Reduce Cost, Drive Innovation and Shorten Time to Market with Commercial Hardware Platforms

This research brief establishes the quantitative and qualitative benefits produced by the strategic sourcing of commercial integrated computer system from Tier 1 technology solution providers based on a global research study.

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EXECUTIVE SUMMARY

Organizations developing intelligent solutions now must navigate product requirements that are fundamentally intertwined with both customer satisfaction and revenue generation. New workload demands ranging from remote monitoring to AI to virtualization are now upending the product system lifecycle, from design through production and service. The traditional technical decision making common in the industry, however, ignores the need to address increasingly connected system deployments that directly impact business outcomes.

Platform-level hardware integration:

- Drives 20% reduction in development costs
- Shortens time to market, resulting in increased product lifecycle revenue
- Doubles time available to spend creating differentiated IP (Analytics, AI, Cloud, etc.)

Our research shows that today's product development organizations must now not only select technologies that facilitate this transition, but they must also identify partners to help them optimize their solutions, increase organizational agility, and refine their ability to focus on differentiating layers of the solution stack. By strategically outsourcing more of the integrated compute and related development, test, and management with tier one partners, product development organizations can bring differentiated solutions to market faster and at lower cost. This paper examines these trends and the benefits achieved through the strategic realignment of product and design strategies. In particular, it highlights the tangible benefits and cost savings available to organizations that leverage commercial hardware systems instead of relying on traditional in-house, component-based engineering. Key findings from our research include:

- **Leveraging platform-level hardware drives ROI**
  - **Lower development cost** – Companies leveraging commercial hardware platforms cut their total development cost by 20% as compared to those sourcing only component-level technology.
  - **Reduce time to market** – Commercial hardware platform users are more likely to complete their projects ahead of schedule than are those that rely on component-level technology from third parties, translating to earlier revenue returns and expanded product profitability.
  - **Promote focus on innovation** – Organizations sourcing complete commercial hardware platforms are able to devote more of their time developing differentiating IP, such as that focused on analytics and AI, instead of wasting it on lower-value tasks.
- **Solution partner choice amplifies impact**
  - Address expertise gaps – Leveraging third-party services increases the likelihood of beating schedules by 3X.
  - Improve scale & service – Tier one technology providers can help manage supply chains, provide global serviceability, and offer broader ecosystems of supporting technology and partners.

BACKGROUND ON VDC RESEARCH

VDC has been covering the product development technology market since 1994. The analysis and supporting discussions in this paper are based on VDC's ongoing research in this market and by findings from a survey of 600 product decision-makers and engineers. This global survey offers insight into leading business and technical trends impacting product development organizations as well as the best practices implemented to address them. The respondents are based across a range of industries including automotive, aerospace and defense, healthcare, industrial automation, and transportation, among others.

AT THE EDGE OF TRANSFORMATION

Product development organizations (PDOs) within OEMs, ODMs, and systems integrators are facing unprecedented challenges and disruption to their solution development, strategy, and roadmaps. New customer edge functionality goals are reshaping their business models and service delivery architectures for increasingly connected product lifecycles. The need to drive real-time insights and more complicated compute has upended the collection of technology in which PDOs must place value and invest their resources. New workloads revolving around edge analytics and artificial intelligence (AI) place new priorities on hardware and software strategy for a new generation of connected systems. The growing capabilities of edge computing solutions from leading commercial technology platform providers[1] have emerged as an additional accelerant, changing possible system deployment architectures and augmenting a need to speed time to market and improve return on investment on the foundational products used for within today's systems of systems.

Adoption of fully configured platforms is growing as PDOs address new market demands

Intelligent Development with Commercial Platforms

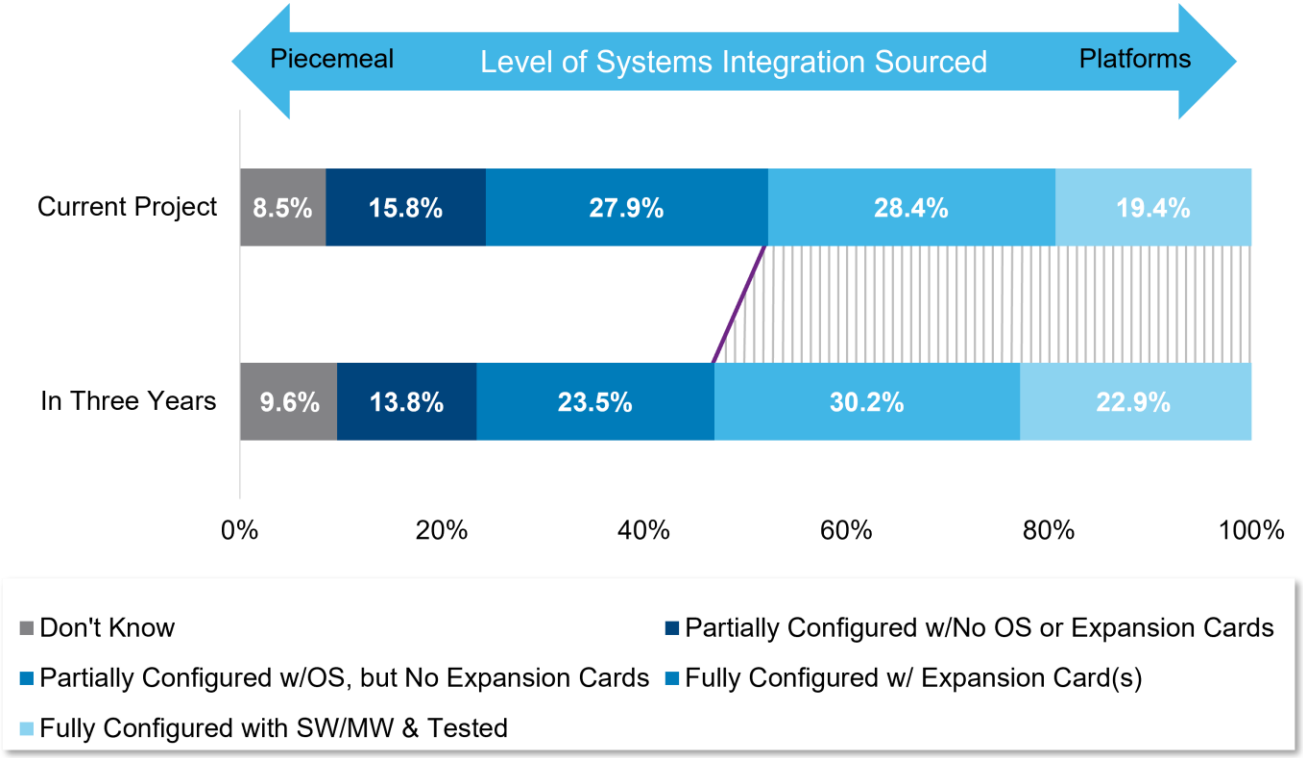
For decades, product optimization goals pushed PDOs to use a range of heterogeneous, component-level hardware and software for their designs. This myopic view and DIY approach to product development limited supplier choice, design reuse, and the supporting ecosystem that engineering organizations could access to speed development. PDOs historically focused on sourcing relatively barebones hardware components from commercial partners with their differentiation often driven by in-house mechanical and electrical engineering. However, the marriage of hardware, software, cloud, and data-dependent design elements is solidified, requiring the use of well-supported development platforms.

