ANSYS INC
Form 10-K
February 28, 2019

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549
FORM 10-K
(Mark One)

x	ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended
December 31, 2018
OR

o	TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

Commission File Number
0-20853
ANSYS, Inc.
(Exact name of registrant as
specified in its charter)

Delaware	04-3219960
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
2600 ANSYS Drive, Canonsburg, PA	15317
(Address of principal executive offices)	(Zip Code)

844-462-6797
(Registrant's telephone number, including area code)
Securities registered pursuant to Section 12(b) of the Act:

Common Stock, $0.01 par value per share	The Nasdaq Global Select Market
(Title of each class)	(Name of exchange on which registered)

Securities registered pursuant to section 12(g) of the Act:
None
(Title of class)
Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes x No ¨

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act. Yes ¨ No x

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes x No ¨

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes x No ¨

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§ 229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. x

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer x	Accelerated filer ¨
Non-accelerated filer ¨	Smaller reporting company ¨
Emerging growth company ¨	

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ¨

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ¨ No x

The aggregate market value of the voting stock held by non-affiliates of the registrant, based upon the closing sale price of the Common Stock on June 29, 2018 as reported on the Nasdaq Global Select Market, was $11,318,000,000.

The number of shares of the registrant's Common Stock, par value $.01 per share, outstanding as of February 22, 2019 was 83,771,828 shares.

Documents Incorporated By Reference:

Portions of the Proxy Statement for the Registrant's 2019 Annual Meeting of Stockholders are incorporated by reference into Part III.

ANSYS, Inc.
ANNUAL REPORT ON FORM 10-K FOR FISCAL YEAR 2018
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Important Factors Regarding Future Results

Information provided by ANSYS, Inc. (hereafter the Company or ANSYS), in this Annual Report on Form 10-K, may contain forward-looking statements concerning such matters as projected financial performance, market and industry segment growth, product development and commercialization, acquisitions or other aspects of future operations. Such statements, made pursuant to the safe harbor established by the securities laws, are based on the assumptions and expectations of the Company's management at the time such statements are made. The Company cautions investors that its performance (and, therefore, any forward-looking statement) is subject to risks and uncertainties. Various important factors including, but not limited to, those discussed in Item 1A. Risk Factors, may cause the Company's future results to differ materially from those projected in any forward-looking statement. All information presented is as of December 31, 2018, unless otherwise indicated.

Note About Forward-Looking Statements

The following discussion should be read in conjunction with the audited consolidated financial statements and notes thereto included elsewhere in this Annual Report on Form 10-K. The Company's discussion and analysis of its financial condition and results of operations are based upon the Company's consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States of America (GAAP). The preparation of these financial statements requires the Company to make estimates and judgments that affect the reported amounts of assets, liabilities, revenues and expenses, and related disclosure of contingent assets and liabilities. On an ongoing basis, the Company evaluates its estimates, including those related to fair values of stock awards, bad debts, contract revenue, acquired deferred revenue, the valuation of goodwill and other intangible assets, deferred compensation, income taxes, uncertain tax positions, tax valuation reserves, useful lives for depreciation and amortization, and contingencies and litigation. The Company bases its estimates on historical experience, market experience, estimated future cash flows and various other assumptions that management believes are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates.

This Annual Report on Form 10-K contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934, including, but not limited to, the following statements, as well as statements that contain such words as "anticipates," "intends," "believes," "plans" and other similar expressions:

- The Company's intentions regarding its hybrid sales and distribution model.
- The Company's intentions related to investments in research and development, particularly as it relates to expanding the ease of use and capabilities of its broad portfolio of simulation software products.
- The Company's expectations regarding the accelerated development of new and innovative products to the marketplace while lowering design and engineering costs for customers as a result of the Company's acquisitions.
- The Company's statements regarding the impact of global economic conditions.
- The Company's expectations regarding the outcome of its service tax audit cases.
- The Company's belief that, in most geographical locations, its facilities allow for sufficient space to support present and future foreseeable needs, including such expansion and growth as the business may require.
- The Company's expectation that it can renew existing facility leases as they expire or find alternative facilities without difficulty, as needed.
- The Company's assessment of the ultimate liabilities arising from various investigations, claims and legal proceedings.
- The Company's statement regarding the strength of the features, functionality and integrated multiphysics capabilities of its software products.
- The Company's belief that its overall performance is best measured by fiscal-year results rather than by quarterly results.
- The Company's estimates regarding the expected impact on reported revenue related to the acquisition accounting treatment of deferred revenue.
- The Company's expectation that it will continue to make targeted investments in its global sales and marketing organizations and its global business infrastructure to enhance and support its revenue-generating activities.

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- The Company's intention to repatriate previously taxed earnings in excess of working capital needs and to reinvest all other earnings of its non-U.S. subsidiaries.
- The Company's plans related to future capital spending.
- The sufficiency of existing cash and cash equivalent balances to meet future working capital and capital expenditure requirements.
- The Company's belief that the best uses of its excess cash are to invest in the business and repurchase stock in order to both offset dilution and return capital, in excess of its requirements, to stockholders with the goal of increasing stockholder value.
- The Company's intentions related to investments in complementary companies, products, services and technologies.
- The Company's expectation that changes in currency exchange rates will affect the Company's financial position, results of operations and cash flows.
- The Company's expectations regarding future claims related to indemnification obligations.
- The Company's estimates regarding total compensation expense associated with granted stock-based awards for future years.
- The Company's expectations regarding the impacts of new accounting guidance.
- The Company's assessment of its ability to realize deferred tax assets.
- The Company's performance expectations related to its partnerships and strategic alliances.
- The Company's expectations regarding acquisitions and integrating such acquired companies to realize the benefits of cost reductions and other synergies relating thereto.

Forward-looking statements should not be unduly relied upon because they involve known and unknown risks, uncertainties and other factors, some of which are beyond the Company's control. The Company's actual results could differ materially from those set forth in the forward-looking statements. Certain factors that might cause such a difference include risks and uncertainties detailed in Item 1A. Risk Factors.

PART I

ITEM 1. BUSINESS

ANSYS, a Delaware corporation formed in 1994, develops and globally markets engineering simulation software and services widely used by engineers, designers, researchers and students across a broad spectrum of industries and academia, including aerospace and defense, automotive, electronics, semiconductors, energy, materials and chemical processing, turbomachinery, consumer products, healthcare, and sports. Headquartered south of Pittsburgh, Pennsylvania, the Company and its subsidiaries employed approximately 3,400 people as of December 31, 2018. The Company focuses on the development of open and flexible solutions that enable users to analyze designs directly on the desktop, providing a common platform for fast, efficient and cost-conscious product development, from design concept to final-stage testing and validation. The Company distributes its ANSYS® suite of simulation technologies through a global network of independent resellers and distributors (collectively, channel partners) and direct sales offices in strategic, global locations. It is the Company's intention to continue to maintain this hybrid sales and distribution model. The Company operates and reports as one segment.

