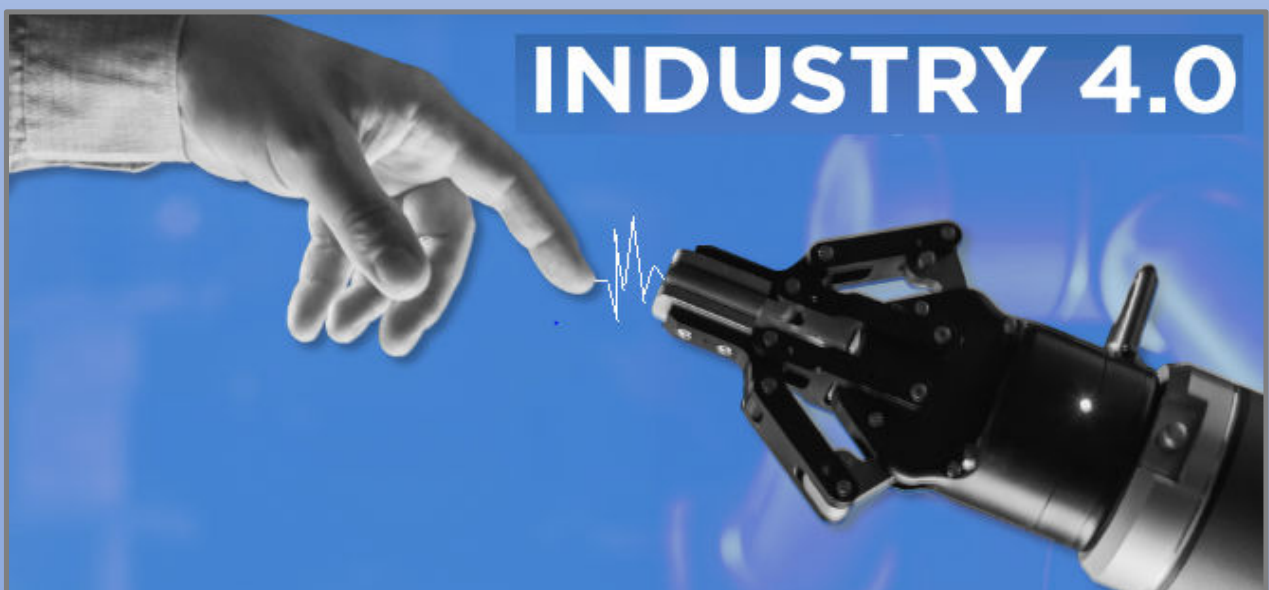


ACPA7002 Financial Management and Planning

Assignment - Capital Project Appraisal Presentation

**JUSTIFICATION FOR THE CAPITAL
OUTLAY TO IMPLEMENT A
DIGITISATION SOLUTION UTILISING
A COMMON REPORTING, CONTROL
AND PROCEDURES PLATFORM
(WITHIN A MULTINATIONAL
MANUFACTURING ORGANISATION
ACROSS SITES IN THE UNITED
KINGDOM, POLAND & MOROCCO)**

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Introduction

The purpose of this report is to highlight the financial benefits that would become apparent in changing from 3 disparate reporting and control processes across the 3 sites to an integrated process across the whole organisation. There are several ways in which this initiative could be applied, but the report will identify those parts with the highest return and focus on those. Data has been analysed in order to model the cost of each part in order to give an accurate sum of the project cost benefit. The report will also include methods of financing the projects and a realistic implementation plan, considering the management of associated risks.

Background

There are currently 3 systems used within the organisation. These are:

- Wrexham – Development Database, EFACs and Intouch.
- Poland - Development Database, EFACs and their own production routing system.
- Morocco – Hsys.

Each site has a different system of reporting and control.

The Moroccan site already has a digital system in place which is proven to be effective.

Figure 1 - Existing UK data input :

- Development Database being the initial sales, engineering and project knowledge hub,
- EFACs being the orders and Sales system,
- InTouch being the production monitoring system.