Complex workloads and evolving system functionality are now accelerating demand for standards-based, integrated computing platforms. The value of leveraging third-party development solution partners and sourcing higher-levels of integrated hardware to focus on areas of true differentiation continues to rise. To that end, more PDOs are recognizing the capabilities now available from top commercial platform providers to help them achieve these goals. Offerings from these tier one technology suppliers such as customization, program management, global delivery, joint engineering support, and planning for new designs (e.g., access to solution architects) are more important than ever. Downstream, improving these areas can help OEMs and others better compete, meet evolving customer demands, and tap into opportunities for additional revenue streams, such as usage-based fees or data brokerage.

[1] Commercial Technology Platform Providers: Third-party organizations offering open and end-to-end hardware, software, and cloud/IoT support and services (e.g., customization, configuration, testing, certification, post-deployment support) to product development organizations creating intelligent industry solutions.

Commercial integrated computing system platforms save PDOs time and money while letting them focus on their target applications, core competencies, and customers. Data from our research shows that a growing percentage of respondents plan to use systems offering higher levels of integrated functionality, with the percentage using fully integrated systems continuing to increase over the next three years (see Exhibit 1). The pressure to innovate and adapt to today's business climate further shifts this cost benefit analysis.

Exhibit 1: Primary Embedded Computing System or Subsystem Configuration



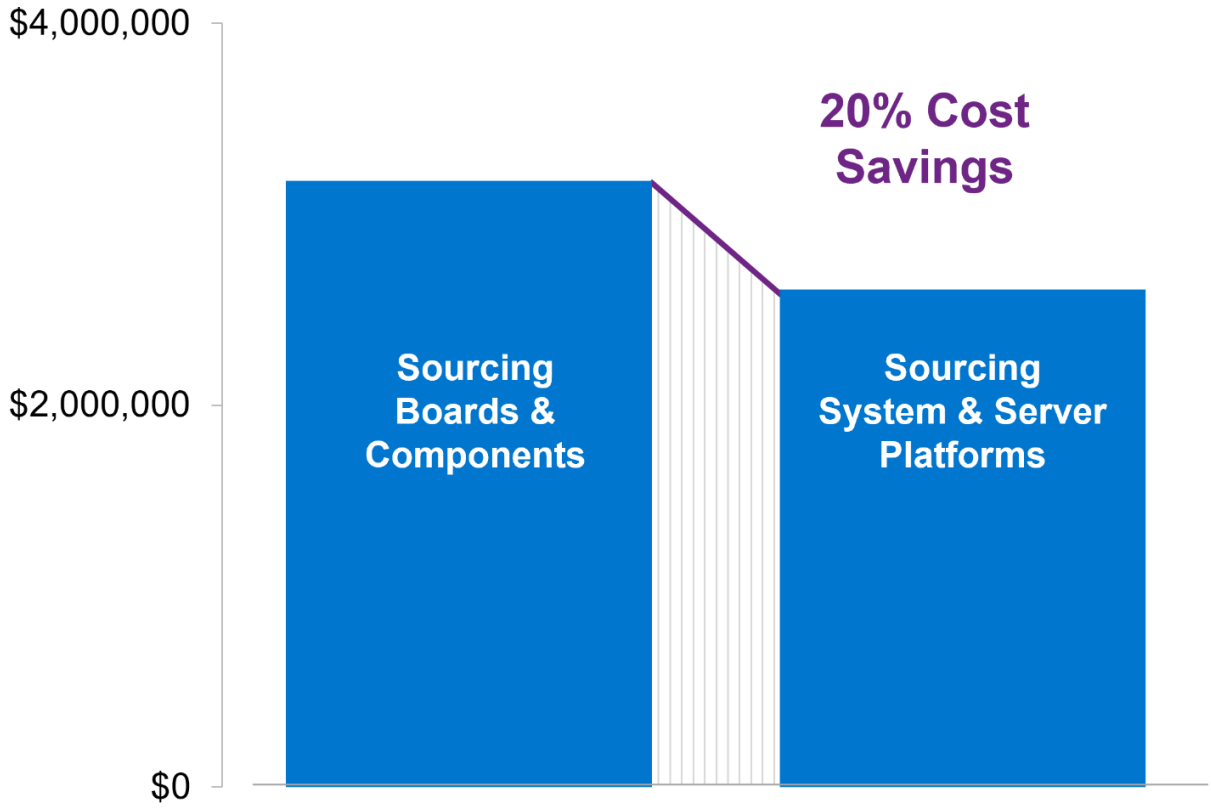
LOWER PROJECT COST WITH INTEGRATED PLATFORM HARDWARE

Not only do complete, commercial platforms help product development organizations address today's trends and business pressures, but their use also helps reduce the cost of development. Some PDOs initially hesitate when purchasing complete, integrated systems, resisting perceived cost premiums and potential losses of control and/or differentiation. PDOs can both save internal development time when using complete platforms as well as reduce per-unit bill of material costs considerably versus those resulting from the use of proprietary solutions.

Choosing complete compute platforms can save 20% on project costs

