

Syncromatics

Customer Success Story

Autodesk® Inventor®

Autodesk Inventor has changed the way we think of our design process. It enabled us to gather considerable momentum in picking up new clients across the country and to expand our service with existing transit agencies and numerous campuses from California to Florida.

—Stephen Salazar
Chief Operating Officer
Syncromatics

Spiraling into control.

Syncromatics uses Autodesk® Inventor® software and Digital Prototyping to provide smart transit information.



Project Summary

Today commuters know when the next bus will arrive and how many passengers are riding, thanks to the real-time tracking and intelligent transportation systems of Syncromatics. Since running power lines to bus shelters is not always an option for cities, the California-based company's solar-powered signs represent an efficient new way to bring smart transit information directly to the rider at the bus or shuttle stop.

Syncromatics needed to design its signs to meet the requirements of transit agencies across the country and to operate in a wide variety of climates, from Southern California to extremely cold winters in Pennsylvania and seasonal hurricanes in Florida. The company used Autodesk® Inventor® software to understand how its products would operate in these real-world environments—for example, how much load they would bear and how much variance in movement they could withstand—before they were deployed in the field. With Inventor software and Digital Prototyping, Syncromatics has been able to:

- Gain momentum in picking up new clients countrywide
- Validate design concepts before physical prototyping
- Reduce modification time from days to hours

The Challenge

Since the signs are composed of mechanical, electronic, and software components—each requiring a different design process—Syncromatics needed to coordinate the development in a timely manner. Adding to the challenge: the company's product is customized for different customers, with revisions and modifications often made late in the design process, so another goal was to help these changes to be made easily and rapidly.

The Solution

Syncromatics used a design process of three separate but interdependent spirals that commit the development of the mechanical, electronics and software components to a sequenced fashion so that the hardware and electronic circuitry are robust enough to allow agile development of the software. The success of the methodology is determined by the speed in which each generation of digital and physical prototypes moves the system closer to production and allows for quick and easy changes.

“With the spiral methodology and Autodesk Inventor software, we were able to go straight from Digital Prototyping to production, without the time and expense of having to create and refine several physical prototypes. We were able to model a full assembly, see how it was going to perform, and catch any errors before anything was built. That saved us a lot of time and money, and helped us earn customer respect.”

Autodesk®

Proof of Function: Syncromatics' goal for the first design spiral was to validate the operating characteristics of the shelter sign. Proof-of-function prototypes were developed to show they met the customers' requirements and engineering specifications. For the mechanical system, a preliminary CAD model was created using Autodesk Inventor software. This enabled changes to be made within hours, whereas changes using physical prototypes took days.¹

Functional prototypes for the electronics were made on breadboards or mocked up with off-the-shelf components, including cellular antennas and displays. Using breadboards, changes were made in minutes, helping the concept development modifications were easy to explore.¹

Finally, the software was coded into a desktop computer so that its function could be simulated and that changes could be made with the click of a mouse.¹

Proof of Product: On the second design spiral, Syncromatics developed proof-of-product prototypes to help refine the components and assemblies for the mechanical and electronic components. Geometry, materials, and manufacturing process were as important as function for these prototypes.¹

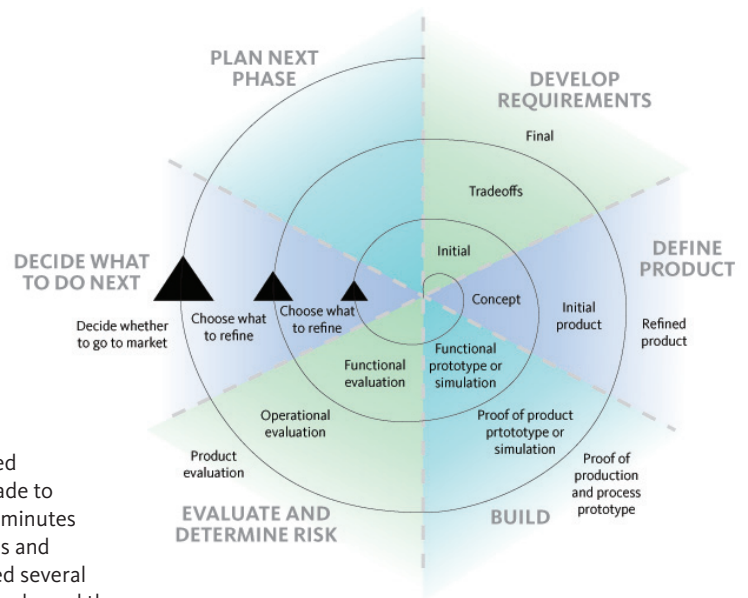
For the mechanical system, a physical prototype was hand-built to match the CAD model. Once it was built and verified, the design was finalized. The first prototype ended up being the design that went into production, and the solid modeling using Inventor fulfilled both the functional and product prototype needs.¹

Electronic PC boards were then created, replacing the breadboard-wiring with etched circuits. Changes could be made to these boards within hours or minutes by cutting leads on the boards and soldering the wires. It required several days to complete the new boards, and the proof-of-product prototypes were installed and tested at customer locations to validate how they worked in real operating conditions. At this stage, much was learned about weather-proofing, glare off the displays, and the ability to understand the annunciation systems.¹

Proof of Process: During the last design spiral, proof-of-process prototypes were used to verify the function, geometry, and manufacturing process. Since the first prototype used the same manufacturing methods as the final product, this spiral was not needed for the mechanical system. However, the next generation of signs will use more tooling-intensive methods such as castings and extrusions, which will result in the need for this loop in the future. As in the earlier loop, changes to the PC boards took days, and changes to the code took minutes.¹

The Result

Using Autodesk Inventor software and a spiral design process, Syncromatics was able to identify and resolve the biggest risks early in the development cycle. Each spiral in the process



Spiral process as shown in Chapter 5 of The Mechanical Design Process, 4th edition, McGraw Hill, by David G. Ullman

included a reassessment of risks and assumptions, an evaluation of lessons learned, and a decision to proceed to the next phase.

The bottom line, according to Salazar, is that Syncromatics was able to move quickly and nimbly as an organization, with less development time and faster time to market. "Autodesk Inventor has changed the way we think of our design process," he says. "It enabled us to gather considerable momentum in picking up new clients across the country and to expand our service with existing transit agencies and numerous campuses from California to Florida."

For More Information

To learn more about Autodesk Inventor software and Digital Prototyping, visit www.autodesk.com/inventor.



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¹David G. Ullman, A Spiral Product Development at Syncromatics: A Case Study for the Mechanical Design Process, 2009. Read the full story at www.mhhe.com/ullman4e. David G. Ullman does not endorse or support the use of any specific engineering support system, technology or methodology. Images courtesy of Syncromatics.