



## Motivation

Paige is committed to building products that enable efficiencies in the pathology workflow, optimize disease detection and characterization, and increase capacity without compromising on accuracy.

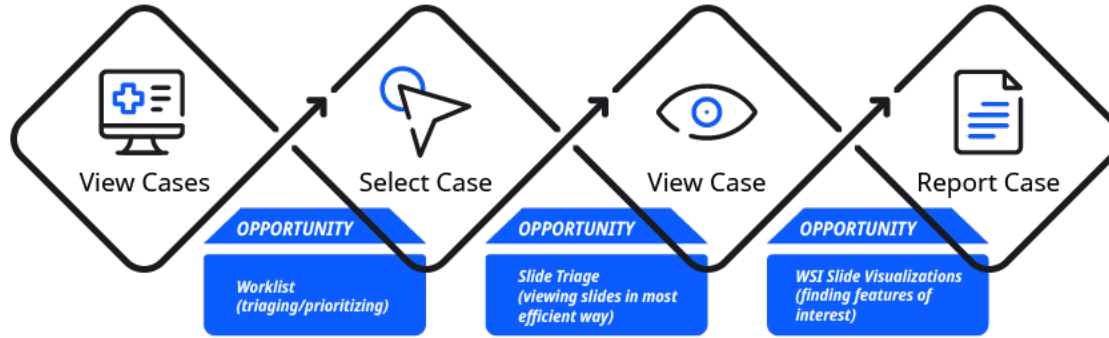
When developing a solution to assist a pathologist in their clinical workflow, Paige seeks to understand current processes, needs and pain points. The product and design teams continuously work with pathologists to gather feedback and insights on solutions and features to ensure maximum benefit to pathologists.

## Background

Paige constructed and deployed a survey to 44 pathologists across the United States, United Kingdom and European Union to gain an understanding of perceptions when applying digital pathology and artificial intelligence (AI) in their clinical workflow.

The survey results revealed a need for a digital product that allows them to work remotely, be more efficient while also reducing opportunities for error during primary diagnosis. It was also identified that pathologists felt less comfortable making diagnostic calls digitally compared to traditional glass slides.

Pathologists in all regions surveyed had great interest in using AI in their digital workflow. Across all experience levels, there was a general belief that AI is the future of digital pathology and has the most potential to increase efficiency. Moreover, the promise of AI has the opportunity to counterbalance time and costs required to digitize slides and to enhance pathologists' confidence in signing out slides digitally.



## Methods

Three (3) design concepts were generated to assist in addressing the problems identified in the survey:

1. Visualization of features that could be identified by AI on the Whole Slide Image (WSI).
2. Aggregation of AI results at the case and specimen level to provide a holistic view of the case and seamless navigation to salient areas.
3. AI informed digital case management (DCM) designed to drive a user's efficiency in the clinical workflow by providing a preliminary understanding of the cases assigned to assist in the prioritization of cases at both the pre-review and signout stage.

Prototypes for each of the three (3) concepts were designed and a user study to test the concepts was conducted with six (6) breast pathologists across various geographies.

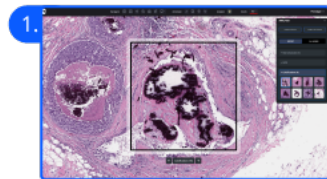
### User Study Objectives:

#### 1. Remote Task-Based Contextual Inquiry

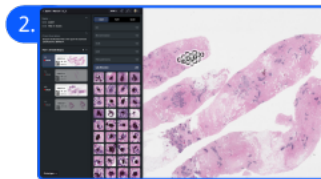
Due to the pandemic, the contextual inquiry was set up remotely and participants were asked to join from their current work environment. Each participant was given two (2) cases to review, a biopsy case and a resection case. All cases were assessed in Paige's FullFocus digital viewer with no AI enabled and participants were asked to create a free text report for each case the same as would be expected in clinical practice. While completing the tasks, participants were encouraged to speak aloud their thoughts while completing their end-to-end workflow.

#### 2. Design Walk-Through and Concept Validation

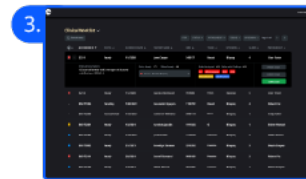
After the participant completed the review of both cases, they were individually presented with prototypes of the new design concepts and asked to provide qualitative feedback. Below were the concepts presented.



A screenshot of Concept 1: visualization of a feature identified by AI in the WSI



A screenshot of Concept 2: AI aggregation at the case and specimen level



A screenshot of Concept 3: AI informed digital case management

## Results

### Concept 1: AI visualizations on the WSI

Reviewing features identified by AI and visualized on the WSI was perceived as useful for scenarios where the pathologist wanted assistance in identifying areas of interest (e.g. small amount of tumor on a mostly benign slide). In cases where there is an obvious or large amount of suspicious areas, participants believed this visualization was less helpful because they could easily identify the tumor.

### Concept 2: AI aggregation at the case and specimen level

Seeing an overview of which slides in both the biopsy and resection cases were identified to harbor cancer by the AI was perceived by pathologists as highly valuable in helping them to navigate to the areas of suspicion on not one, but also all slides of suspicion in the case.

The way in which this aggregated data was presented was suboptimal from an interpretive standpoint.

### Concept 3: AI informed digital case management

This concept was well received by all pathologists. Triaging and prioritizing cases at the pre-signout stage based on AI results was deemed extremely valuable. This would be a novel experience for pathologists that could only be possible with an AI driven digital workflow.

Pathologists pointed out that the data they would like to see pre-signout would be different than the information they would find useful when reviewing the case retrospectively.

## Conclusion

Generally, pathologists found it extremely beneficial to have access to AI results available at various stages of the workflow rather than just on the WSI. This has informed Paige's approach to design its AI based products to help pathologists complete their daily critical tasks with less friction, not just to replicate a pathologist's workflow.

AI as a workflow tool (such as the DCM concept) was very exciting to pathologists and had lots of perceived values and uses.

Limitations of this user study include the use of idealized AI outputs and future research would test the visualizations of both correct and incorrect AI outputs to assess the value of various visualizations for pathologists as well as evaluate the interpretability and safety of certain visualizations.