The Company's product portfolio consists of the following:

Simulation Platform: ANSYS Workbench™

ANSYS Workbench is the framework upon which the Company's suite of advanced engineering simulation technologies is built. The innovative project schematic view ties together the entire simulation process, guiding the user through complex multiphysics analyses with drag-and-drop simplicity. With bi-directional computer-aided design (CAD) connectivity, powerful highly-automated meshing, a project-level update mechanism, pervasive parameter management and integrated optimization tools, the ANSYS Workbench platform enables Pervasive Engineering Simulation™.

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The Company's Workbench framework allows engineers and designers to incorporate the compounding effects of multiple physics into a virtual prototype of their design and simulate its operation under real-world conditions. As product architectures become smaller, lighter and more complex, companies must be able to accurately predict how products will behave in real-world environments where multiple types of physics interact in a coupled way. ANSYS multiphysics software enables engineers to simulate the interactions between structures, heat transfer, fluids and electronics all within a single, unified engineering simulation environment.

ANSYS Workbench enables companies to create a customized simulation environment to deploy specialized simulation best practices and automations unique to their product development process or industry. With ANSYS ACT™, end users or ANSYS partners can modify the user interface, process simulation data or embed third-party applications to create specialized tools based on ANSYS Workbench.

High-Performance Computing

The Company's high-performance computing (HPC) product suite enables enhanced insight into product performance and improves the productivity of the design process. The HPC product suite delivers cross-physics parallel processing capabilities for the full spectrum of the Company's simulation software by supporting structures, fluids, thermal and electronics simulations. This product suite decreases turnaround time for individual simulations, allowing users to consider multiple design ideas and make the right design decisions early in the design cycle.

Structures

The Company's structural analysis product suite offers simulation tools for product design and optimization that increase productivity, minimize physical prototyping and help to deliver better and more innovative products in less time. These tools tackle real-world analysis problems by making product development less costly and more reliable. In addition, these tools have capabilities that cover a broad range of analysis types, elements, contacts, materials, equation solvers and coupled physics capabilities, all targeted toward understanding and solving complex design problems. The Company also provides comprehensive topology optimization tools that engineers use to design structural components to meet loading requirements with minimal material and component weight. The Company offers a complete simulation workflow for additive manufacturing that allows reliable 3D printing by simulating the laser sintering process and delivering compensated CAD geometries that ensure reliable printed parts.

Fluids

The Company's fluids product suite enables modeling of fluid flow and other related physical phenomena. Fluid flow analysis capabilities provide all the tools needed to design and optimize new fluids equipment and to troubleshoot already existing installations. The suite contains general-purpose computational fluid dynamics software and specialized products to address specific industry applications.

Electromagnetics

The Company's electromagnetics product suite provides field simulation software for designing high-performance electronic and electromechanical products. The software streamlines the design process and predicts performance of mobile communication and internet-access devices, broadband networking components and systems, integrated circuits (ICs) and printed circuit boards (PCBs), as well as electromechanical systems such as automotive components and power electronics equipment, all prior to building a prototype.

Semiconductors

Advancements in semiconductor design and manufacturing enable smaller electronic architectures. Shrinking geometries, especially in the emerging 3D IC, FinFET and stacked-die architectures, reveal design challenges related to power and reliability. The Company's power analysis and optimization software suite manages the power budget, power delivery integrity and power-induced noise in an electronic design, from initial prototyping to system sign-off. These solutions deliver accuracy with correlation to silicon measurement; the capacity to handle an entire electronic system, including IC, package and PCB, efficiently for ease-of-debug and fast turnaround time; and comprehensiveness to facilitate cross-domain communications and electronic ecosystem enablement.

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Embedded Software
The Company's SCADE® product suite is a comprehensive solution for embedded software simulation, code production and automated certification. It has been developed specifically for use in critical systems with high dependability requirements, including aerospace, rail transportation, nuclear, industrial and automotive applications. SCADE software supports the entire development workflow, from requirements analysis and design, through verification, implementation and deployment. SCADE solutions easily integrate with each other and the rest of the ANSYS product suite, allowing for development optimization and increased communication among team members.
Systems
The Company delivers a unique and comprehensive system simulation capability that is ideal for the design of today's increasingly automated products. This collaborative environment leverages the Company's multiphysics, multibody dynamics, circuit and embedded software simulation capabilities, enabling users to simulate the complex interactions between components, circuits and control software within a single environment. These technologies provide a complete view into predicted product performance, which creates greater design confidence for engineers.
3D Design
The Company’s Discovery™ product family allows every engineer to benefit from the insight of simulation in their product design. The Discovery products range from early design exploration tools powered by interactive real-time simulation and intuitive geometry editing, to detailed product validation solutions utilizing proven flagship solver technology with easy-to-use guided workflows. These tools allow for design engineers of all levels of expertise to utilize simulation across the entire product design process and to work seamlessly with simulation experts using ANSYS flagship products for even more advanced analysis.
Academic
The Company's academic product suite provides a highly scalable portfolio of academic products based on several usage tiers, including associate, research and teaching. Each tier includes various non-commercial products that bundle a broad range of physics and advanced coupled field solver capabilities. The academic product suite provides entry-level tools intended for class demonstrations and hands-on instruction. It includes flexible terms of use and more complex analysis suitable for doctoral and post-doctoral research projects. The Company also provides a special product at no cost to students that is suitable for use away from the classroom and in non-commercial applications.
PRODUCT DEVELOPMENT
The Company makes significant investments in research and development and emphasizes frequent, integrated product releases. The Company's product development strategy centers on ongoing development and innovation of new technologies to increase productivity and to provide engineering simulation solutions that customers can integrate into enterprise-wide product lifecycle management (PLM) systems. The Company's product development efforts focus on extensions of the full product line with new functional modules, further integration with CAD, electronic CAD (ECAD) and PLM products, and the development of new products. The Company's products run on the most widely-used engineering computing platforms and operating systems, including Windows, Linux and most UNIX workstations.
The Company's total research and development expenses were $233.8 million, $202.7 million and $183.1 million in 2018, 2017 and 2016, respectively, or 18.1%, 18.5% and 18.5% of total revenue, respectively. As of December 31, 2018, the Company's product development staff consisted of approximately 1,200 employees, most of whom hold advanced degrees and have industry experience in engineering, mathematics, computer science or related disciplines. The Company has traditionally invested significant resources in research and development activities and intends to continue to make investments in expanding the ease of use and capabilities of its broad portfolio of simulation software products.