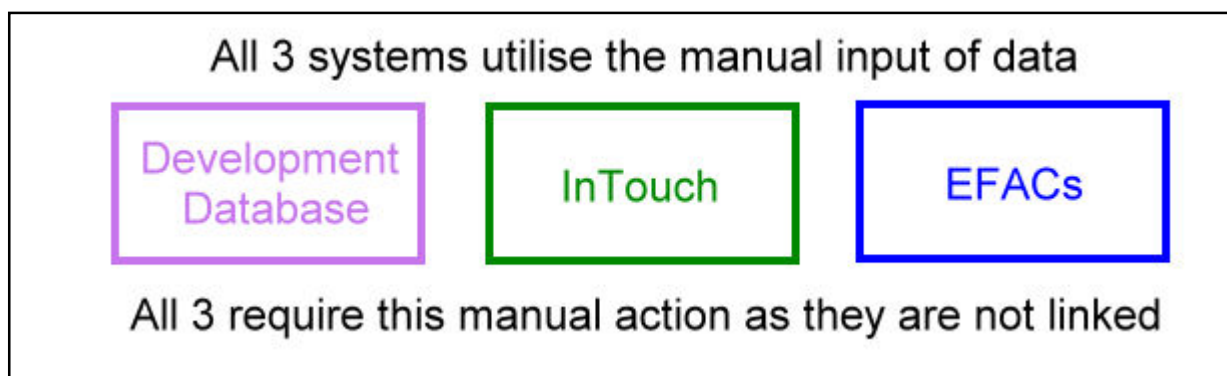


Figure 1 - Existing UK data input systems

Hsys and Cyclades would both cut down on the number of manual data inputs required.

Both would also assist in the tracking of movements across all production activities in an effort to improve efficiency across the whole manufacturing process.

Using the 7 types of waste, as defined in The Toyota Way (Liker, 2004), a simple table can be used to highlight the types of waste encountered in the current process.

7 wastes:

- Defects
- Overproduction
- Transportation
- 'Extra' or Non-Value Added' Processing
- Motion
- Waiting
- Inventory

Since Taiichi Ohno of Toyota introduced the 7 wastes, an additional 8th waste has been added the widely adopted Lean Principles of Six Sigma Management (Skhmot, 2017).

The 8th waste:

- Unused Talent

Key notes:

- All operator related tasks have 'unused talent' waste as they are over-skilled for the task
- Extra processing happens each time the operator opens the machine door
- The rigid moulding cycle runs faster and so over produces and creates inventory each cycle
- There is motion waste each time the operator carries out a process
- The operator incurs significant waiting time during the over-moulding cycle

For the purpose of highlighting these wastes in process map they've been colour coded as shown below:

Type of Waste	Colour Code
Defects	
Overproduction or Underproduction	
Transportation	
Extra Processing	
Motion	
Waiting	
Inventory	
Unused Talent	

Table 1 - 8 Wastes colour coded

Below is an example of the manufacturing process steps and the attached wastes:

Process Step	Waste 1	Waste 2	Waste 3	Waste 4
Material utilisation				
Moulding cycle				
Parts moulded				
Parts inspected				
Parts packed				
Parts despatched				

Table 2 - Process steps and wastes

Key notes:

- All operator related tasks generally have 'unused talent' waste as they are over-skilled for the task.
- Extra processing happens each time the operator breaks a moulding cycle.
- The moulding cycle runs slower, so under produces and creates less inventory each cycle.
- There is motion waste each time the operator carries out a process.
- The operator incurs significant waiting time during the over-moulding cycle.
- Extra processing is required to diligently sort defect parts.

Proposed Solution

The proposed solution would be to replace the somewhat manual reporting and controls with a system that keeps track of how much material has been used, how many parts have been moulded, monitors the cycle times to ensure a good production rate, keeps a count of the defects sorted, the good parts packed and traceability of the boxes stacked for storage or despatch. Table 3 - Proposed Process waste shows the process wastes after the changes.