In fact, according to our survey of PDO leaders, the average total development cost for projects sourcing component-level technology was 20% greater than that of those projects relying on complete platforms [See Exhibit 2]. Beyond potential cost savings, the sourcing of increasingly integrated hardware is changing the creation of value for industry solutions. As leading platform providers invest in their own R&D and customization capabilities that make their systems offerings more valuable, solution builders can simply invest in more of their own innovation and IP.

Exhibit 2: Estimated Total Cost of Development for Current Project, Segmented by Hardware Sourcing



A leading player in **Industrial Automation** saw a 50% increase in profitability by shifting to commercial technology solutions

Organizations participating in the manufacturing automation space produce complex machines for which precision and performance issues can cause great impact to their customers' end productivity as well as their own profitability via maintenance service level agreements. One company interviewed for this project from that industry had traditionally relied on component-level technology to design its products. However, despite the experience of the engineering team, their bespoke hardware choices repeatedly led to unforeseen software development problems. Ultimately, this OEM decided to experiment with a solution from a tier 1 commercial solution supplier for their next generation design.

The use of a tier 1 commercial solution helped improve profitability by **over 50%**

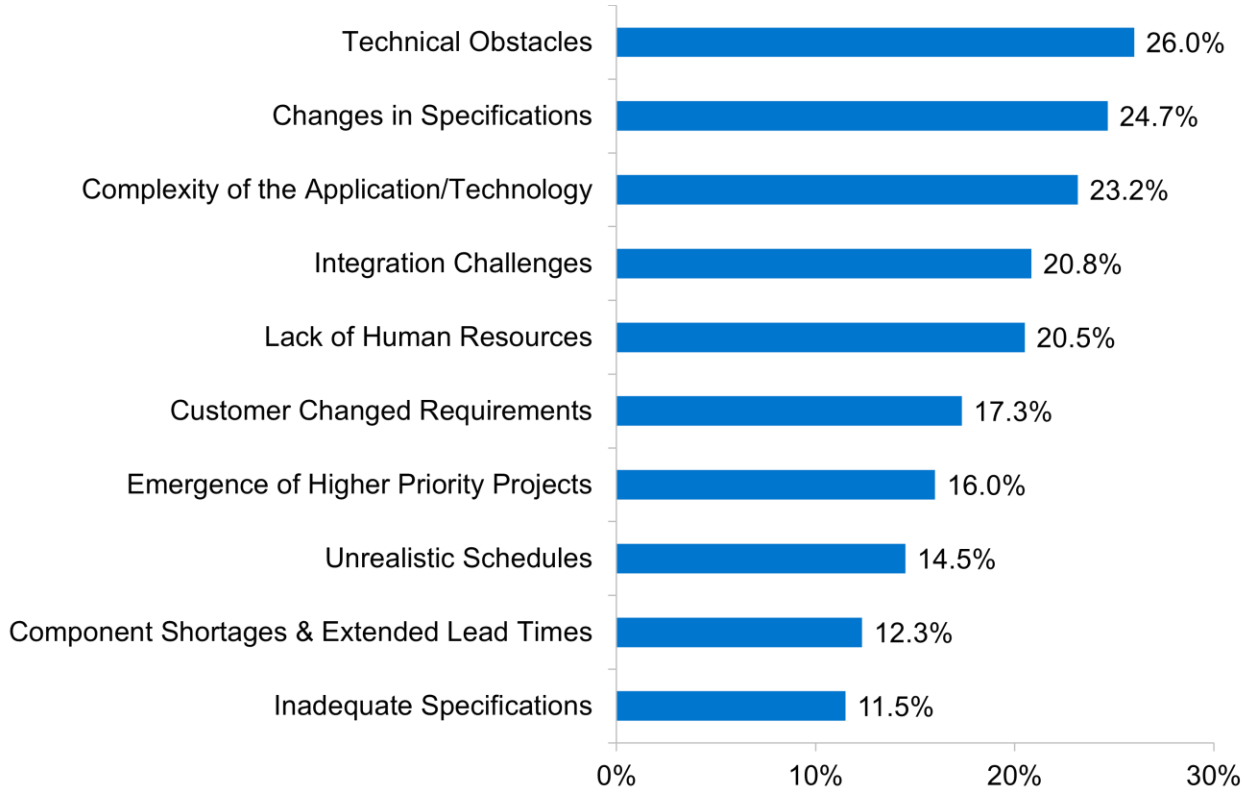
After some initial hesitation related to a minimal increase in the hardware bill of material costs for the system versus their prior component selection, they saved a tremendous amount of time and labor cost in software development. For one, the tier 1 supplier provided access to a vast array of software libraries and a third-party ecosystem that eliminated work they otherwise would have done internally. Secondarily, the company recognized that because they were working with a tier 1 organization that had such a broad customer base, the solutions they leveraged were themselves much more likely to be robust. This reduced not only re-engineering work during development, but also the issues and patches they would normally make post deployment. Ultimately, the product development organization, recognizing that their solutions are priced to the value their customers receive, kept pricing consistent and dramatically improved profitability – by over 50%. Looking forward, the company is planning to integrate additional adaptive AI functionality into its solution to visually inspect the work conducted by its systems. The company believes that the difficulty associated with developing for this next layer of functionality will further amplify the return associated with its selection of commercial-grade solution stacks.