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The Company completed the following major product development activities and releases:

- In February 2019, the Company released ANSYS 2019 R1. The new ANSYS Fluent® user experience improves the workflow process without compromising accuracy. Engineers benefit from the complete, single-window solution within ANSYS Fluent. ANSYS Motion™ was released with the most-powerful multibody dynamics solution. New offerings in the electronics and electromagnetics suite include an EMI Scanner, electromigration analysis and noise-vibration-harshness (NVH) capabilities. In structures, ANSYS Mechanical added thermal compliance to enable the generation of designs that maximize heat transfer using topology optimization. A new semi-implicit method allows efficient solution of problems that involve both large strain and large deformation. ANSYS Additive Suite™ includes ANSYS Additive Science™, an exploratory environment for engineers to determine how process parameters affect meltpool sizes and material porosity. Improvements to the SCADE suite for automotive make it simpler and faster to comply with industry standards like AUTOSAR and ISO 26262 for model-based systems and software in autonomous vehicles. ANSYS VRXPERIENCE™ integrates two new camera models, enabling users to test the perception algorithm in night driving conditions. New features in ANSYS medini® analyze allow users to more quickly and accurately perform functional safety analysis for DO-178C and other standards on aircraft systems. ANSYS SPEOS™ strengthens predictive design capabilities for creating, testing and validating a virtual design in a fast iteration loop, ensuring compliance with international standards and regulations. Topology optimization has been added to ANSYS Discovery Live, taking a leap forward in making digital exploration and generative design accessible for every engineer.
- In September 2018, the Company released ANSYS 19.2 with faster problem-solving capabilities. In fluids, ANSYS 19.2 delivered new features to accelerate computational fluid dynamics simulations using a task-based workflow for watertight geometries and Mosaic meshing technology, empowering more engineers to get accurate results faster and with less training. ANSYS 19.2 introduced System Coupling 2.0 for multiphysics simulation with improved and consistent performance for any scenario, enabling HPC for multiphysics simulations. Engineers benefit from new functionality to improve workflow for semiconductors, specifically those used in the automotive and autonomous vehicle industries, with dedicated ISO 26262 support to meet safety regulations in ANSYS medini analyze. ANSYS introduced ANSYS VRXPERIENCE, providing virtual reality simulation and validation for autonomous vehicle simulation, complex systems such as intelligent headlamps, interior and exterior lighting, autonomous vehicles controls and HMI validation. A new product bundle, ANSYS SPEOS, provides a complete solution for designing and simulating illumination, interior and exterior lighting, cameras and lidars. New inverse analysis in the ANSYS structural suite, material designer and topology optimization developments give engineers more simulation options. Inverse Analysis predicts the shape of a component, helping achieve the desired shape during operation. Additive solutions provided improved robustness for both ANSYS Additive Print™ and ANSYS Workbench Additive, including physics-driven lattice optimization. In topology optimization, ANSYS 19.2 added loading options; manufacturing constraints that are ideal for additive manufacturing; and a unique lattice optimization capability. In the electromagnetics suite, new advancements in multi-channel radar system simulation include a lightweight geometry modeler that enables rapid meshing and an efficient actor movement in pulse-by-pulse road scene simulation resulting in 20 times faster processing.
- In May 2018, the Company released ANSYS 19.1 with new simulation-based digital twin functionality. ANSYS Twin Builder™ is a first-of-its-kind product, enabling customers to build, validate and deploy simulation-based digital twins. A digital twin combines accurate physics-based virtual replicas of a product with data collected using industrial internet of things connectivity platforms, providing intelligence and predictive maintenance insights in real-world operating conditions. ANSYS 19.1 also provided updates across all physics and delivered new metal additive manufacturing solutions, empowering customers to quickly test their product designs virtually before printing a part. ANSYS Additive Suite enables designers to optimize weight reduction and lattice density; create, repair and clean up CAD geometry; simulate the additive process; and conduct structural and thermal analysis for data validation. In fluids, ANSYS 19.1 offered a new approach to cavitation modeling across diverse applications, from hydro pumps to rocket fuel systems. Users reliably predict cavitation using pre-existing material properties, without the need for empirical model parameters or extensive physical testing. ANSYS 19.1 introduced ANSYS EnVision™ Pro, a new version of ANSYS EnSight™ Viewer, which empowers engineers to interact with EnSight data and create new views

and photorealistic images. In semiconductors, a new 3D IC graphical user interface wizard enabled automatic and seamless connections between multiple dies, interposer and package for chip-level power and thermal integrity analysis, significantly improving usability and easing 3D IC setup and analysis.

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New Product Offerings

Optical

On May 2, 2018, the Company acquired OPTIS, a premier provider of software for scientific simulation of light, human vision and physics-based visualization. Adding OPTIS' optical sensor and closed-loop, real-time simulation to the Company's leading multiphysics portfolio, the Company now offers the broadest toolset for validating the safety and reliability of autonomous vehicles.

The Company's capabilities now span the simulation of all sensors, including lidar, cameras and radar; the multiphysics simulation of physical and electronic components; the analysis of systems functional safety; as well as the automated development of safety-certified embedded software. This functionality can be integrated into a closed-loop simulation environment that interacts with weather and traffic simulators, enabling thousands of driving scenarios to be executed virtually.

Beyond the autonomous vehicle sector, the acquisition reinforces the Company as a world-class simulation provider across various industries and verticals.

PRODUCT QUALITY

The Company's employees generally perform product development tasks according to predefined quality plans, procedures and work instructions. Certain technical support tasks are also subject to a quality process. These plans define, for each project, the methods to be used, the responsibilities of project participants and the quality objectives to be met. The majority of software products are developed under a quality system that is certified to the ISO 9001:2015 standard. The Company establishes quality plans for its products and services, and subjects product designs to multiple levels of testing and verification in accordance with processes established under the Company's quality system.

SALES AND MARKETING

The Company distributes and supports its products through its own direct sales offices, as well as a global network of independent channel partners. This channel partner network provides the Company with a cost-effective, highly-specialized channel of distribution and technical support. It also enables the Company to draw on business and technical expertise from a global network, provides relative stability to the Company's operations to help mitigate geography-specific economic trends and provides the Company with an opportunity to take advantage of new geographic markets or enhance its sales coverage in existing markets. The Company derived 22.4%, 24.8% and 24.4% of its total revenue through the indirect sales channel for the years ended December 31, 2018, 2017 and 2016, respectively.

The channel partners sell ANSYS products to new customers, expand installations within the existing customer base, offer training and consulting services, and provide the first line of ANSYS technical support. The Company's channel partner certification process helps to ensure that each channel partner has the ongoing capability to adequately represent the Company's expanding product lines and to provide an acceptable level of training, consultation and customer support.

The Company also has a direct sales organization to develop an enterprise-wide, focused sales approach and to implement a worldwide major account strategy. The sales management organization also functions as a focal point for requests to ANSYS from the channel partners and provides additional support in strategic locations through the presence of direct sales offices.

During 2018, the Company continued to invest in its existing domestic and international strategic sales offices. In total, the Company's direct sales organization comprises 1,700 employees who are responsible for the sales, technical support, consulting services, marketing initiatives and administrative activities designed to support the Company's overall revenue growth and expansion strategies.

The Company's products are utilized by organizations ranging in size from small consulting firms to the world's largest industrial companies. No single customer accounted for more than 5% of the Company's revenue in 2018, 2017 or 2016.

Information with respect to foreign and domestic revenue may be found in Note 16 to the consolidated financial statements in Part IV, Item 15 of this Annual Report on Form 10-K and in the section entitled “Management's Discussion and Analysis of Financial Condition and Results of Operations” in Part II, Item 7 of this Annual Report on

Form 10-K.

