  - A total of 23 implementation issues identified (from 17)
  - Conceptual refinement

- Current & Future Research:

- Assess impact of Workload Control on performance (RQ2)
- Generality (another company = a different set of issues?):
  - Building up a body of cases
  - Cross-sectional survey of implementation issues

Thank you

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