COMBAT PROJECT DELAYS WITH BETTER TECHNOLOGY CHOICE

Even in good times, schedule adherence is a significant challenge to product development organizations. Nearly a third of all projects are late reaching market. Schedule adherence is even more challenging in today's competitive environment with the development of increasingly complex and interconnected systems.

When investigating reasons for delay within the results of our global research survey, the value complete commercial technology platforms provide is apparent [See Exhibit 3]. The technical obstacles, system complexity, and integration challenges that often set organizations back can be directly addressed through the selection of certified, pre-integrated third-party solutions. This value proposition further aligns with the second-leading cause of delay to projects: when engineering teams attempt to manage changes in specifications. The human resource challenges many organizations face only make these issues and time-to-market challenges more acute. With both engineering head count and newly valued skill sets in short supply, there is even greater need for third-party solutions that can ease internal burdens and accelerate development. The standard technology building blocks available through commercial hardware platforms makes such change easier, both for current projects as well as for future product generations.

Exhibit 3: Attributions of Delays for Current Projects

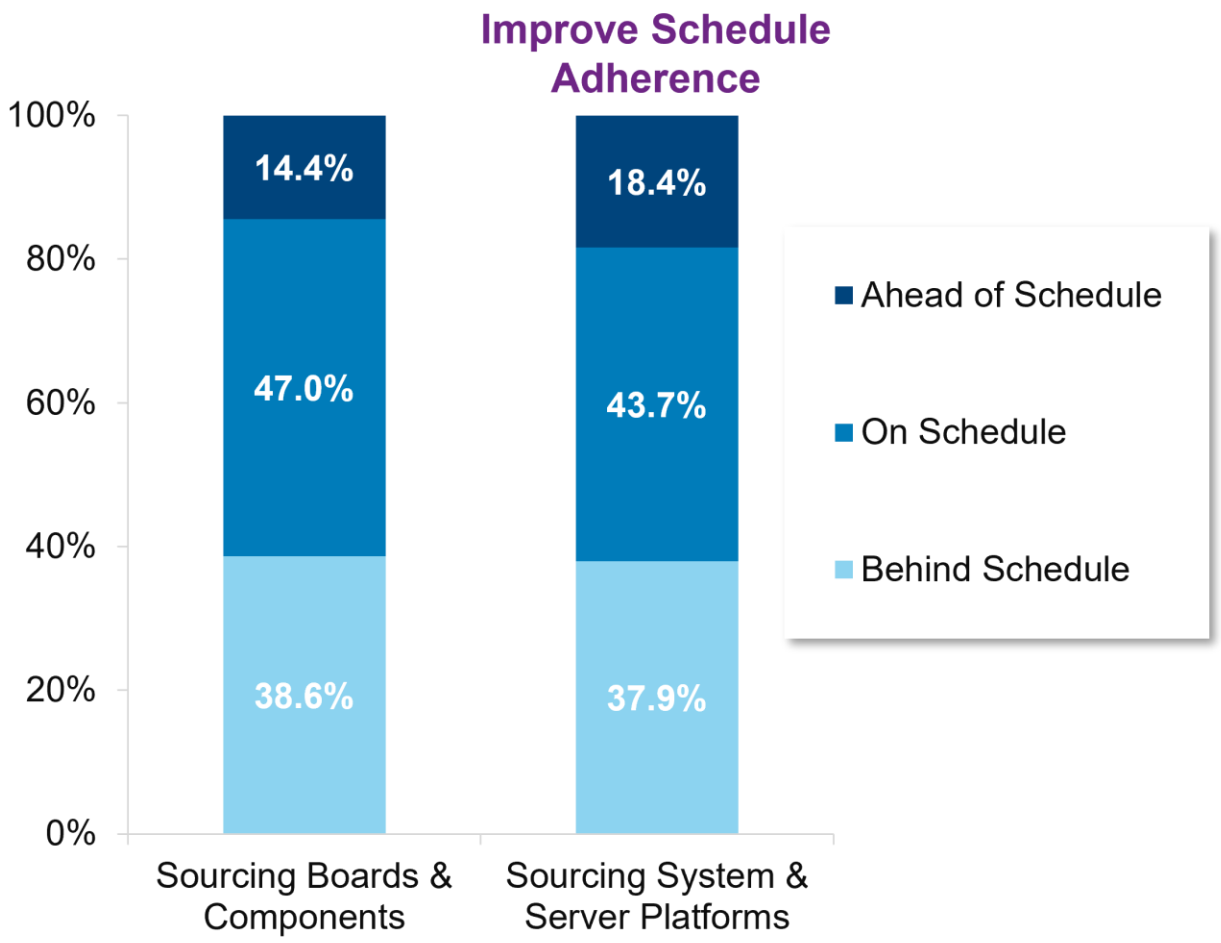


Note: Percentages sum to greater than 100% due to multiple permitted responses. Top 10 responses shown.