STRATEGIC ALLIANCES AND MARKETING RELATIONSHIPS

The Company has established and continues to pursue strategic alliances with advanced technology suppliers, hardware vendors, specialized application developers, and CAD, ECAD and PLM providers. The Company believes that these relationships facilitate accelerated incorporation of advanced technology into the Company's products, provide access to new

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customers, expand the Company's sales channels, develop specialized product applications and provide direct integration with leading CAD, electronic design automation (EDA), product data management and PLM systems.
The Company has technical and marketing relationships with leading CAD vendors, such as Autodesk, PTC and Siemens Product Lifecycle Management Software, to provide direct links between products. These links facilitate the transfer of electronic data models between the CAD systems and ANSYS products.
In 2018, the Company partnered with PTC to accelerate product innovation by providing customers a world-class simulation-driven design solution. Working together, ANSYS and PTC will deliver ANSYS Discovery Live real-time simulation within PTC’s Creo® 3D CAD software. The combined solution will be sold by PTC as part of the Creo product suite. This solution will offer customers a unified modeling and simulation environment, removing the boundaries between CAD and simulation and enabling design engineers to gain insight into each of the many design decisions they make throughout the product development process. This insight will enable design engineers to create higher quality products, while reducing product and development costs. The product is expected to be commercially available in the first half of 2019.
Similarly, the Company maintains marketing and software development relationships with leading EDA software companies, including Cadence Design Systems, Synopsys, Mentor Graphics, Zuken and National Instruments. These relationships support the transfer of data between electronics design and layout software and the ANSYS electronics simulation portfolio. In 2017, the Company entered into an integration and distribution agreement with Synopsys to cooperatively integrate ANSYS RedHawk technology into an in-design add-on to a Synopsys design tool for the primary purpose of providing customers with direct, in-design access to the RedHawk technology's capabilities.
The Company also has a relationship with Spatial Corp. to provide the 3D modeling kernel technology upon which the Company's in-house geometry modeling software solutions are built.
The main method that ANSYS employs to democratize HPC to a wider audience is through partnerships with a number of companies, such as cloud-hosting providers, HPC hardware manufacturers and supercomputing centers such as HLRS in Stuttgart, Germany. The cloud partners not only provide HPC services, but also the back-end infrastructure to those customers who lack the in-house HPC or IT staff, but still want the ability to increase computational resources quickly. In addition, ANSYS has established partnerships with HPC partners that provide appliances, or pre-configured racks of computational hardware optimized and configured to run ANSYS software.
The Company's open cloud strategy allows it to work with various public cloud providers and cloud hosting partners. This approach makes it easy for customers to use the same workflows on-premise and in the Cloud. In addition, the Company strengthened its other cloud-hosting service partnerships by further improving best practices for executing engineering simulation in the Cloud. Cloud-hosting partners such as Nimbix, Rescale and Gompute provide friction-free cloud access to ANSYS solutions for customers. Furthermore, the Company enjoys mutually-committed alliances with large cloud platform providers such as Microsoft and AWS. In 2018, the Company entered into an agreement with SAP to embed ANSYS' pervasive simulation solutions for digital twins into SAP's market-leading digital supply chain, manufacturing and asset management portfolio. The partnership's first solution, expected in 2019, will run on SAP Cloud Platform and empower industrial asset operators to optimize operations and maintenance through real-time engineering insights, to reduce product cycle times and increase profitability.
The Company's Partner Program actively encourages specialized developers of software solutions to use the Company's technology as a development platform for their applications and provides customers with enhanced functionality related to their use of the Company's software. With almost 200 active solution partnerships, spanning a wide range of technologies, including optimization, electronics, mechanical simulation, fluid simulation and CAD, this partner ecosystem extends the depth and breadth of the Company's technology offerings.
The Company has a software license agreement with Livermore Software Technology Corporation (LSTC) whereby LSTC has provided LS-DYNA® software for explicit dynamics solutions used in applications such as crash test simulations in automotive and other industries. Under this arrangement, LSTC assists in the integration of the LS-DYNA software with the Company's pre- and post-processing capabilities and provides updates and problem resolution in return for royalties from sales of the ANSYS LS-DYNA® combined product.
The Company has a license agreement with Dynardo GmbH involving the optiSLang software for robust design optimization. Under this arrangement, Dynardo provides its optiSLang software and assists with marketing, customer

support, training, and integration into the Company's platform, in return for royalties from sales of the combined product. ANSYS optiSLang applies across many industries, extending and strengthening the Company's capabilities in sensitivity analysis and simulation process automation to enable faster and better-performing product designs.

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The Company has a software license agreement with HBM that provides the advanced fatigue capabilities of nCode DesignLife™, a leading durability software from HBM. ANSYS nCode DesignLife™ technology leverages the open architecture of the ANSYS platform and enables mechanical engineers to more easily address complex product life and durability issues before a prototype is built.

COMPETITION

The Company believes that the principal factors affecting sales of its software include ease of use, breadth and depth of functionality, flexibility, quality, ease of integration with other software systems, file compatibility across computer platforms, range of supported computer platforms, performance, price and total cost of ownership, customer service and support, company reputation and financial viability, and effectiveness of sales and marketing efforts.

The Company continues to experience competition across all markets for its products and services. The Company's competitors include large, global, publicly traded companies; small, geographically-focused firms; startup firms; and solutions produced in-house by the end users. Some of the Company's current and possible future competitors have greater financial, technical, marketing and other resources than the Company, and some have well-established relationships with current and potential customers of the Company. The Company's current and possible future competitors also include firms that have elected, or may in the future elect, to compete by means of open source licensing. These competitive pressures may result in decreased sales volumes, price reductions and/or increased operating costs, and could result in lower revenues, margins and net income.

PROPRIETARY RIGHTS AND LICENSES

The Company regards its software as proprietary and relies on a combination of trade secret, copyright, patent and trademark laws, license agreements, nondisclosure and other contractual provisions, and technical measures to protect its proprietary rights in its products. The Company distributes its software products under software license agreements that grant customers nonexclusive licenses, which are typically nontransferable, for the use of the Company's products. License agreements for the Company's products are directly between the Company and end users. Use of the licensed software product is restricted to specified sites unless the customer obtains a multi-site license for its use of the software product or the software product is by its nature a multi-site use product. Software security measures are also employed to prevent unauthorized use of the Company's software products and the licensed software is subject to terms and conditions prohibiting unauthorized reproduction. For most products, customers may purchase a perpetual license of the technology with the right to annually purchase ongoing maintenance, technical support and upgrades, or may lease the product on a fixed-term basis for a fee that includes the license, maintenance, technical support and upgrades. For its Discovery products, customers purchase an annual subscription for a certain number of named users that includes the license, maintenance, technical support and upgrades.

The Company licenses its software products utilizing a combination of web-based and hard-copy license terms and forms. For certain software products, the Company primarily relies on "click-wrapped" licenses (i.e. online agreements where the website provider posts terms and conditions, and the user clicks on the "accept" button). The enforceability of these types of agreements under the laws of some jurisdictions is uncertain.

The Company also seeks to protect the source code of its software as a trade secret and as unpublished copyrighted work. The Company has obtained federal trademark registration protection for ANSYS and other marks in the U.S. and foreign countries. Additionally, the Company was awarded numerous patents by the U.S. Patent and Trademark Office, and has a number of patent applications pending. To the extent the Company does not choose to seek patent protection for its intellectual property, the Company primarily relies on the protection of its source code as a trade secret.