Process Step	Waste 1	Waste 2	Waste 3	Waste 4
Material utilisation				
Moulding cycle				
Parts moulded				
Parts inspected				
Parts packed				
Parts despatched				

Table 3 - Proposed Process waste

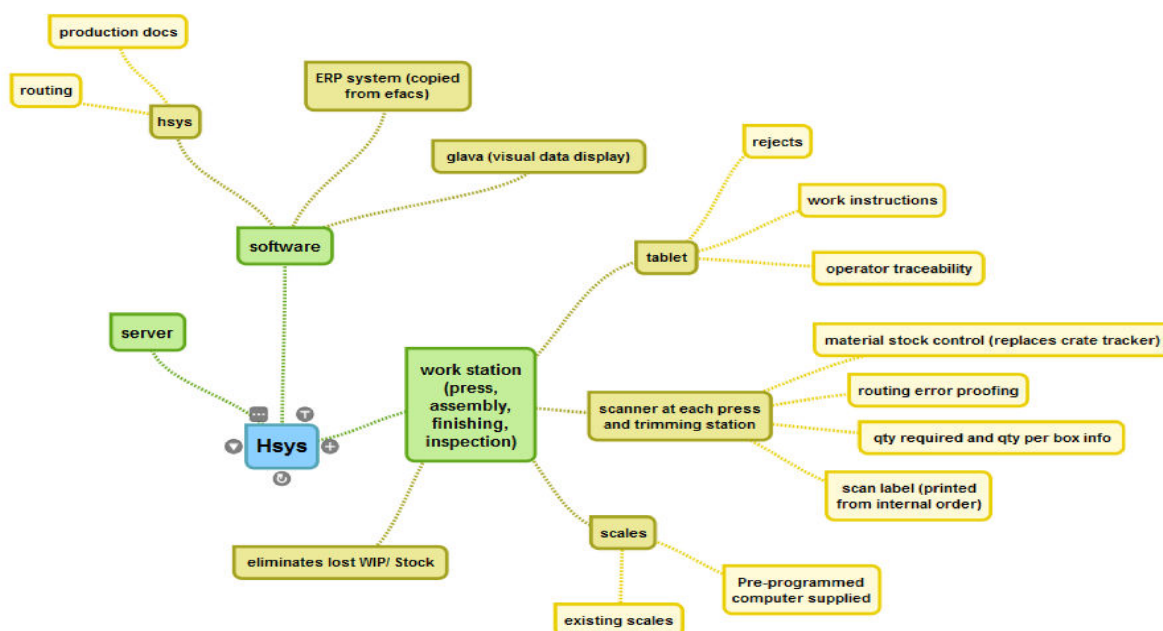
Key Notes:

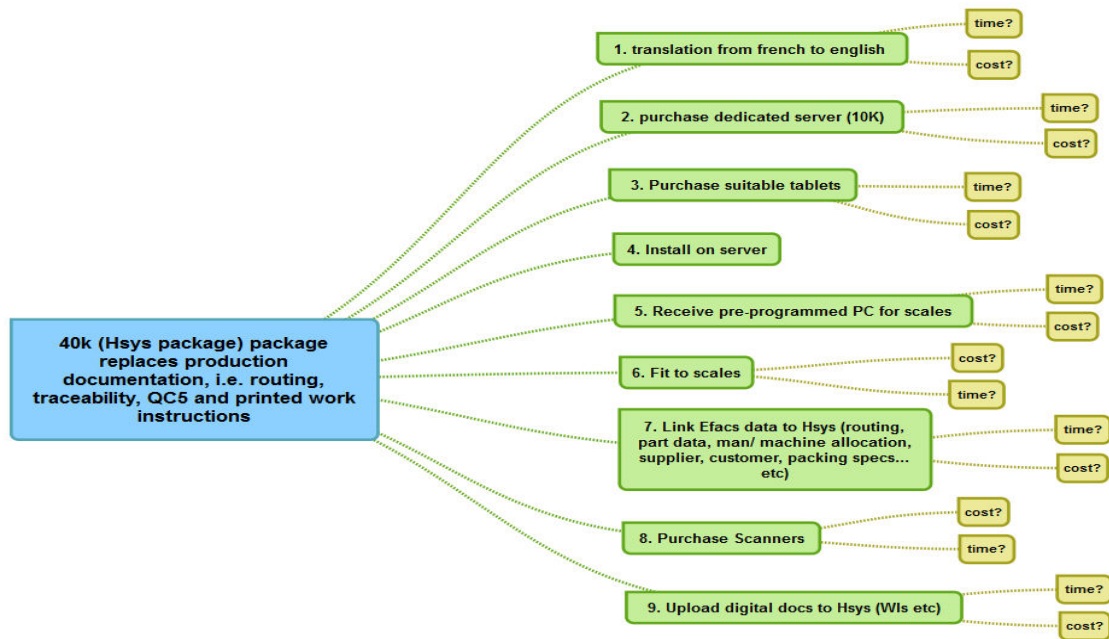
- The monitoring of cycle times will allow processes to run at the optimum speed removing the over processing and inventory waste from an erratic moulding cycle.
- Motion waste is still present, but the cost has been reduced significantly by using less valuable resource.
- All 'unused talent' waste has been eliminated as tasks are performed more consistently.
- Part traceability is maintained.
- All waiting time has been eliminated from the over-moulding process.
- In theory less defects are made and fed into the process.
- 2 systems under appraisal – Hsys and Cyclades
- Cyclades is the cheaper option but is less flexible
- Hsys is the more flexible and can connect to existing systems within the company location, and in turn with other sites within the organisation – See below.