Technology choice can make a massive difference to project performance. In those cases when commercial platform solutions align with needs, they can greatly accelerate time to market. Beyond direct labor savings related to development and integrations, they also can remove the uncertainty and issues that schedule setters have been conditioned to consider. In fact, respondents citing complete system platform use were more likely to complete their projects ahead of schedule than were those that only relied on component-level technology [See Exhibit 4]. With our research showing that the average product development project is 16.4 months long and costs $6.9M, a reduction of one month in schedule translates to a savings of $420K. Furthermore, by accelerating schedules and time to market, organizations can drive additional revenue growth, outcompeting laggard competitors. With more end-customers opting for usage-based leasing and service agreements, accelerated deployments can have an even more profound impact on revenue recognition.

Selection of complete commercial platforms increases the chances of completing a project ahead of schedule, resulting in developmental cost savings and increased product lifecycle revenue

Exhibit 4: Current Project's Schedule Adherence, Segmented by Hardware Type



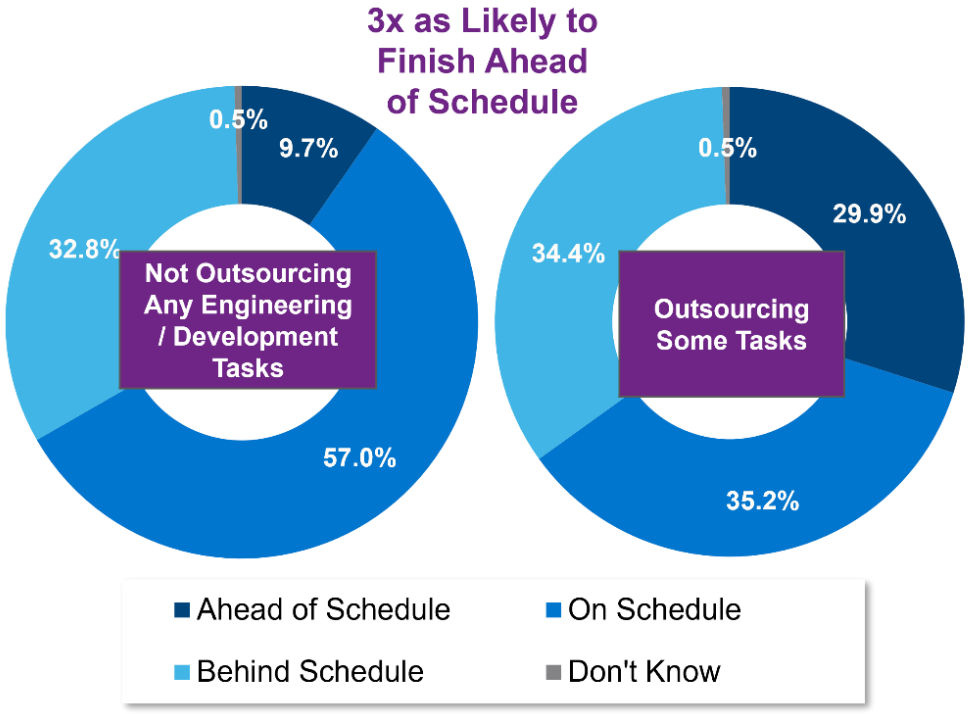
ACCELERATE TIME TO MARKET WITH TIER 1 PARTNERS

End-product differentiation often requires extensive optimization – at each step of the development and production process. This requirement is not just limited to the design and engineering lifecycle, but also as a mechanism for long-term support, availability, and serviceability. Managing globally complex supply chains and customer bases can tax any organization. Navigating those business needs during a time of acute business pressures – while also attempting to address the rapidly evolving set of new product development requirements – can create an environment that impedes innovation time-to-market and customer satisfaction.

Outsourcing design, development, or test work increases the likelihood of beating development schedules three-fold

Third-party commercial solution partners help PDOs accelerate time to market and save on project cost. As the data from our global research project (presented below) highlights, organizations outsourcing at least some engineering/development tasks were three times as likely to finish their project ahead of schedule. While pre-integrated and optimized compute platforms can provide substantial value alone, there is significant benefit and organizational agility that can be gained through the utilization of third-party services during the product development process. Not only can organizations address resource bottlenecks, but they can also better align internal resources with more strategic layers of the solution stack. Furthermore, given the current state of embedded and edge solution development, PDOs are best positioned when leveraging technology platforms and services from tier one organizations. That way, they gain access to standard technology building blocks, platforms pre-certified for and/or tailored to their target environment, as well as partners that can address expertise (design, supply, support) and labor gaps.

Exhibit 5: Current Project's Schedule Adherence, Segmented by Use of Outsourcing

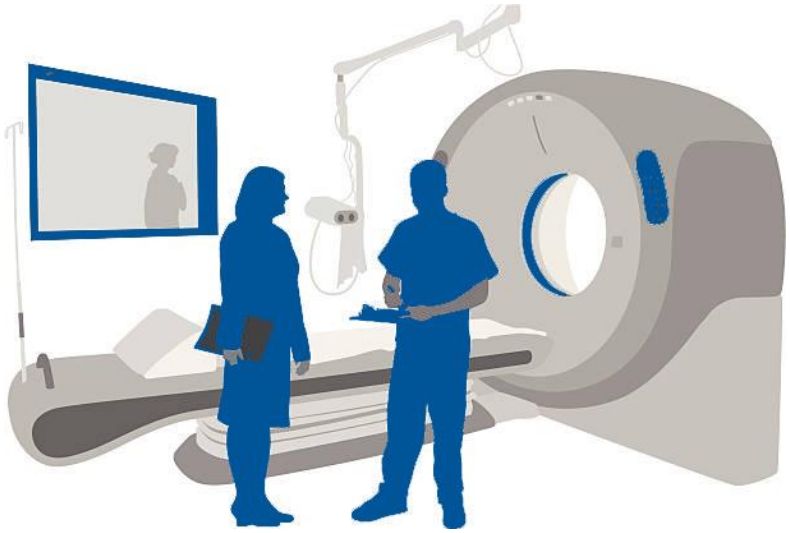


A large **Medical** device OEM gains 20% reduction in project schedule by using commercially integrated systems

In the medical field, enabling connected healthcare solutions is a challenging yet valuable opportunity for OEMs. To enable new device-to-cloud solution architectures, commercial integrated systems are instrumental to using new technology such as virtualization or containers as well as third-party software, storage, tools, and cloud services.

