

# Hewlett-Packard Improves Digital Photo Processing with a New Photo Order Sorter System from D&K Engineering

## Intro...

Taking something good and making it even better is the essence of innovative engineering. When HP selected D&K Engineering to broaden the scope of HP's digital photo minilab by adding a new module to store and retrieve prints, that's exactly what happened. Thanks to D&K Engineering, HP now has a multi-user system with new market possibilities. The system is used by retailers behind-the-counter, or as a standalone photo vending kiosk for public use. Consumers can send files remotely, from home office or the corner café, picking up the finished prints at their convenience.



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## A Tightly Knit, Multi-Disciplinary Team Makes All the Difference

D&K Engineering assembled an experienced development team with proven capabilities to architect, design, prototype, test, and transfer the new photo management system to HP's manufacturing partner overseas. The team faced very challenging functional and industrial design (ID) requirements as well as significant space, cost, and schedule constraints.

Step one was an in-depth review of the specification to fully understand the requirements, scope, constraints and relative importance of potential design tradeoffs. The team then undertook an extensive concept development phase, evaluating multiple options. Each new concept challenged the original specification and, in many instances, further refined and improved the quality of that specification. At the end of a concept development effort, a comprehensive matrix decision process was implemented to select the best architectural option in light of the refined product specification.

Once architectural consensus was reached, the engineering team launched into the detailed design phase. This phase included significant ID integration, complex mechanism development, touch-screen user interface development, Windows programming, custom PC board design, embedded system development, design of molded, formed and machined mechanical parts, cable design and routing, and more.

Extensive breadboard testing was also completed during this phase to validate design decisions. Inhouse rapid prototyping techniques (SLS and SLA models) were used to significantly reduce design iteration time and to improve the robustness of the design. The use of rapid prototyping early in the design phase enabled a very efficient and effective designbuild-test-redesign approach for challenging elements of the project.

Computer generated FEA analyses were performed to ensure the structural integrity and rigidity of the entire frame while minimizing weight. Also, computer generated air flow analyses were conducted to optimize the location and ducting of cooling fans.

Industrial design was a critical part of this project, with the challenge of integrating numerous desired features into a specific "look" without increasing manufacturing costs. A team of ID, ME, and EE engineers worked closely together for several weeks, iterating through various arrangements until the client was satisfied.

## About Us...

D&K Engineering is a global contract, R&D, engineering and manufacturing services company focused on developing and manufacturing complex electromechanical products and equipment. With a core set of best practices and industry knowledge that spans the entire product development lifecycle, D&K Engineering mobilizes the right people, processes, tools and infrastructure to create and deliver sustainable business value to organizations seeking to outsource the design, development and/or manufacturing of their equipment or products.

D&K Engineering enables organizations to decrease time-to-market, reduce cost and improve product quality.

*Simply put, D&K Engineering bridges the gap between concept and reality.*



A detailed design review was conducted and was accepted by the crossdisciplinary team put together by HP to review, critique, and provide feedback. Next, five prototypes were built: three for testing, one for demonstration, and one sent to the manufacturing partner overseas. All parts were procured by D&K Engineering and assembled at D&K Engineering's facility.

Software was written to enable comprehensive testing of the system. Off-the-shelf components were used wherever practical to minimize prototype costs.

D&K Engineering developed a comprehensive test plan using six-sigma techniques to ensure system reliability. Results were captured and a detailed report was produced listing potential improvements before manufacturing release by HP's manufacturing partner.

## Superior Results Delivered in Record Time and Under Budget

The final project was delivered on schedule and significantly under budget. The success of the project was attributed to skilled engineers, a detailed development process, an experienced product development team, and rigorous management of the competing and conflicting design, schedule, and cost constraints.

When the D&K Engineering team held a functional demonstration of the product, HP was delighted to discover their new photo order sorter system was much more advanced than anticipated. HP received a fully detailed design package, including 3D CAD, 2D drawings, electrical schematics, and software. When the entire package was handed off to HP's manufacturing partner, HP's manufacturing partner commented that "this was one of the most comprehensive design packages we've seen."

*"I wanted to provide you feedback on HP's experience working with D&K Engineering on the recently completed Order Sorter project. Throughout the project, from the start of the RFQ process and throughout the project to the final deliverables, D&K worked in a thorough, careful, no-BS, style that greatly facilitated easy communication. D&K accurately and carefully describes what they are going to do, and then delivers everything they promise and more. D&K staffed the project with talented, experienced and easy-to-work-with engineers, with a discipline mix appropriate to the overall project and each phase of the project.*

*The project began with D&K gaining a thorough understanding of our customer's requirements. Then D&K's skilled architects worked closely with us to invent, innovate, and select the optimum architecture for our product. D&K's multidiscipline team worked closely and collaboratively with us and with our outside ID firm to develop, design and prototype a fully functional product meeting all our specifications. This first development phase product was so well designed and met all customer requirements so well that we are now able to shortcut the usual final development phase and bring the product to market faster than planned and faster than the typical product.*

*Throughout the project, D&K's project management process made sure that all deliverables were on schedule, as promised, and more importantly, management was open, honest and created a real partnership with us, to get the best product to market as fast as possible. And always, both the D&K technical and management team were enthusiastic, motivated, highly productive, and enjoyable to work with like true partners."*

**Thanks for the great project,  
Tim Carlin  
HP R&D Project Manager  
Imaging & Printing Systems**