Figure 2 – below shows the proposed process layout



Figure 2 - Proposed system process layout

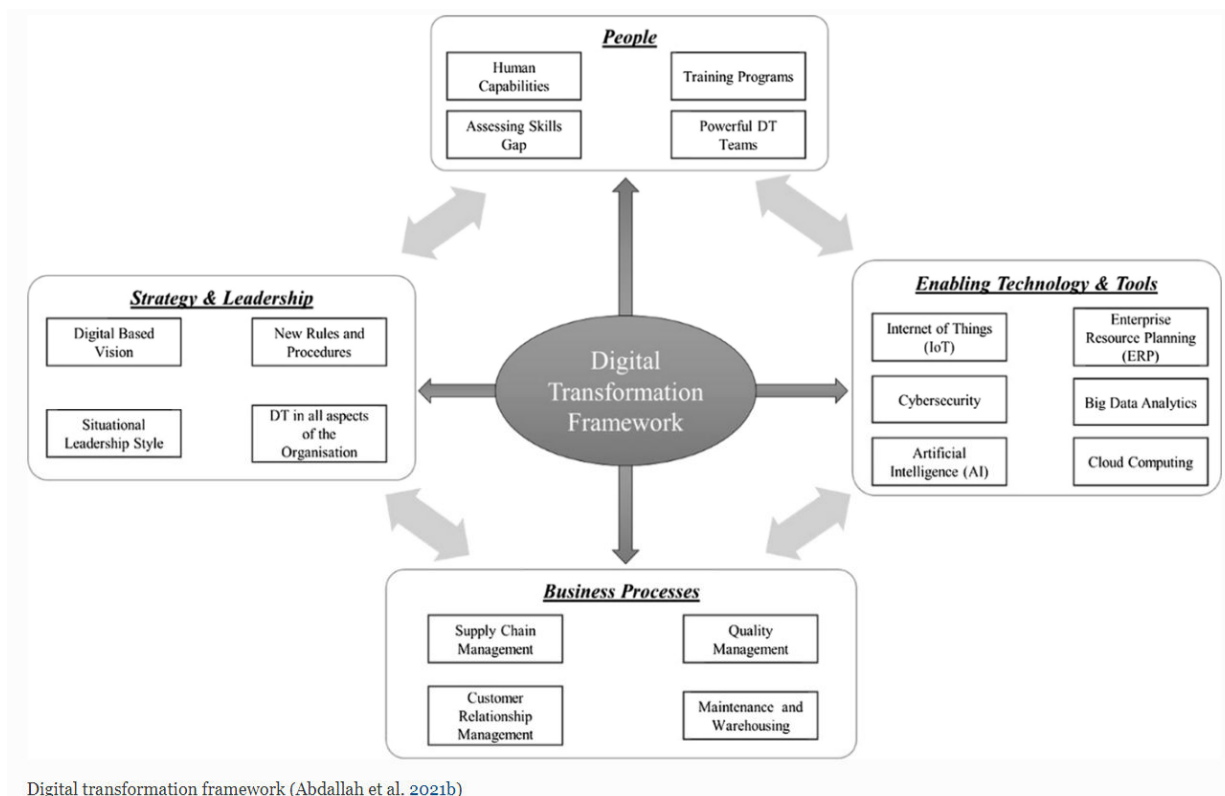




Hsys can be connected to other systems within the organisation via the cloud to share information quickly and easily



Thus creating a fully integrated manufacturing data and monitoring hub.



