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Paper Title: Digital Pen and Paper for Capturing Maintenance Data

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Abstract: To satisfy DoD repair process requirements, machinists and NDI technicians repairing FA-18 aircraft complete production-floor inspections with up to 6,000 data entries per aircraft. Due to the sheer mass of data, it takes up to 40 hours to document the inspection findings digitally. The data is collected, manually entered, reviewed, and sent to downstream activities, such as engineering, which can result in costly rework. In addition to the burden of managing manual paperwork, the team workflow and processes rely heavily on manual steps (such as email) to collaborate and communicate results. Sponsored by the National Center for Manufacturing Sciences/Commercial Technologies for Maintenance Activities (CTMA), Adapx Inc worked with the NAVAIR Fleet Readiness Center Southwest to investigate the potential for using digital pen technology to improve DoD maintenance efficiency and to streamline the depot's manual paperwork processes with minimal disruption and training.

In a pilot test, machinists and NDI technicians evaluated the use of digital pen-based data capture software use with ordinary paper forms printed with digital pattern. These repair artisans could still easily write entries on the same inspection forms they have been using for years. But in this case, the digital pen instantly records the handwritten data and uploads it to a forms server through a simple USB connection. With this approach, both the original handwriting and the converted text in the form are instantly accessible for review and correction.

Over the course of a four-month study at FRCSW using digital pen technology, it was observed that machinists and NDI technicians were able to document inspection data 80% faster with fewer transcription errors. Data entry by some of the repair artisans, notably the NDI technicians, is a bottleneck in the critical path of the repair process. By enabling this large speedup in the arrival of NDI data to the rest of the repair process, and by expanding the use of digital pen technology wherever pen and paper data collection is currently being used, it is anticipated by depot staff that a potential maintenance cycle time reduction could be achieved.

In a full deployment, the use of this technology can also help to reengineer the maintenance process by automatically populating the depot's backend data bases and content management / PLM systems, notifying team members of form status. Team members would simply log into the server from any location and access the inspection reports they need, in the format and file types they want. This avoids the need to email team members with completed forms as attachments.

The same digital pen-based technology can be employed wherever a paper-based data collection process is used, cutting across Services (e.g., Army 2404 forms), use cases, etc. It requires minimal training (after all, the technology is essentially a pen) and can use the same forms with which personnel are familiar. The present study has found a high ROI, and shown the potential for process improvements that should result in an increase in readiness through cycle time reduction.