Employees of the Company have signed agreements under which they have agreed not to disclose trade secrets or confidential information. These agreements, where legally permitted, restrict engagement in or connection with any business that is competitive with the Company anywhere in the world while employed by the Company (and, in some cases, for specified periods thereafter) and state that any products or technology created by employees during their term of employment are the property of the Company. In addition, the Company requires all channel partners to enter into agreements not to disclose the Company's trade secrets and other proprietary information.

Despite these precautions, there can be no assurance that misappropriation of the Company's technology and proprietary information (including source code) will be prevented. Further, there can be no assurance that copyright, trademark, patent and trade secret protection will be available for the Company's products in certain jurisdictions, or that restrictions on the ability of employees and channel partners to engage in activities competitive with the Company will be enforceable. Costly and time-consuming litigation could be necessary in the future to enforce the Company's rights to its trade secrets and proprietary information or to enforce its patent rights and copyrights, and it is possible that, in the future, the Company's competitors may be able to obtain the Company's trade secrets or to independently develop similar, unpatented technology.

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The software development industry is characterized by rapid technological change. Therefore, the Company believes that factors such as the technological and creative skills of its personnel, new product developments, frequent product enhancements, name recognition and reliable product maintenance are also important to establishing and maintaining technology leadership in addition to the various legal protections of its technology that may be available.

The Company does not believe that any of its products infringe upon the proprietary rights of third parties. There can be no assurance, however, that third parties will not claim such infringement by the Company or its licensors or licensees with respect to current or future products. The Company expects that software suppliers will increasingly be subject to the risk of such claims as the number of products and suppliers continues to expand and the functionality of products continues to increase. Any such claims, with or without merit, could be time consuming, result in costly litigation, cause product release delays or require the Company to enter into royalty or licensing agreements. Such royalty or licensing agreements, if required, may not be available on terms acceptable to the Company.

SEASONAL VARIATIONS

The Company's business has experienced seasonality, including quarterly reductions in software sales resulting from slowdowns of customer activities during the summer months, particularly in Europe, as well as from the seasonal purchasing and budgeting patterns of the Company's global customers. Lease and maintenance contract renewals are typically highest in the first and fourth quarters. The Company's revenue is typically highest in the fourth quarter.

DEFERRED REVENUE AND BACKLOG

Deferred revenue consists of billings made or payments received in advance of revenue recognition. The deferred revenue on the Company's consolidated balance sheets does not represent the total value of annual or multi-year, noncancellable agreements. The Company's backlog represents installment billings for periods beyond the current quarterly billing cycle and customer orders received but not processed. The Company's deferred revenue and backlog as of December 31, 2018 and 2017 consisted of the following:

ASC 606[1]	Balance at December 31, 2018		
(in thousands)	Total	Current	Long-Term
Deferred revenue	$343,174	$328,584	$ 14,590
Backlog	315,998	147,299	168,699
Total	$659,172	$475,883	$ 183,289

ASC 605[1]	Balance at December 31, 2018		
(in thousands)	Total	Current	Long-Term
Deferred revenue	$555,539	$526,168	$ 29,371
Backlog	401,543	142,284	259,259
Total	$957,082	$668,452	$ 288,630

ASC 605	Balance at December 31, 2017		
(in thousands)	Total	Current	Long-Term
Deferred revenue	$468,560	$440,491	$ 28,069
Backlog	301,150	97,283	203,867
Total	$769,710	$537,774	$ 231,936

[1] Effective January 1, 2018, the Company adopted new guidance on revenue recognition, Accounting Standards Codification (ASC) 606. The Company recorded $244.1 million of deferred revenue to retained earnings upon the adoption of the new guidance. Deferred revenue and backlog is presented under the prior guidance, ASC 605, for comparability purposes. For further information, see Note 3 to the consolidated financial statements included in Part IV, Item 15 of this Annual Report on Form 10-K.

Revenue associated with deferred revenue and backlog that will be recognized in the subsequent twelve months is classified as current in the tables above.

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EMPLOYEES

As of December 31, 2018, the Company employed approximately 3,400 people. At that date, there were also contract personnel and co-op students providing ongoing development services and technical support. Certain employees of the Company are subject to collective bargaining agreements and have local work councils.

ACQUISITIONS

The Company makes targeted acquisitions in order to support its long-term strategic direction, accelerate innovation, provide increased capabilities to its existing products, supply new products and services, expand its customer base and enhance its distribution channels.

During the year ended December 31, 2018, the Company completed the acquisition of 100% of the shares of OPTIS, a premier provider of software for scientific simulation of light, human vision and physics-based visualization, for a purchase price of $291.0 million.

During the years ended December 31, 2017 and 2016, the Company completed various acquisitions to expand its customer base and accelerate the development of new and innovative products to the marketplace while lowering design and engineering costs for customers. The acquisitions were not individually significant. The combined purchase prices of the acquisitions purchased during the years ended December 31, 2017 and 2016 were approximately $67.0 million and $10.3 million, respectively.

The 2018 and 2017 technology acquisitions are further described in the table below:

Date of Closing	Company	Details
May 2, 2018	OPTIS	OPTIS, a premier provider of software for scientific simulation of light, human vision and physics-based visualization, extends the Company's portfolio into the area of optical simulation to provide comprehensive sensor solutions, covering visible and infrared light, electromagnetics and acoustics for camera, radar and lidar.
November 15, 2017	3DSIM	3DSIM, a developer of premier additive manufacturing technology, gives ANSYS a complete additive manufacturing simulation workflow solution. 3DSIM's software solutions empower manufacturers, designers, materials scientists and engineers to achieve their objectives through simulation-driven innovation rather than physical trial and error.
July 5, 2017	Computational Engineering International, Inc. (CEI Inc.)	CEI Inc., the developer of EnSight, aids engineers and scientists in their ability to analyze, visualize and communicate large simulation data sets in clear, higher-resolution outputs.
March 10, 2017	CLK Design Automation (CLK-DA)	CLK-DA offers fast transistor simulation technology that complements the Company's semiconductor product portfolio.

For further information on the Company's business combinations, see Note 4 to the consolidated financial statements included in Part IV, Item 15 of this Annual Report on Form 10-K.

AVAILABLE INFORMATION

The Company's website is www.ansys.com. The Company makes available on its website, free of charge, Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, interactive data files, Current Reports on Form 8-K, reports filed pursuant to Section 16 and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended, as soon as reasonably practicable after such materials are electronically filed or furnished to the Securities and Exchange Commission (SEC). The Company's reports may also be obtained by accessing the EDGAR database of the SEC's website at www.sec.gov. In addition, the Company has posted the charters for its Audit Committee, Compensation Committee, and Nominating and Corporate Governance Committee, as well as the Company's Code of Business Conduct and Ethics, Standard Business Practices and Corporate Governance Guidelines on its website. Information posted on the Company's website or social media accounts is not incorporated by reference in this Annual Report on Form 10-K.

ITEM 1A. RISK FACTORS

Information provided by the Company or its spokespersons, including information contained in this Annual Report on Form 10-K, may from time to time contain forward-looking statements concerning projected financial performance, market and industry sector growth, product development and commercialization or other aspects of future operations. Such statements will be based on the assumptions and expectations of the Company's management at the time such statements are made. The Company cautions investors that its performance (and, therefore, any forward-looking statement) is subject to risks and uncertainties. Various important factors, including, but not limited to, the following may cause the Company's future results to differ materially from those projected in any forward-looking statement.

