# Understanding the complex challenges in digital pathology and artificial intelligence integration

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## SUMMARY

The hexagonal socio-technical framework was employed to understand the complex system of digital pathology (DP) workflow and artificial intelligence (AI) application while identifying the complex human factors challenges within the DP and AI integration process.

## KEYWORDS

Socio-technical systems, digital pathology, artificial intelligence

### Introduction

In the last decade, rapid advancements with AI in pathology suggest an imminent transformation. Concurrently, Health Trusts in England are establishing networks to expedite digitizing workflows for remote diagnosis and quicker turnaround times. However, this vision still faces complex and multifaceted socio-technical challenges such as the lack of transparency in machine learning algorithms and the affordability of required computational expenses (Tizhoosh et al, 2018). The study aims to understand the working systems of current pathology networks and identify the various complex human factor challenges.

### Study design and data collection

A case study examining a histopathology lab's digitalized workflow was conducted. It consisted of graphic stimulated interviews (Crilly et al, 2006) with 8 stakeholders (5 consultant pathologists, 1 biomedical scientist, 1 project manager, and 1 provider) to explore their perspective of current nontechnical challenges within DP and AI integration. A stakeholder system map was developed and used as a stimulus throughout the interviews to encourage input from participants and ensure their attention remained on a systems level. This map consisted of five sections, each representing a different type of stakeholder, including funding parties, regulatory bodies, providers, and laboratory-related stakeholders surrounding the pathology network. The map shows interactions between different stakeholders, allowing participants to think broader when asked about challenges.

### Data analysis

The hexagonal socio-technical framework (Davis et al, 2014), which consisted of six elements namely goals, people, culture, technology, infrastructure, and process, was selected to categorize the challenges mentioned by participants. These challenges were further integrated into a narrative

according to their interrelationships (extracted from the transcription) to show how they contribute to each other and accumulate.

## Results

Figure 1 shows the main challenge categories. Unrobust technology performance was the most frequently mentioned challenge and could lead to responsibility disputes among IT teams and

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developers, which could disrupt workflows and increase delays in reporting. Maintaining service delivery introduced parallel manual workflows which could give laboratory staff more workload, causing them to lose interest in the implementation, and eventually increase resistance to change within the entire system. Challenges like out-of-date digital systems and extra validation work can also reduce enthusiasm in a similar way.

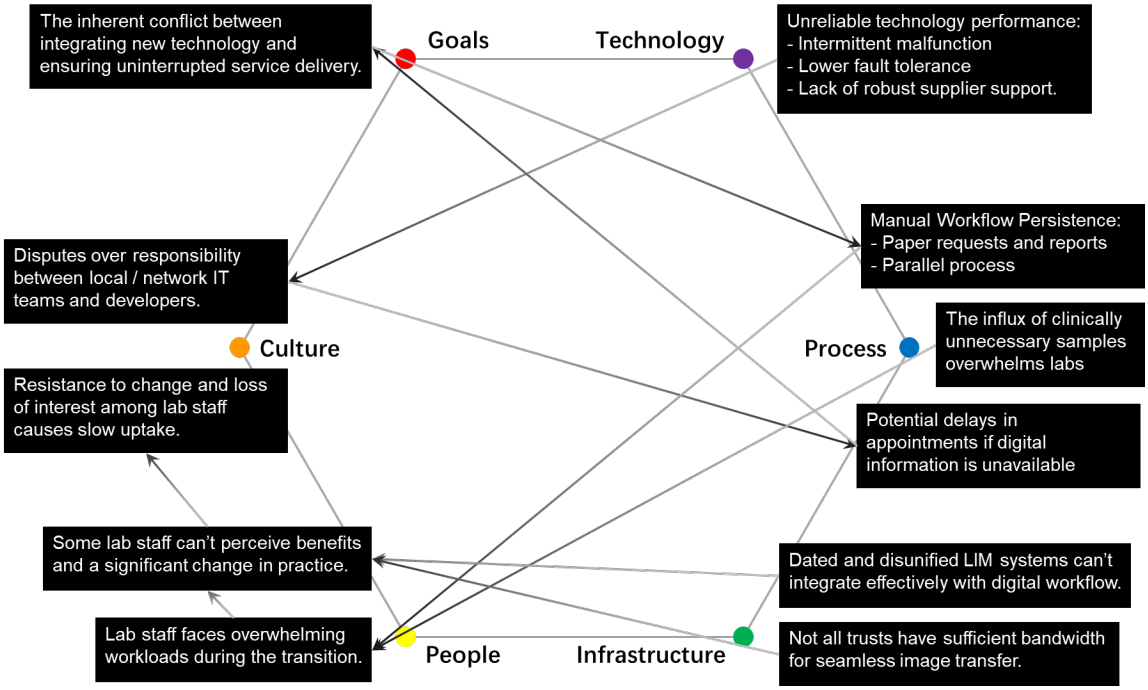


Figure 1: Categorized challenges in the hexagonal socio-technical framework

The findings have shown a major challenge cluster lies in DP and AI integration, which indicates that challenges in the system do not independently exert a negative impact on the integration process. Challenges under multiple categories such as people, culture, technology, processes, infrastructure, goals, etc. will interact, accumulate, and form a complex systems integration gap. A new stakeholder system map was developed based on the interview input, and will be presented at the conference, it also supports the complexity of human factors in the system. Furthermore, to solve the gap in the integration of AI in pathology applications, it is not only necessary to comprehensively consider various socio-technical factors but also requires the collaboration and communication of stakeholders from multiple backgrounds.

## References

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