



## *Andrews-Cooper White Paper Custom vs. Commercial Off-the-Shelf (COTS)*

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Andrews-Cooper helps customers increase yields, lower costs, improve quality, and enhance safety by developing custom automation systems. Dozens of Andrews-Cooper customers from a variety of industries including medical, consumer electronics, and semi-conductor have realized the benefits of automating manufacturing and test processes: part handling, pick and place, fluid dispensing, welding, part inspection and measurement, laser marking, packaging, and many other complex physical operations. A typical automation system integrates a variety of components and subsystems including PLC's, robots, linear actuators, vision systems, pneumatics, sensors, framing, and safety guards.

Development of an automation system requires make or buy decisions for each subsystem and component. Specifying the right components is a critical step in the development process and a decision we face with nearly every component we specify is "*do we develop a custom solution or purchase a commercial off-the-shelf (COTS) product?*" The decision we make effects cost, schedule, performance, reliability, maintainability, leveragability, and project risk.

Some automation systems are one of a kind, and the majority might have less than one or two dozen installations. These low volumes are an important factor in the make or buy decisions.

With a custom solution, you get exactly what you need and/or want and don't pay for unnecessary functionality. With a low complexity component, like a shaft or locating pin, the cost to develop a custom solution is small relative to the cost of the entire system and worth it for the perfect fit. This is also true of relatively simple subsystems like a pneumatic pick and place.

However, with higher complexity components and subsystems, like a pressure vessel or multi-axis motion systems, the non-recurring engineering investment to develop a custom solution can be significant and when amortized over a small quantity of automation systems can quickly exceed the cost of a COTS solution. When quantities are high, a custom solution has a much better chance of being lower cost than a COTS solution.

Cost and schedule risk must be considered in the make or buy decision. The cost and schedule to develop a custom solution must be **estimated** before it is developed and therefore carry a level of risk, whereas the cost and lead time of a COTS solution are known upfront. These risks are lower with simple, low complexity components and subsystems or when leveraging experience from the development of similar custom solutions.

COTS solutions are not without risks. Some COTS solutions come with a steep learning curve and require expertise to integrate effectively. Utilizing a technology for the first time may require special training, prototyping, or extra time for development and testing. Andrews-Cooper has expertise integrating a number of complex, highly capable COTS solutions: 6-axis robots, vision systems, PLC’s, pneumatics..., however this expertise has been built over many years through specialized training courses and completing dozens of projects.

COTS solutions can be more reliable than custom. When you purchase COTS, you are leveraging a significant investment in R&D and testing the manufacturer has made. It is difficult to attain the same level of reliability from a custom solution at a comparable cost and schedule, especially for complex components and subsystems.

The detailed documentation and intimate understanding that comes with a custom solution can be advantageous for maintaining an automated system. Stocking spare parts, troubleshooting performance issues, and making repairs can be done faster and at a lower cost than with a COTS solution. In some situations, leveraging the warranty and support that comes with a COTS solution is a better fit.

Custom solutions are typically designed and optimized for a specific need with little investment made towards building-in flexibility or leveragability for future needs. It is not uncommon for a COTS solution to have capabilities that are not needed now but add flexibility to the system they are integrated into or become leveragable for repurposing in a different system.

The key factors to be considered when deciding between custom and COTS are summarized in the table below.

<b>Factor</b>	<b>Custom</b>	<b>COTS</b>
Functionality	Exactly what is needed for application	Might include unnecessary functions
Development and Unit Costs	Low unit cost, but higher NRE	Higher unit costs, but little or no NRE
Cost and Schedule Risks	Estimated , higher risk	Known in advance, low risk
Reliability	Can be lower for complex components	Can be higher
Learning Curve	Low	Can be high
Repair and Serviceability	Low cost	Higher cost unless warranted
Flexibility for future needs	Less, optimized for specific need	Might include growth features

A recent Andrews-Cooper automation project required a large, single-axis motion system for a heavy payload. A semi-custom, single-axis solution seemed like the obvious choice and was what the customer was looking for. An investigation into COTS solutions showed that a large, 6-axis Fanuc robot had the reach and payload capacity that would work for this application. A cost comparison of the two solutions showed that implementing the Fanuc robot was marginally higher than the estimated cost for the single-axis solution. However, when taking into account the low cost risk and schedule risk, high reliability, and outstanding Fanuc warranty and support, the Fanuc robot was selected. Additionally, the 6-axis robot would enable production of a future product with simple programming changes only.



On another Andrews-Cooper project, the customer needed an automated test fixture capable of pressing buttons on their medical device and verifying correct audio and visual responses: beeps, voice commands, LED's, and text on the display. The fixture contained over a dozen electric actuators and sensors all wired back to the fixture controller. Between R&D and manufacturing, there was a need for over 50 fixtures. For lower volumes, a COTS I/O block would have been the most cost-effective solution. However, for 50 fixtures, a custom PCA was lower cost and allowed us to optimize the shape of the PCA as well as the location and type of connectors. Since Andrews-Cooper has a team of talented electrical engineers, this was a low risk, easy to implement solution.

## White Paper – Custom vs. COTS

Companies are realizing the benefits of automation every day. Developing an automation solution that is the right fit and maximizes the potential is always the goal. The choice between custom and COTS is critical and must be given careful consideration. Several factors can provide a compelling reason for one approach over another. Experience and expertise can help you make the right decision.

Leverage the experience and expertise of Andrews-Cooper to maximize the potential of your next automation project.