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Global Economic Conditions. The Company's operations and performance depend significantly on foreign and domestic economic conditions. Uncertainty in the macroeconomic environment, as well as geopolitical conditions, can result in significant volatility in credit, equity and foreign exchange markets. This volatility and the related economic conditions may negatively impact the Company as customers defer spending in response to tighter credit; higher unemployment; geopolitical tensions and uncertainties; unpredictable government trade, tax or other policies; evolving immigration and other labor policies; financial market volatility; government austerity programs; negative financial news; declining valuations of investments; and other factors. In addition, certain of the Company's customers' budgets may be constrained and may be unable to purchase the Company's products at the same level as they have in prior periods. Customer spending levels may be impacted by trade or tax policies or decreased government spending in certain countries as concerns continue regarding economic conditions and government debt levels. These economic conditions can change abruptly. To the extent the global economy experiences volatility, the Company may be exposed to impairments of certain assets as their values deteriorate.

Tighter credit due to economic conditions may diminish the Company's future borrowing ability. The Company's customers' ability to pay for the Company's products and services may also be impaired, which may lead to an increase in the Company's allowance for doubtful accounts and write-offs of accounts receivable. Since the Company is exposed to the majority of major world markets, uncertainty in any significant market may negatively impact the Company's performance and results, particularly with respect to the Company's largest geographic customer bases. The Company is unable to predict the likely duration and magnitude of changing economic conditions or the likelihood of additional uncertainty arising in any of the Company's key markets.

Decline in Customers' Businesses. The Company's sales are based significantly on end-user demand for products in key industrial sectors. Many of these sectors periodically experience economic declines, which may be exacerbated by other economic factors. These factors may also adversely affect the Company's business by extending sales cycles and reducing revenue. These economic factors may cause the Company's customers to reduce the size of their workforce or cut back on operations and may lead to a reduction in renewals of licenses or maintenance contracts with the Company. The Company's customers may request discounts which may cause fluctuations in the Company's future operating results. The Company may not be able to adjust its operating expenses to offset such fluctuations because a substantial portion of the Company's operating expenses are related to personnel, facilities and marketing programs. The level of personnel and related expenses may not be able to be adjusted quickly and is based, in significant part, on the Company's expectation for future revenue.

Risks Associated with International Activities. A majority of the Company's business comes from outside the United States and the Company has customers that supply a wide spectrum of goods and services in virtually all of the world's major economic regions. If any of the foreign economies in which the Company does business deteriorate or suffer periods of uncertainty, the Company's business and performance may be negatively impacted through reduced customer spending, changes in purchasing cycles or timing, reduced access to credit for its customers, or other factors impacting the Company's international sales and collections. The Company's results may also be negatively impacted by geopolitical tensions, which may result in increased economic volatility.

As a result of its significant international presence, the Company has revenue, expenses, cash, accounts receivable and payment obligations denominated in foreign currencies. As a result, the Company is subject to currency exchange risk. The Company's revenues and operating results are adversely affected when the U.S. Dollar strengthens relative to other currencies and are positively affected when the U.S. Dollar weakens. As a result, changes in currency exchange rates will affect the Company's financial position, results of operations and cash flows. In the event that there are economic declines in countries in which the Company conducts transactions, the resulting changes in currency exchange rates may affect the Company's financial position, results of operations and cash flows. The Company seeks to reduce currency exchange transaction risks primarily through its normal operating and treasury activities, but there can be no assurance that it will be successful in reducing these risks.

Additional risks inherent in the Company's international business activities include imposition of government controls; export license requirements; restrictions on the export of critical technology, products and services; the violation of anti-corruption laws and regulations applicable to the Company, by third parties in countries where such conduct may be permissible or commonplace; political and economic instability; difficulties in staffing and managing international operations; changes in data privacy regulations; longer accounts receivable payment cycles; burdens of complying with a wide variety of foreign laws, taxes and regulations; protectionist economic policies; new foreign tariffs and trade sanctions; new U.S. export and/or import and doing-business regulations, including new trade sanctions impacting more foreign entities thereby restricting the sale of the Company's products and services to those entities (which may result in an advantage to certain of the Company's competitors who may not be subject to the same regulatory restrictions); and the fact that patent, copyright, trademark and trade secret protection may not be available in every foreign country in which the Company sells its products and services. The Company's business, financial position, results of operations and cash flows could be materially, adversely affected by any of these risks.

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The U.S. government has been requesting foreign governments to renegotiate existing trade agreements with the U.S. and to change currency conversion rates, increasing uncertainty levels in the international trade environment. While preliminary agreements were reached with Mexico and Canada, a high level of uncertainty remains in the future trade conditions, including with China, which may have an impact on the Company's business.

In 2017, the United Kingdom initiated a two-year process to leave the European Union commonly known as "Brexit". The lack of success of the efforts of the government of the United Kingdom to conclude a withdrawal agreement with the representatives of the European Union creates a high level of uncertainty in the political, legal and economic environment in the United Kingdom, the European Union and the United States. The Company has significant operations in the United Kingdom and the European Union. Ongoing uncertainty or the conclusion of withdrawal terms that are disadvantageous for the Company could negatively impact the Company's results.

In May 2018, the General Data Protection Regulation (GDPR) went into effect in the European Union. These rules outline a comprehensive set of requirements for businesses that use any personal data in-scope for the regulation, including the use of data solely for sales, marketing, or support purposes and with respect to employee data originating in or processed within the European Economic Area. The Company is subject to the requirements of the GDPR with respect to both customer and employee data, for which non-compliance can result in potentially significant monetary penalties and enhanced regulatory oversight of data practices, as well as the basis for a private right of action and class action claims. If the Company fails to comply with the GDPR or a number of other data protection regulations that apply to the Company's business globally, its reputation may suffer and its financial position, results of operations and cash flows may be negatively impacted.

Sales Forecasts. The Company makes many operational and strategic decisions based upon short- and long-term sales forecasts. The Company's sales personnel continually monitor the status of all proposals, including the estimated closing date and the value of the sale, in order to forecast quarterly sales. These forecasts are subject to significant estimation and are impacted by many external factors, including global economic conditions and the performance of the Company's customers. A variation in actual sales activity from that forecasted could cause the Company to plan or budget incorrectly and, therefore, could adversely affect the Company's business, financial position, results of operations and cash flows. The Company's management team forecasts macroeconomic trends and developments, and integrates them through long-range planning into budgets, research and development strategies and a wide variety of general management duties. Global economic conditions, and the effect those conditions and other disruptions in global markets have on the Company's customers, may have a significant impact on the accuracy of the Company's sales forecasts. These conditions may increase the likelihood or the magnitude of variations between actual sales activity and the Company's sales forecasts and, as a result, the Company's performance may be hindered because of a failure to properly match corporate strategy with economic conditions. This, in turn, may adversely affect the Company's business, financial position, results of operations and cash flows.

