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Automation in the Histology Laboratory: A Comparison of Manual Verses Automated Processes

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Abstract

Automation can significantly reduce the time that is spent on manual processes, automation can also provide a quicker turnaround and offer a good quality product. However, the automation needs to be a sustaining innovation that offers ease of use for the user, and that provides the benefits that are expected. Across the histology laboratory the processes remain mostly manual and therefore it gives an opportunity to look to innovation to help the process through of the laboratory. The opportunity to provide the customer with a high quality end product at a quicker turnaround time must be investigated and compared with the manual embedding technique. Research shows that the auto-embedder can offer a high quality end product, and also reduce overheads. By using the auto-embedder to embed samples the histologist can save approximately 80% of their time that is normally spent manually embedding samples. The average payback of an auto-embedder would be around 2 years.

Implementation of automation requires the use of a more modern change management approach, and this must carefully consider the employee where the innovation will be in use.

Keywords: Automation, culture, disruption, embedding, engagement, histology, laboratory, return on investment, sustaining, transformation

Introduction

This paper provides a comparison of manual verses automated techniques in the histology laboratory to show that automation can bring about more efficient practices in the laboratory, but that there are also challenges as well as benefits.

Automation brings many positive outcomes for employees and organizations, it can reduce time spent on tasks and it *can give an organization financial benefits, along with achieving a more competitive status in the industry* (Devitt, 2017) [1]. *The right automation can provide faster results and reduce overheads* (Nasim, 2015) [2]. *Delivering new technologies places the business at a competitive advantage* (Henry, 2008) [3], so for organizations to continue to offer better turnaround times, and increase their quality potential, they need to consider deployment of automation in their laboratory, this paper discusses the challenges and benefits of the auto-embedder in the histology laboratory.

Materials

Histology is the collecting of tissue samples, and preparing the samples so that they can be fixed to a slide for reading, the basic steps for histology can be seen in figure 1.

The steps that are shown in figure 1 are mostly manual, this is because *there still remains a mostly manual process within the histology laboratory* (Tufel, 2015) [4], also a*utomation for histology is mostly at the end of the process* (DeSalvo, 2019) [5], an example of this could be digital scanning of the slides for the pathologist. So this provides an opportunity to assess suitable automation for the front end of histology, and one of these processes is embedding.

Automation may be difficult across some areas of the histologist role, for example when manipulating different tissue types and sizes, so as such histology still remains more manual with its procedures.

Cuddihy and Garrity (2014) [6] suggest that in histology the *benefits of automation can make it easier for pathologists to read the slides because the automation standardizes preparation*.

There is some opportunity to further develop the automation across the histology laboratory by the use of an auto-embedder at the embedding stage, but it needs to be sustaining and be used to the sustainable potential.

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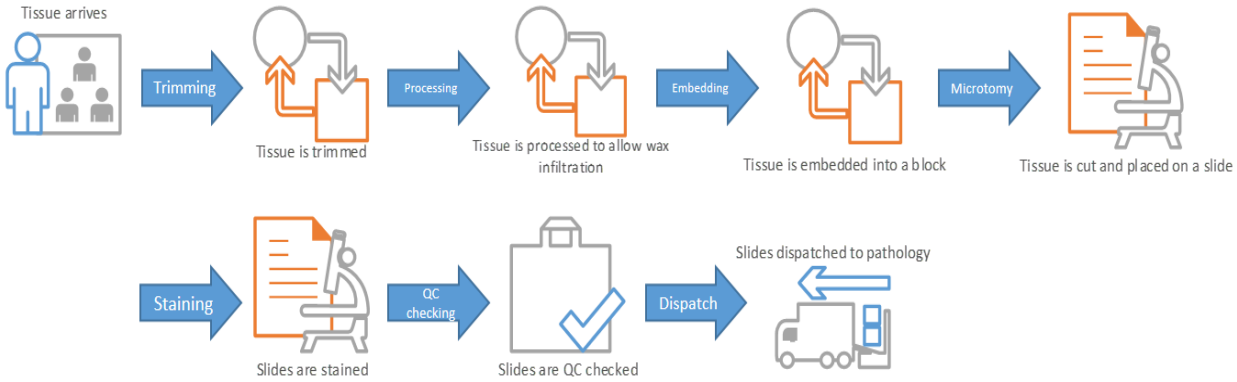

Fig 1: A basic overview of the process taken by histologists to get tissue samples fixed to a slide (Wall, 2021).

Results & Discussion

Table 1: The potential financial metrics for the auto-embedder.

Financial Metric for the Auto-embedder	
Return on Investment (ROI)	
Average cost of an auto-embedder	$217K
Internal Rate of Return (IRR)	72.40%
Average Net Present Value (NPV) @ 12% WACC	$268K
Payback (months)	23

Note: Adapted from: Wall, S. E., (2019). Developing a Global Strategy for Automation within the Histology Laboratory. Master of Business Administration, Consultancy Project. Leeds Beckett University, U.K.

Table 2: The potential production metrics for the auto-embedder verses a manual embedding process.

Average Number of Blocks Embedded Per Day	
Average Manual Embedding Process	221 blocks
Auto-embedder Process	840 blocks
Days of Embedding for a Standard Project, Based on an Average of 1150 Blocks	
Average Manual Embedding Process	5 days
Auto-embedder Process	1 day

Note: Adapted from: Wall, S. E., (2019). Developing a Global Strategy for Automation within the Histology Laboratory. Master of Business Administration, Consultancy Project. Leeds Beckett University, U.K.