Commercial integrated system use saved **more than 20%** in project time

The development of end-to-end connected healthcare solutions requires more intelligent design through platforms with access to more resources and building blocks for innovation. One large medical device OEM cited greater than 20% in project time reduction when leveraging commercial integrated systems for the development of its patient monitoring system. The heart of their system refresh rested on the need to create a new, secure way to manage firmware updates for their system, which can often be deployed in environments where the connectivity options are unreliable at best. Identifying a need to implement new software technologies to partition and securely manage the updates, the company ultimately reevaluated their entire solution stack. They quickly recognized the potential to shorten hardware development time by adopting standard commercial systems. Prior decisions to base their development on an enterprise-class Linux offering further guided their hardware selection to the potential benefits and ecosystem offered by an Intel-based integrated system. Not only did the aforementioned reductions in development time produce hard cost savings, but it also fostered increased business agility with lower time-to-update systems and a commercial support ecosystem that could facilitate future product generation evolution.

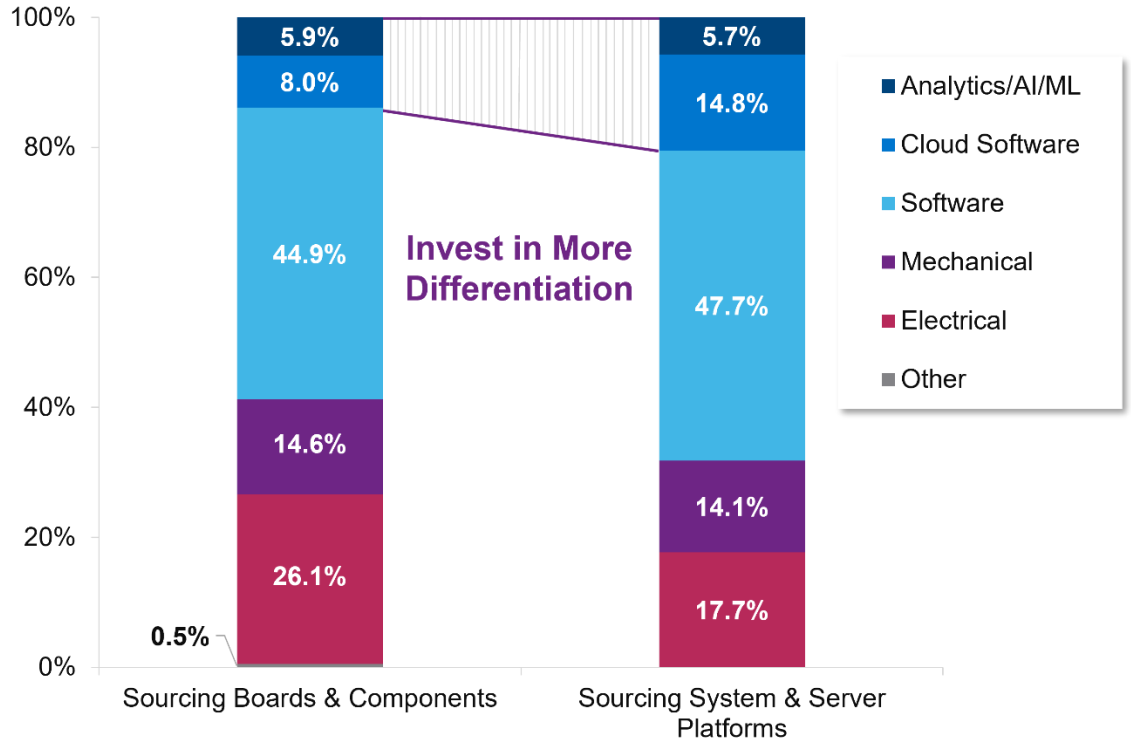


Design Evolution Demands New Investments in Technology and People

Product development organizations are struggling to expand their capacity and differentiation in a time when schedule and cost overruns are a persistent problem. A more complete and new partnership model is needed for OEMs and other PDOs to keep pace with market dynamics and the evolving requirements of end users. This dynamic is accelerating adoption of commercial integrated computer system platforms. More PDOs are now migrating from in-house development with component-level hardware to supported, commercial system-level offerings. In addition to demonstrating schedule benefits, the use of complete system platforms allows organizations to focus their internal resources on the areas of functionality that they deem critical to future product development. In fact, decision makers within our global survey show that organizations sourcing complete integrated systems are able to devote over 20% of their development costs to differentiating areas like analytics and AI and cloud software/services – nearly twice the rate reported by companies spending time integrating component-level technology [See Exhibit 6].