Stock Market and Stock Price Volatility. Market prices for securities of software companies have generally been volatile. In particular, the market price of the Company's common stock has been, and may continue to be, subject to significant fluctuations as a result of factors affecting the Company, the software industry or the securities markets in general. Such factors include, but are not limited to, declines in trading price that may be triggered by the Company's failure to meet the expectations of securities analysts and investors. Moreover, the trading price could be subject to additional fluctuations in response to quarter-to-quarter variations in the Company's operating results, material announcements made by the Company or its competitors, conditions in the financial markets or the software industry generally, or other events and factors, many of which are beyond the Company's control.

Rapidly Changing Technology; New Products; Risk of Product Errors. The Company operates in an industry generally characterized by rapidly changing technology and frequent new product introductions, which can render existing products obsolete or unmarketable. A major factor in the Company's future success will be its ability to anticipate technological changes and to develop and introduce, in a timely manner, enhancements to its existing products, products acquired in acquisitions and new products to meet those changes. If the Company is unable to introduce new products and to respond quickly to industry changes, its business, financial position, results of operations and cash flows could be materially, adversely affected.

The introduction and marketing of new or enhanced products requires the Company to manage the transition from existing products in order to minimize disruption in customer purchasing patterns. There can be no assurance that the Company will be successful in developing and marketing, on a timely basis, new products or product enhancements, that the new products will adequately address the changing needs of the marketplace or that the Company will successfully manage the transition from existing products. Software products as complex as those offered by the Company may contain undetected errors when first introduced, or as new versions are released, and the likelihood of errors is increased as a result of the Company's commitment to the frequency of its product releases. There can be no assurance that errors will not be found in any new or enhanced products after the commencement of commercial shipments. Certain products require a higher level of sales and support expertise. Failure of the Company's sales channel, particularly the indirect channel, to obtain this expertise and to sell the new

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product offerings effectively could have an adverse impact on the Company's sales in future periods. Any of these problems may result in the loss of or delay in customer acceptance, diversion of development resources, damage to the Company's reputation, or increased service and warranty costs, any of which could have a material adverse effect on the Company's business, financial position, results of operations and cash flows.

Product Quality. The Company has separate quality systems and registrations under the ISO 9001:2015 standard, in addition to other governmental and industrial regulations. The Company's continued compliance with quality standards and favorable outcomes in periodic examinations is important to retain current customers and vital to procure new sales. If the Company was determined not to be compliant with various regulatory or ISO 9001 standards, its certificates of registration could be suspended, requiring remedial action and a time-consuming re-registration process. Product quality issues or failures could result in the Company's reputation becoming diminished, resulting in a material adverse impact on revenue, operating margins, net income, financial position and cash flows.

Competition. The Company continues to experience competition across all markets for its products and services. Some of the Company's current and possible future competitors have greater financial, technical, marketing and other resources than the Company, and some have well-established relationships with current and potential customers of the Company. The Company's current and possible future competitors also include firms that have competed or may in the future elect to compete by means of open source licensing. Parties among the Company's current or future strategic alliances may diminish or sever technical, software development and marketing relationships with the Company for competitive purposes. These competitive pressures may result in decreased sales volumes, price reductions and/or increased operating costs, and could result in lower revenues, margins and net income.

Research and Development. The Company devotes substantial resources to research and development. New competitors, technological advances in the software development industry by the Company or by competitors, acquisitions, entry into new markets, or other competitive factors may require the Company to invest significantly greater resources than it anticipates. If the Company is required to invest significantly greater resources than anticipated without a corresponding increase in revenue, its operating results could decline. In addition, the Company's periodic research and development expenses may be independent of its level of revenue, which could negatively impact its financial results. Finally, there can be no guarantee that the Company's research and development investments will result in products that create additional revenue.

Changes in the Company's Pricing Models. The intense competition the Company faces in the sales of its products and services, and general economic and business conditions, can put pressure on the Company to adjust its prices. If the Company's competitors offer deep discounts on certain products or services, or develop products that the marketplace considers more valuable, the Company may need to lower prices or offer discounts or other favorable terms in order to compete successfully. Any such changes may reduce operating margins and could adversely affect operating results. The Company's maintenance products, which include software license updates and product support fees, are generally priced as a percentage of its new software license fees. The Company's competitors may offer lower percentage pricing on product updates and support that could put pressure on the Company to further discount its new license or product support prices.

Any broad-based change to the Company's prices and pricing policies could cause new software license and service revenues to decline or be delayed as its sales force implements and its customers adjust to the new pricing policies. Some of the Company's competitors may bundle software products for promotional purposes or as a long-term pricing strategy or provide guarantees of prices, product implementations or wider geographical license usage provisions. These practices could, over time, significantly constrain the prices that the Company can charge for certain products. If the Company does not adapt its pricing models to reflect changes in customer use of its products or changes in customer demand, the Company's new software license revenues could decrease. Additionally, increased distribution of applications through application service providers, including software-as-a-service providers, may reduce the average price for the Company's products or adversely affect other sales of the Company's products, reducing new software license revenues unless the Company can offset price reductions with volume increases. The increase in open source software distribution may also cause the Company to adjust its pricing models.

Dependence on Senior Management and Key Technical Personnel. The Company's success depends upon the continued services of the Company's senior executives, key technical employees and other employees. Each of the Company's executive officers, key technical personnel and other employees could terminate his or her relationship with the Company at any time. The loss of any of the Company's senior executives might significantly delay or prevent the achievement of the Company's business objectives and could materially harm the Company's business and customer relationships.

In addition, because of the highly technical nature of the Company's products, the Company must attract and retain highly skilled engineering and development personnel, many of whom are recruited from outside of the United States. The market for this talent is highly competitive. The Company is limited in its ability to recruit internationally by restrictive domestic immigration laws. If the immigration laws become stricter or the processing of immigration requests becomes more cumbersome or less efficient, or if the Company has less success in recruiting and retaining key personnel, the Company's business, reputation and operating results could be materially and adversely affected.

Dependence on Proprietary Technology. The Company's success is highly dependent upon its proprietary technology. The Company generally relies on contracts and the laws of copyrights, patents, trademarks and trade secrets to protect its technology. The Company maintains a trade secrets program, enters into confidentiality agreements with its employees and channel partners, and limits access to and distribution of its software, documentation and other proprietary information. There can be no assurance that the steps taken by the Company to protect its proprietary technology will be adequate to prevent misappropriation of its technology by third parties, or that third parties will not be able to develop similar technology independently. Costly and time-consuming litigation could be necessary to enforce and determine the scope of trade secret rights and related confidentiality and nondisclosure provisions. Although the Company is not aware that any of its technology infringes upon the rights of third parties, there can be no assurance that other parties will not assert technology infringement claims against the Company or that, if asserted, such claims will not prevail. Any such litigation could be costly to the Company, damage its reputation, and distract the Company’s employees from their daily work. Any successful infringement claims asserted against the Company could require the Company to develop technology workarounds for the impacted products or product development, which could be costly, disrupt product development, and delay go-to-market activities. Such disruption and delay could negatively impact the Company’s results.