Digital transformation framework (Abdallah et al. 2021b)

Data analysis

Input required for existing state analysis were retrieved from various sources relative to the current production scenario.

- Current cycle times were retrieved from recent production runs.
- Hourly rate for resource was taken from the commercial guidelines for costing.
- Annual volume taken from the projected platform forecasts.
- Resource allocation taken from existing process allocation.

Input data required for the proposed state calculation were partly retrieved from existing data and partly made on an estimation of what will be expected to be gained from the proposed state.

- Expected cycles time based on previous developments and known cycle excluding operator intervention.
- Hourly rate again taken from commercial guidelines
- Annual volume assumptions are again based on platform forecast
- Resource allocation made on assumption based on reduced operator allocation and a less operator.

The operating and material costs were obtained with permission from readily available sources within the company.

$$\text{Annual Cost} = (\text{Annual Machine hrs}) \times (\text{resource cost per hr}) \times (\text{resource allocation})$$

This analysis was carried out by looking at a modest return of a saving of 2% calculated from the difference between the annual cost before and after the proposal:

$$\text{Annual Cost Saving} = \text{Annual Cost Before} - \text{Annual Cost After}$$

Part	Before	After	Annual Savings
Production labour and overhead cost	£4,821,337.37	£4,724,910.62	£96,426.75

Table 4 - Potential Annual Savings

The full cost analysis is available in Appendix A.

Cost of Investment

To cover the complexities of the project, considering the skill level available internally, the preferred option would be to approach this project as a turn-key solution. The supplier would supply, test and develop, install and commission all equipment, including hardware and software. This is also a good training opportunity for existing staff already up-skilling in these areas. They would be involved in the development and implementation learning how to produce and maintain a complex automation system.

In order to establish a fair cost of investment 3 quotations were obtained from 3 suppliers. One supplier we've worked with previously, one supplier not previously worked with, and one supplier who were introduced within our network. The latter was the lowest cost supplier as were also the ones most keen to work on the project. Find quotations in Appendix B.

Based on the itinerary of equipment offered it was possible to choose items at a lower cost or remove items that provide functionality that we either do not require or can add on at a later date for more advanced functionality.

The cost of Equipment/ Hardware: £55,680.

The costs of Labour, i.e. Design, Development and Installation: £17,200.

Total cost of investment: £82,880.

Find breakdown of required Equipment and Labour in Appendix C

Project Screening

To ensure that the profit from the investment is maximised and the time invested in the development is most efficient the project was screened to identify the most valuable parts. Although payback doesn't necessarily answer which part will turn the most profit it is will be used as tool to filter out the low value projects, homing in on those worth spending further time evaluating (Plewa, F. J., Friedlob, G. T. , 1996).

The project has an envisaged payback within 1 year. Based on this, the evidence would suggest moving forward with the more flexible Hsys system and the added timesaving benefits that can be achieved would be the most favourable option.

Find payback model in Appendix D.

Cost Model

The cost model uses a discount rate known as WACC (Weighted Cost of Capital) to assess the project value based on the discounted future value of money. By taking the sum of the discounted cashflow and subtracting the initial investment cost it is possible to identify the real Net Present Value of the investment (Fernando, 2022).

Using this method, the NPV calculation is as follows:

Appendix E - Cost Model

	2023	2024	2025	2026	2027	2028	2029
Year	1	2	3	4	5	6	7
Investment	(82,880)	0					
Return		96,427	96,427	96,427	96,427	-	-
Net Value	(82,880)	13,547	109,974	206,400	302,827	302,827	302,827

Payback	0.86	Years
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Discount Rate (WACC)	10.00%
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Denominator	1.00	1.10	1.21	1.33	1.46	1.61	1.77
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Future Value	(82,880)	87,660.68	79,691.53	72,446.84	65,860.77	-	-
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NPV	222,780	Net Present Value = Sum of future value (incl. cost of investment)					
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Figure 3 - NPV Calculations

As shown above payback will be within one calendar year.