In histology some automation implementation has been difficult (DeSalvo, 2019) [5], and *some innovation can bring undesirable performance* (Christensen, 2000) [7], this would then move a potentially sustaining process to a more disruptive process. However, it is important to note that *automation can bring a higher quality product* (Cuddihy and Garrity, 2014) [6], and for histology the end product of the slide needs to be of a very high quality to ensure that the potential for artefacts are eliminated, this means that the pathologist receives a high quality slide to read. *There has been a move towards histology laboratory automation, however often the automation may not be used to its full potential* (Wall, 2019) [8], this would lead to disruptive technology which is undesirable.

A recent study that was conducted in 2019 across a global histology laboratory, shows that an auto-embedder can provide organizations with a reduction in turnaround time, and it can also reduce the overheads that are needed for the embedding procedure. This confirms what Nasim (2015) [2] comments on with regards to *a reduction in heads and faster turnaround*. The study shows that the auto-embedder can reduce costs and error rates, while increasing efficiencies, so therefore the auto-embedder would bring a sustaining automation to the histology laboratory.

Table 1 above shows that the payback on the automation would be 23 months, therefore the auto-embedder would need to be in operation for about 2 years before it started to financially show a return on investment (ROI). This means that the financial benefits return after 2 years. Although we can see that the automation does offer a ROI after the payback time, we also need to look at the production output to ascertain whether the automation offers a quicker turnaround time, and therefore provides the efficiency potential that shows the automation to be sustaining.

Table 2 above shows that by using the automated process for embedding, it can significantly reduce the embedding time. The auto-embedder is capable of embedding on average 1150 blocks daily; this shows an efficiency potential of 80% compared with that of the manual embedding process, and as such the auto-embedder could completely transform the histology laboratory operations, and give opportunity for the histologist to concentrate on other tasks. The auto-embedder can therefore provide the histology laboratory with a sustaining product, that will show a ROI after the payback of 2 years, and also reduce the histologists time by 80%. This means that there is potential for increasing production, and using the histologist time saving from the embedding process to other duties within the laboratory.

The laboratory would need to conduct their own analysis on the quality and suitability of the end product.

Of course if implementing the automation was as easy as calculating the efficiencies that it brings there would probably be more automation available in the histology laboratory, however the inherent issues with embracing new technologies lie within the organization. *The issues are within the organizational culture and the change management practice that are used to bring about the automation and ensure its successful deployment* (Wall, 2020) [9]. Ritson (2019) [10] suggests that *organizational culture is shaped by the employee, and the employee identifies with that culture*. Therefore, if the benefits of new initiatives, such as the auto-embedder, are not fully understood by the employees then the successful deployment of such innovation has much less probability of being successfully implemented. *We need to involve employees and engage a more modern approach to change management* (Wall, 2020) [9]. If the necessary change management is considered then the auto-embedder can bring a good sustaining product to increase efficiency in the histology laboratory.

Conclusions

Innovation can bring a competitive advantage to organizations, as we can see above the successful deployment of an auto-embedder would provide a laboratory with a reduced turnaround time, and also reduce the histologists time spent manually manipulating samples by on average 80%. So comparing manual embedding with an automated embedding process it is clear that the auto-embedder provides the laboratory with a sustaining product.

This could be alarming to histologists who may fear that their role may be at risk, however if the histologists embrace innovation, and organizations take the right steps in their change management process, then the auto-embedder can be a great asset to the histologist who can focus on the many other pieces of their role. This also then brings a benefit to the organization and the customer. After all, the histologist is working to provide the pathologist with a high quality end product, if the auto-embedder can give the high quality needed, and reduced the turnaround time, then the histologists has a responsibility to be part of driving that change.

Further work would be to look at the other processes across the histology laboratory, such as the decalcification of bone and reducing the time taken for this step in the histology process.

There are also other opportunities to look at other innovation such as speeding up the tissue processing time, and bringing more automation to the section cutting of the blocks to make the slide.

Overall there are many opportunities for the histology laboratory to become more automated, but the histologist must embrace the innovation.

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References

1. Devitt D. *11 Benefits of Automating Manual Processes*, 2017. https://info.sydcon.com/blog/11-benefits-of-automating-manual-processes.
2. Nasim M. *The New-Model Histotechnologist*. Lab Operations, 2015. http://www.clpmag.com/2015/09/new-model-histotechnologist/.
3. Henry A. Chapter 1: What is Strategy? *Understanding Strategic Management.* Oxford University Press, 2008, 4-6.
4. Tufel G. Histotechnology Takes Aim at Automation. *The Implications for Histotechnologists' Job Security*. Lab Operations, 2015. https://clpmag.com/lab-essentials/lab-automation/histotechnology-takes-aim-automation/.
5. DeSalvo WN. *Why are Automation & Innovation Critical to Histology Lab?* 2019. https://www.leicabiosystems.com/pathologyleaders/why-are-automation-innovation-critical-to-the-histology-lab/.
6. Cuddihy MJ, Garrity AG. *Automation in the Histology Lab*. Investing in cost savings, faster turnaround times, reduced contamination and standardization. Aquaro Biosystems, 2014.
7. Christensen C. The Innovator's Dream. When New Technologies Cause Great Firms to Fail. *Harvard Business Review Press*, 2000, xv.
8. Wall SE. *Developing a Global Strategy for Automation within the Histology Laboratory*. [Unpublished] Master of Business Administration, Consultation Project. Leeds Beckett University, 2019.
9. Wall SE. *Change Management has a Critical Role in Automation*. LIGS University, Hawaii, 2020. https://www.ligsuniversity.com/en/blogpost/change-management-has-a-critical-role-in-automation.
10. Ritson N. *Business Strategy and Strategic Management*, A Definition and Definitive Guide. Chapter 13 Culture. 2nd ed. Bookboon.com, 2019, 54-67.