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

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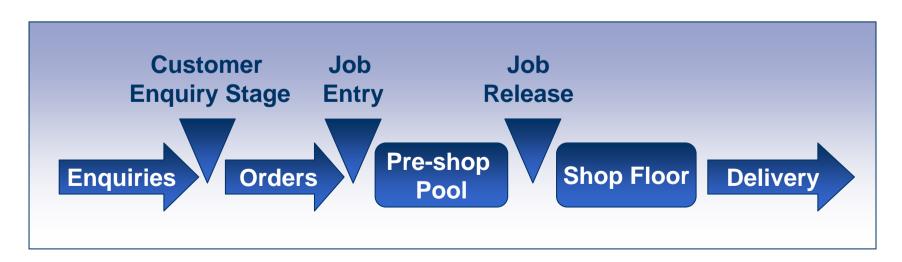
Content

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



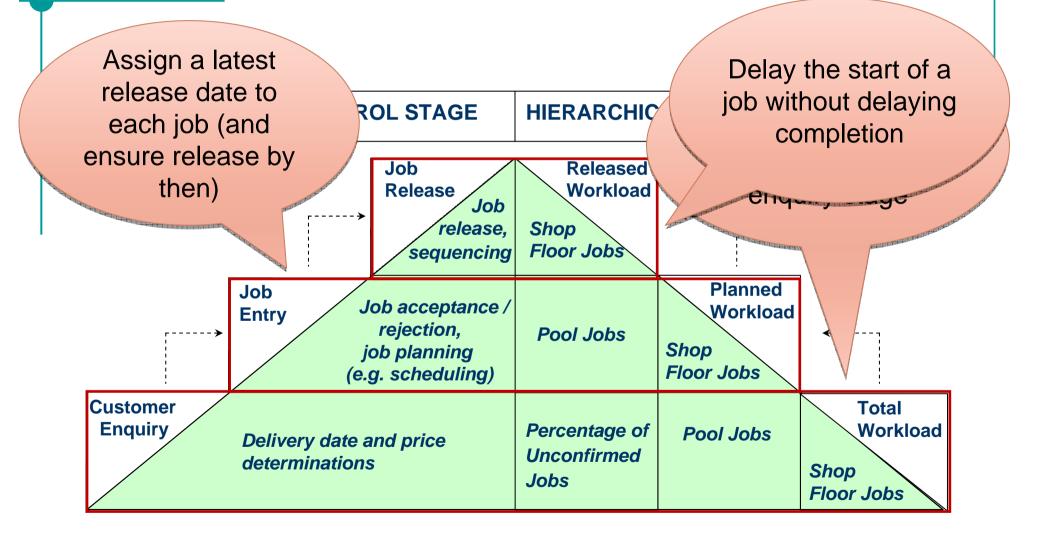
Workload Control (WLC)

- 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



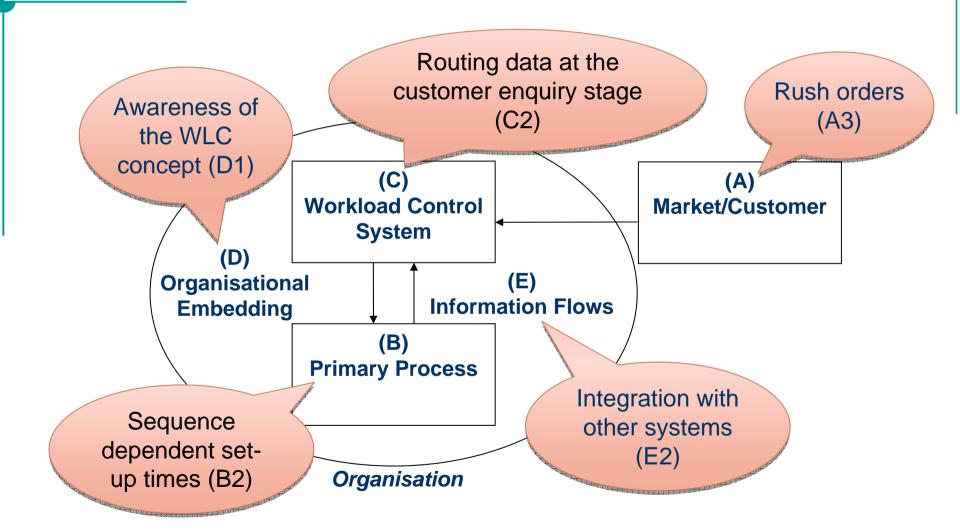


WLC: State-of-the-Art

- 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



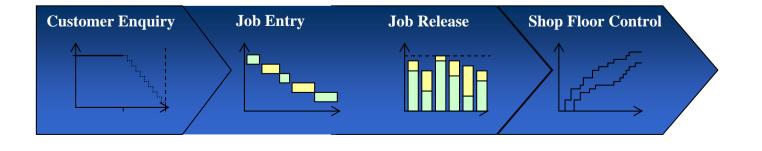


Decision Support System for WLC

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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	Awareness of the concept of WLC (D1)	
Embedding	User visibility (D2)	
	Support of task structures (D3)	
E. Information Flow	System-related start-up issues (E1)	
	Integration with other systems (E2)	



12 of Original 17 Issues Encountered

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	×	Awareness of the concept of WLC (D1)
Embedding	√	User visibility (D2)
	~	Support of task structures (D3)
E. Information Flow	-	System-related start-up issues (E1)
		Integration with other systems (E2)



12 of Original 17 Issues Encountered

Category		17 Ke	y Im	elementation Issues			
A. Market/Customer	Ch	Characteristics of order quotations (A1)					
		Rush vers (A3)	e gro	wth (A4)			
	• Little planning undertaken at the (B How can unrealistic and						
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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	✓ Awareness of the concept of WLC (D1)	
Embedding	✓ User visibility (D2)	Issues
	✓ Support of task structures (D3)	encountere
	✓ End-user choice and involvement (D4*)	·· / ??
	✓ Accommodating functionality requests (D5*)	
	✓ Timely implementation procedure (D6*)	
	✓ Performance measurement and review (D7*)	New issues "
E. Information Flow	✓ System-related start-up issues (E1)	
	Integration with other systems (E2)	



6 New Implementation Issues Identified

Category	23 Key Implementation Issues	
A. Market/Customer	 Characteristics of order quotations (A1) High precision engineering and production leads to scrap and 	
3. Primary Process	 Overproduction also sometime Alternative Industry-specific rocess (B4) 	es evident
C. WLC System	certainty after the order release s Time-span-depe ot critical resources (C3) ✓ Output control m ot (C4*)	stage (B5*
	Awareness of the n the WLC concept be made ible enough to cope with	
uncert	ainties after jobs have been eased to the shop floor?	



Response to Implementation Issues

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



Response to Implementation Issues

ŀ	Key Issues	Concept	Implementation Strategy	
A2: Uncertainty at	<i>"orders for replacement part huge costs involved in keep</i>			
A3: Rush orders B4: Industry-speci	• Reserve capacity for rush orders with tight due dates (Hendry <i>et al.</i> , 2008)			
B5*: Uncertainty a	But here, arrival rate of rus	sh orders is too	unpredictable	
D3: Support of tas D5*: Accommodat	Conduct rush order 'impact			
D6*: Timely impler D7*: Performance	 Determine the knock-on-ef (e.g., delay to other jobs o 	ffect of a rush or	rder	



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:
 - Traceability: provides an audit trail important, e.g., in aerospa
 - Respons respond
 - Decisior meeting
 - Problem constraints (e.g.,

"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"

of workload on the shop floor)

- 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



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