Users of complete hardware platforms can nearly double the amount of time spent on differentiating features, like AI

Exhibit 6: Estimated Percent of Development Costs Spent on Specific Tasks, Segmented by Hardware Sourcing



A leading **Transportation** control system manufacturer leveraged commercial platforms to focus on core areas of product differentiation

Commercial product development solutions can present even greater value for safety-critical computing systems. One leading control system manufacturer suffered significant time-to-market delays by relying on in-house designs. Their system ultimately had to be certified to a strict level of safety, SIL 3 as defined by the IEC 61508 standard. After conducting the required mechanical and electrical integration work to build their system, they used both a real-time operating system and Linux, paired with a hypervisor to manage memory utilization between the safety-critical and non-safety-critical application functions

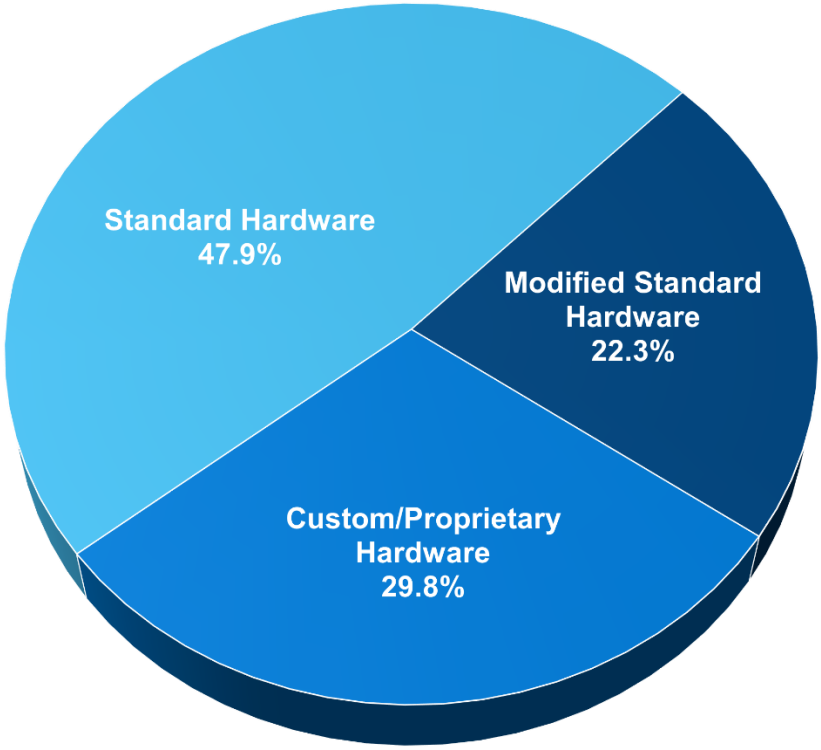
The OEM's technology choices enabled it to function as a software company, focusing on only areas **critical to its differentiation**

The in-house design that they had believed to be both innovative and ironclad caused unforeseen and expensive issues. Upon the completion of their design work, the company failed to achieve its needed level of certification, requiring significant labor and lead time to re-architect its system and reenter the certification process. Now, the company's central planning office is mandating the use of pre-certified commercial integrated systems when possible. The subsequent generation of the project not only selected pre-certified hardware, but also a vendor that could include bundled operating system and virtualization options. The technology choices the company made has now enabled it to essentially function as a software company, focusing on only those areas critical to its differentiation. The combined use of pre-certified hardware with virtualization-enabled separation allows it to view its new hardware solution as a black box, which it can trust will pass through certification without the risk of substantial rework and delayed time to market.

Extending the Value of Commercial Products

Beyond recognizing the value of commercial integrated hardware platforms, PDOs must find partners that can help them leverage and optimize the value from those solutions. The unique design requirements PDOs navigate will not dissipate – industry specifications and differentiation demands dictate them. This wide range of deployment considerations drives a need for modified hardware systems. For example, ruggedization requirements have long influenced hardware system selection and driven needs for customization. Now, however, optimization for bleeding-edge workloads (AI/ML, 5G, IIoT, etc.) is driving many organizations to integrate additional processor technologies into their designs ranging from FPGAs, GPGPUs, and other co-processor peripherals for computation acceleration. To this end, more than 20% of respondents already cite the use of standard solutions that have been modified or customized to some degree [See Exhibit 7]. This trend will only accelerate as more organizations move away from in-house builds in favor of commercial solutions, yet recognize a need for application-specific optimization that cannot be satisfied through standard off-the-shelf products. Once again, the ability to tap the ecosystem for solutions meeting both of these goals can allow OEMs and others to focus their time, attention and resources on other areas they deem critical for differentiation.

Exhibit 7: Organizations Total Compute Systems Used, Segmented by Hardware Platform Type



VDC'S VIEW

Technology Sourcing is More Strategic Now than Ever

Today's solution requirements are challenging the utility of incumbent product design practices. The rapid evolution of product and workload demands are set to fundamentally upend the product system lifecycle, from design through production and service. The traditional, siloed technical decision making common in the industry ignores the need for strategies to address increasingly connected systems-of-systems deployments that directly impact business outcomes. Not only must organizations select technologies that facilitate this transition, but they must also identify partners to help them optimize their solutions, increase organizational agility, and refine their ability to focus on differentiating layers of the solution stack.