To further analyse the project and assess the value against the investment it's possible to use both the profitability index and benefit-cost ratio (Pasqual, Padilla, & Jadotte, 2013). Profitability index calculates that for every pound spent, how many are returned. Benefit cost is calculated by dividing the profit by the investment value.

Profitability Index	2.69	PI = NPV / Investment Value
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BCR	3.69	Benefit-Cost Ratio = Future Value Profit / Investment Value
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Figure 4 - PI and BCR

The project already shows a healthy return, but the investment can be reduced further by assuming that some value of the assets purchased will still be remaining or salvageable at the end

of the project life (BAXTER, 1970). It is difficult to identify an exact scale of depreciation but, 10 years is widely accepted assumption on asset depreciation for plant/ machinery in manufacturing.

Depreciated over 10 years the reclaimed value at the end of the project, year 7, is £15,000. This reclaimed value reduces the project investment to £52,210 and gives a revised NPV of £161,118.45.

	2023	2024	2025	2026	2027	2028	2029
Year	1	2	3	4	5	6	7
Asset Depreciation (10% YOY)	0	0.9	0.8	0.7	0.6	0.5	0.4
Asset Value	£37,500.00	£33,750.00	£30,000.00	£26,250.00	£22,500.00	£18,750.00	£15,000.00
Reclaimed Asset Value	£15,000.00	Asset Value at project end					
Reclaimed Investment	-£67,880.00						
Future Value	(67,880)	54,822.59	49,838.72	45,307.93	41,189.02	19,821.05	18,019.14
NPV	£161,118.45						

Figure 5 - Asset Depreciation and Revised NPV

Using the revised NPV it's possible to calculate the Accounting Rate of Return and show the average return per year over the life of the project. The ARR can be determined by using the following calculations (Arnold, 2007):

Average Annual Investment	£9,697.14	Reclaimed investment/ Project Life	
Average Annual Profit	£23,016.92	NPV/ Project Life	
ARR	237%	Average annual profit / Average annual investment	

Figure 6 – ARR

Find the full cost model in Appendix E

Risk management

Potential Risks	Action to Reduce Risk
Risk to product supply during installation and testing	Proven system already in use in Morocco plus offsite proofing of data input/transfer to develop and trial solutions before on-site installation
Risk of impacting supply of shared line products	Proven system already in use in Morocco plus offsite proofing of data input/transfer to develop and trial solutions before on-site installation
Risk of over-allocating resource to the improved state	Update production planning systems to reflect the new resource allocation when efficiency improvements are seen
Risk of creating redundancies	Use gained resource to deploy on more value-added tasks and upskill to suit
Risk of poor quality caused by the introduction of process changes that are unproven or uncontrolled	Perform capability studies on new process elements to prove the operations are controlled, meet cycle time targets, with a low scrap rate and document new processes to ensure consistency.

As with any project there are a number of risks that require addressing, reducing, and mitigating where possible. Such as follows:

Table 5 - Risk Management

Project Timing and Implementation

The project consists of 4 main phases: Equipment procurement, Manufacture of workstations, Installation and training.

To reduce the lead time the programming and manufacture phases will run simultaneously.

Training will be carried out throughout the build process to prepare a streamlined integration.

The supply of equipment needs to be carefully considered; this is the most likely roadblock to on-time delivery as the supply chain is currently volatile.

Considering all elements under control the total project lead time is 20wks

See Appendix F for full project timing plan.

Conclusion

In summary the project should be carried out, considering a number of positive elements and mitigated risk factors the key points are:

- The project is to be carried out over 2 sites, UK & Poland, as Morocco already has the Hsys system in place.
 - Payback on investment within 11 months. (For each site)
- 7-year lifetime project profit of £302,827.
- Re-allocation of resource to other value-added tasks.
- Significant manufacturing waste reduction supporting an increase in Operating Efficiency.
- Risk reduced in implementing a totally new system by utilising one that is already in use within the organisation.
- Spare capacity to integrate further manufacturing process steps.

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