Estimating Return on Investment for Enhanced Automated Specimen Processing

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Introduction

Automated specimen preparation technology continues to improve, increasing efficiency in workflow in the clinical microbiology laboratory. This efficiency derives from freeing skilled staff to perform more technical tasks, and by absorbing expanded operations without the need for additional staff. The purpose of this study was to estimate the return on investment (ROI) for a **barcode driven and conveyor connected automated specimen processing system that includes plating and streaking, incubation, image acquisition, and digital microbiology** in a typical clinical microbiology laboratory.

Methods

An economic model was created to evaluate expanded automated specimen processing in a typical laboratory. The model accounted for: 1) personnel information, including the number of staff, average salaries, and fringe benefit rates, 2) lab workload, and 3) costs for capital, service contracts, and rechargeables. Benefits were defined as the value of labor diverted to other tasks. It is assumed that the automated specimen processing technology could do the work of 2.5 FTEs (e.g. a lab using 3 lab assistants for specimen processing would only required 1.2 lab assistants). Model outcomes included five-year ROI, measured as the ratio of adjusted benefits to cost, and length of time to break even.

Results

The baseline analysis assumed a laboratory where specimen processing was done by four laboratory assistants performing 907 cultures requiring 1,552 plates and 176 swabs per day, and operating 7 days per week. Wage rates were assumed to be $15.00 per hour for lab assistants, with a fringe rate of 33%. Under these conditions, the expected total costs of adopting automated specimen processing over five years was $582,319 and the expected labor savings was $679,783. The net present value of the technology over 5 years was $158,488 assuming a discount rate of 5%. This yielded an ROI of 16.7% over five years and a breakeven point of 4.1 years. Sensitivity analyses suggested that ROI was sensitive to assumptions about price, wage rates, and efficacy.

Variable	Value
Personnel	
Lab Assistants (FTE)	3
Hourly Rate	$15.00
Fringe Benefits	33%
Lab Workload	7
Days Per Week	
Cultures	
Urine	80
Stool	21
Swabs	176
Gram Stains	54
Percent Anaerobic Transpc	3.0%
Rechargable Costs	
Anaerobic Swabs	$1.35
Traditional Swabs	$0.37

Table 1: Assumptions and Inputs

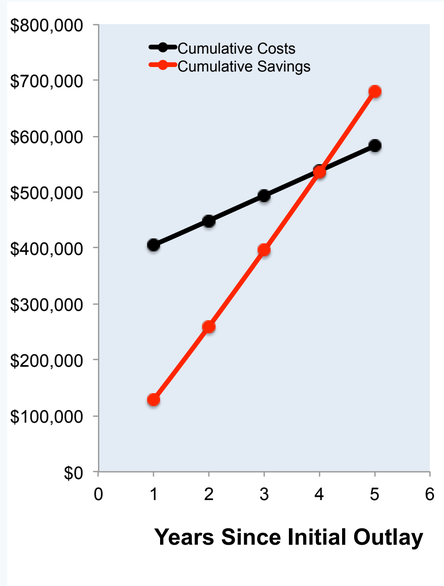

Figure 1: Time to breakeven: 4.1 yrs

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Capital Outlay	$350,000	$0	$0	$0	$0	$350,000
LIS Cost	$10,500	$0	$0	$0	$0	$10,500
Incremental Swab Cost +Loop Cos	$13,364	$13,364	$13,364	$13,364	$13,364	$66,819
Service Cost	$31,000	$31,000	$31,000	$31,000	$31,000	$155,000
Total Costs	**$404,864**	**$44,364**	**$44,364**	**$44,364**	**$44,364**	**$582,319**
Current Labour Costs	$213,400	$219,802	$226,396	$233,188	$240,184	$1,132,972
WASP Labour Costs	$85,360	$87,921	$90,559	$93,275	$96,074	$453,189
Labor Savings	**$128,040**	**$131,881**	**$135,838**	**$139,913**	**$144,110**	**$679,783**
Net Benefits	**-$276,824**	**$87,518**	**$91,474**	**$95,549**	**$99,747**	**$97,464**
Cumulative ROI	**-68.4%**	**-42.1%**	**-19.8%**	**-0.4%**	**16.7%**	

Table 2: Costs and benefits of automated specimen procession

Conclusions

Enhanced automated specimen processing that includes incubation, image acquisition, and digital microbiology has a reasonable ROI over five years, and an estimated breakeven point of 4.1 years. The specific ROI depends on an individual laboratory's needs, volume, and labor market conditions.

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