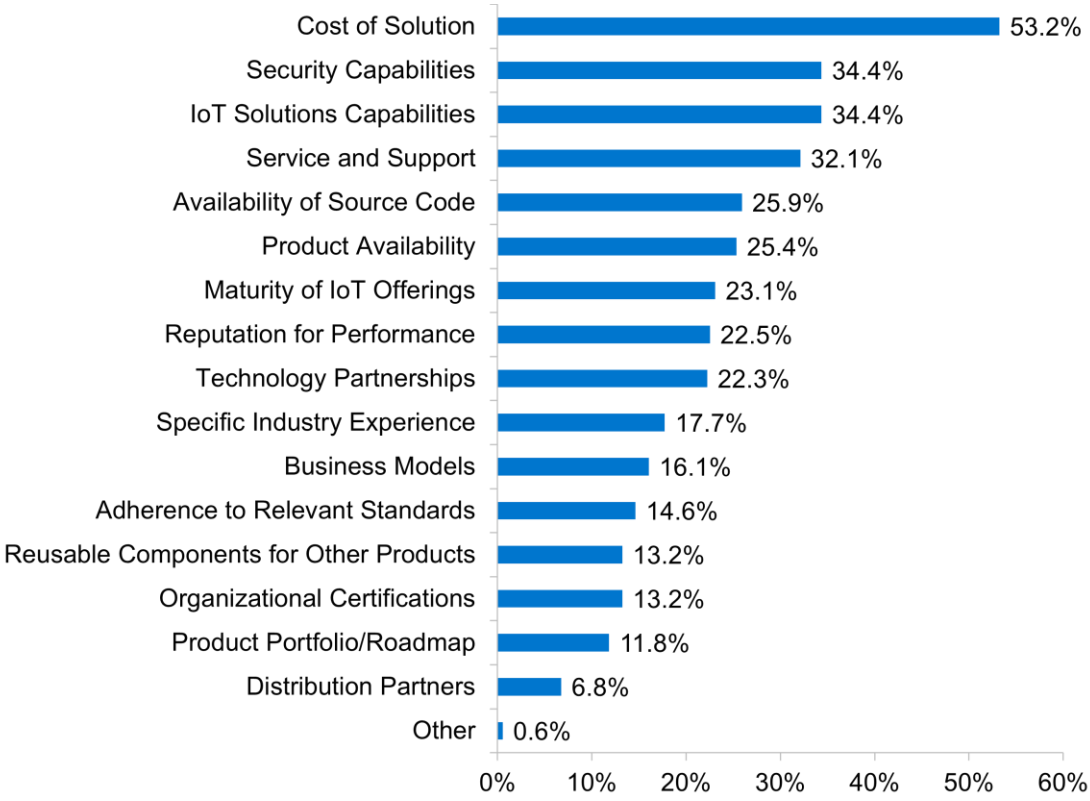
Strategic outsourcing of different project components, development, and management through tier one platform partners can be immensely valuable for global OEMs and solution builders. These partners can serve valuable roles beyond design and development such as independently managing an extensive global supply chain of components, which is a riskier enterprise for many PDOs, especially small-to-mid-sized organizations. Some large, enterprise-class platform providers also have wide visibility over the ecosystem of enablement solutions for next generation workloads and market opportunities for PDOs. This broad access and knowledge base can further complement the fulfillment of design and engineering requirements with expertise to support new applications.

Market Needs Driving New Considerations for Vendor Selection

The factors product development organizations must consider when selecting hardware systems have changed dramatically in response to these pressures. Although criteria such as price, performance, and support will always weigh heavily on solution selection, our research results indicate that the new challenges product development organizations must navigate are now directly influencing supplier selection [See Exhibit 8]. For example, the importance of addressing IoT/Edge capability needs through hardware choice is now apparent with both the maturity and capabilities of related offerings rising up in consequence to selection. As we noted, access to broader commercial product portfolios and partner ecosystems is becoming more and more valuable. Although those criteria played a less important role in the past when proprietary designs were more prevalent, PDOs now count them among the most important factors for hardware selection. Furthermore, the unique requirements of many of end systems also highlight the unwavering need for deployment-specific optimizations, with industry experience as well as access to dedicated teams of design consultants becoming more important.

As discussed, the value commercial integrated computing systems and technology platforms provide over arduous in-house design is clear. So too then is the value from selecting the correct system (and vendor) for one's application. When considering the trends impacting the market and selection criteria already recognized as important by OEMs and other PDOs, there are few vendors with a broad enough set of solutions and expertise to address the wide range of factors required for successful product developments. Our research data highlighted that product decision makers consider Dell Technologies as a top tier provider in all of these categories.

Exhibit 8: Most Important Factors When Considering Suppliers for Embedded Integrated System Solutions



Note: Percentages sum to greater than 100% due to multiple permitted responses.

Dell Technologies is one of the few vendors that has the scale, solutions, and expertise to align with the criteria highlighted above that our research shows is most important to product development organizations. First, the company offers a diverse portfolio of solutions spanning from edge gateways to servers and storage. Furthermore, it offers design, customization, and product management services to help organizations bring optimized and differentiated products to the global market. In fact, it is through the availability of these services from Dell Technologies that the industrial automation company highlighted in the use case on page 4 was able to improve profitability by 50%.

The company's partnership with Intel also offers PDOs access to Intel's extensive roadmap and range of compute options. Dell and Intel's co-engineering efforts focus on optimizing Dell's products to work seamlessly with Intel's processors and other components, to support higher performance and improved efficiency. Not only can Dell Technologies' customers choose between platforms based on low-power Intel Atom to high-performance Intel Xeon-based processing solutions, but they can also have Dell Technologies help them integrate Intel FPGA-based solutions into their designs to efficiently handle new workloads.

We also believe that the security, AI, virtualization, and management solutions offered via the company's broader partner ecosystem will provide additional value going forward as organizations gravitate towards more integrated and robust commercial solution development stacks. Furthermore, the global sales, supply, and service networks they offer as a tier one vendor can help organizations address the production and scaling bottlenecks all too common in the product development ecosystem.

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ABOUT VDC RESEARCH

Founded in 1971, VDC Research provides in-depth insights to technology vendors, end users, and investors across the globe. As a market research and consulting firm, VDC's coverage of AutoID, enterprise mobility, industrial automation, and IoT and embedded technologies is among the most advanced in the industry, helping our clients make critical decisions with confidence. Offering syndicated reports and custom consultation, our methodologies consistently provide accurate forecasts and unmatched thought leadership for deeply technical markets. Located in Natick, Massachusetts, VDC prides itself on its close personal relationships with clients, delivering an attention to detail and a unique perspective that is second to none.

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