Return on Investment for Automated Specimen Processing in the Clinical Microbiology Laboratory

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Introduction

Reliable specimen preparation is crucial to diagnostic accuracy. Automation holds the potential to improve workflow in the clinical microbiology laboratory by freeing skilled staff to performed 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 automated specimen processing in a typical clinical microbiology laboratory.

Methods

An economic model was created to reflect a typical laboratory. Parameters included 1) personnel information, including the number of staff, average salaries, and fringe benefit rates, 2) lab workload, including the average number of specimens processed per day, type of specimen, and the number and cost of plates required for specimens, 3) the equipment cost of an automated specimen procession system, including the initial capital outlay and yearly service costs (See Table 1). Benefits were the value of labor reduction due to the automation. ROI measures included the ratio of adjusted benefits to cost, and length of time to break even.

Results

The base case model assumed a laboratory where specimen processing was done by 3 laboratory assistants performing 230 cultures requiring 609 plates and 176 swabs per day, and operating 7 days per week. Wage rates were assumed to be $28.50 per hour for technologists and $15.00 per hour for lab assistants, with a fringe rate of 33% (Table 1). Under these conditions, the expected total costs of adopting automated specimen processing over five years was $595,683 and the expected labor savings was $804,094. This yielded an ROI of 35.0% (Table 2), and a breakeven point of 2.9 years (Figure 1). Sensitivity analysis suggest that increased FTEs and wage rates yielded higher ROI and quicker breakeven point, while lower wage rates reduced the ROI and lengthened the breakeven point.

Variable	Value
Personnel	
Lab Assistants	3
Hourly Wage	$15.00
Fringe Rate	33%
Lab Workload	
Days Per Week	7
Cultures	277
Urine	80
Stool	21
Swabs	176
Plates	609
Anaerobic Transport %	3.0%
Cost	
Anaerobic Swab	$1.35
Traditional Swab	$0.37

Table 1: Assumptions and Inputs

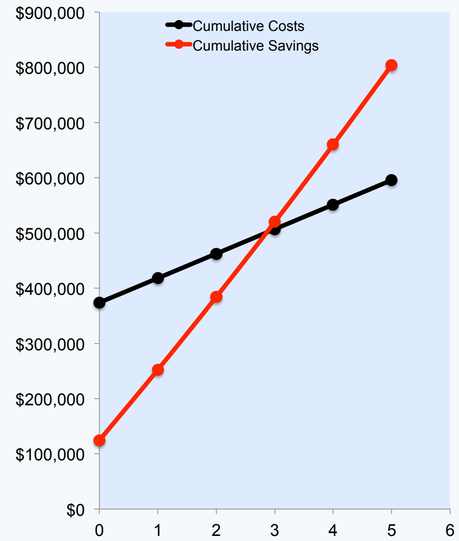

Figure 1: Time to breakeven, 2.9 yrs

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Capital Outlay	$350,000	$0	$0	$0	$0	$0	$350,000
LIS Cost	$10,500	$0	$0	$0	$0	$0	$10,500
Swabs & Loops	$13,364	$13,364	$13,364	$13,364	$13,364	$13,364	$80,183
Service Cost	$0	$31,000	$31,000	$31,000	$31,000	$31,000	$155,000
Total Costs	**$373,864**	**$44,364**	**$44,364**	**$44,364**	**$44,364**	**$44,364**	**$595,683**
Current Labour Costs	$207,185	$213,400	$219,802	$226,396	$233,188	$240,184	$1,340,157
WASP Labour Costs	$82,874	$85,360	$87,921	$90,559	$93,275	$96,074	$536,063
Labor Savings	**$124,311**	**$128,040**	**$131,881**	**$135,838**	**$139,913**	**$144,110**	**$804,094**
Net Benefits	**$249,553**	**-$83,676**	**-$87,518**	**-$91,474**	**-$95,549**	**-$99,747**	**-$208,411**
Cumulative ROI	**-67%**	**-40%**	**-17%**	**3%**	**20%**	**35%**	

Table 2: Costs and benefits of automated specimen procession

Conclusions

Under modest assumptions, automated specimen processing has a high ROI over five years, and a breakeven point of 2.9 years. Individual labs should evaluate the economic value of automated specimen processing given their labor requirements and workload. The proposed model is flexible enough to estimate the ROI for most labs.

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