Risks Associated with Security of the Company's Products, Source Code and IT Systems. The Company makes significant efforts to maintain and improve the security and integrity of its products, source code, computer systems and data. Despite significant efforts to create security barriers to such programs, it is virtually impossible for the Company to entirely mitigate all risks. There appears to be an increasing number of computer “hackers” developing and deploying a variety of destructive software programs (such as viruses, worms, ransomware and the like) that could attack the Company's products and computer systems. Effective security requires increasingly broad governance that may require involvement of increased numbers of personnel or departments. As a result, the Company may incur costs to increase personnel and technology to prevent such attacks and implement such broader governance. Because the techniques used to obtain unauthorized access to networks or to sabotage systems change frequently and generally are not recognized until launched against a target, the Company may be unable to anticipate these techniques or to implement adequate preventive measures. Like all software products, the Company's communications system and software is vulnerable to such attacks. The impact of such an attack could disrupt the proper functioning of the Company's software products, cause errors in the output of its customers' work, allow unauthorized access to sensitive, proprietary or confidential information of the Company or its customers and employees and result in other destructive outcomes. If this were to occur, the Company's reputation may suffer, customers may stop buying products, the Company could face lawsuits and potential liability, and the Company's financial performance could be negatively impacted.

There is also a danger of industrial espionage, cyber-attacks, misuse, theft of information or assets (including source code), or damage to assets by people who have gained unauthorized access to the Company's facilities, systems or information. This includes phishing, which has become a very prevalent technique. Such cybersecurity breaches, misuse or other disruptions could lead to the disclosure of portions of the Company's product source code or other confidential information, improper usage and distribution of the Company's products without compensation, illegal usage of the Company's products which could jeopardize the security of information stored in and transmitted through its computer systems, and theft, manipulation and destruction of private and proprietary data, resulting in defective products and production downtimes. Although the Company actively employs measures to combat unlicensed copying, access and use of software and intellectual property through a variety of techniques, preventing unauthorized use or infringement of the Company's rights is inherently difficult. These events could adversely affect the Company's financial results or could result in significant claims for damages against it. Participating in lawsuits to protect against any such unauthorized access to, usage of or disclosure of any of the Company's products or any portion of the Company's product source code, or in prosecutions in connection with any such cybersecurity breach, could be costly and time-consuming, and may divert management's attention and adversely affect the market's perception of the Company and its products.

Policing the unauthorized distribution and use of the Company's products is difficult, and software piracy (including online piracy) is a persistent problem. The proliferation of technology designed to circumvent typical software protection measures used in the Company's products, and the possibility of methods that circumvent the techniques it employs in its products, may lead to an expansion in piracy or misuse of its products and intellectual property. As a result, and despite the Company's efforts to prevent such activities, the Company may nonetheless lose significant revenue due to illegal use of its software, and management's attention may be diverted to address specific instances of piracy or misuse, or to address piracy and misuse in general.

A number of the Company's core processes, such as software development, sales and marketing, customer service and financial transactions, rely on its IT infrastructure and applications. The Company also relies upon third-party products, which are exposed to various security vulnerabilities. Malicious software, sabotage and other cybersecurity breaches of the types

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discussed above could cause an outage of the Company's infrastructure, which could lead to a substantial denial of service and ultimately to production downtime, recovery costs and customer claims. This could have a significant negative impact on the Company's business, financial position, profit and cash flows.

The Company has implemented a number of measures designed to ensure the security of its information, IT resources and other assets. Nonetheless, unauthorized users could gain access to its systems through cyber-attacks and steal, use without authorization, and sabotage the Company's intellectual property and confidential data. Any breach of its IT security, misuse or theft could lead to loss of production, recovery costs or litigation brought by employees, customers or business partners, which could have a significant negative impact on the Company's business, financial position, profit, cash flows and reputation.

Implementation of IT Systems. The Company is currently implementing a new Customer Relationship Management (CRM) system. While this system is anticipated to simplify the sales and order processing efforts and to enhance customer service, there is a risk that the project will not achieve the anticipated benefits or that the benefits will not be achieved as quickly as anticipated. There is also a risk that the Company will have to write off previously capitalized expenditures if the project is not successful or if implementation decisions regarding the project are modified. The project implementation timeline and scope may change and become longer and broader as new facets of the design and implementation efforts are undertaken. This may take the attention of key operational management away from other aspects of the business, including the integration of acquisitions, and also result in increased consulting and software costs. These factors may have a significant negative impact on the Company's business, financial position, profit, cash flows and reputation.

Dependence on Channel Partners. The Company continues to distribute a meaningful portion of its products through its global network of independent, regional channel partners. The channel partners sell the Company's software products to new and existing customers, expand installations within the existing customer base, offer consulting services and provide the first line of technical support. Consequently, in certain geographies, the Company is highly dependent upon the efforts of the channel partners. Difficulties in ongoing relationships with channel partners, such as failure to meet performance criteria or to promote the Company's products as aggressively as the Company expects, and differences in the handling of customer relationships, could adversely affect the Company's performance. Additionally, the loss of any major channel partner for any reason, including a channel partner's decision to sell competing products rather than the Company's products, could have a material adverse effect on the Company. Moreover, the Company's future success will depend substantially on the ability and willingness of its channel partners to continue to dedicate the resources necessary to promote the Company's portfolio of products and to support a larger installed base of the Company's products. If the channel partners are unable or unwilling to do so, the Company may be unable to sustain revenue growth.

The Company has been increasing its number of channel partners, particularly in international locations. The business relationships with these channel partners are recently established and could result in additional compliance burdens for the Company. These partners also have a less-established payment history with the Company and revenue from these partners could come with a higher rate of bad debt expense.

During times of significant fluctuations in world currencies, certain channel partners may have solvency issues to the extent that effective hedge strategies are not employed or there is not sufficient working capital. In particular, if the U.S. Dollar strengthens relative to other currencies, certain channel partners who pay the Company in U.S. Dollars may have trouble paying the Company on time or may have trouble distributing the Company's products due to the impact of the currency exchange fluctuation on such channel partner's cash flows. This may impact the Company's ability to distribute its products into certain regions and markets, and may have an adverse effect on the Company's results of operations and cash flows.

Revenue Volatility. As described in Note 3 to the consolidated financial statements included in Part IV, Item 15 of this Annual Report on Form 10-K, the Company adopted ASC 606 effective January 1, 2018, which significantly impacts the Company's timing, allocation and presentation of lease license, perpetual license and maintenance revenue. Under previous revenue guidance, the Company historically maintained stable recurring revenue from the sale of software lease licenses and software maintenance subscriptions. However, under ASC 606, the license component of lease revenue is recognized up front, whereas, it was recognized ratably over the contract under prior guidance. The post-contract support portion of lease license contracts continues to be recognized over the contract term, but it is now allocated to maintenance and service revenue.

The Company continues to sell perpetual licenses that involve the payment of a single, upfront fee. Historically, these licenses have been more typical in the computer software industry and remain as the preferred licensing approach in certain markets. The revenue associated with perpetual licenses continues to be recognized up front, consistent with prior revenue guidance.

The adoption of the new revenue recognition guidance, coupled with the Company's continued sales of perpetual licenses, creates the likelihood for software license revenue volatility to increase across periods, particularly as compared to the Company's results under the previous revenue recognition standard. The Company's revenue in any period will depend significantly on sales contracts completed during that period.

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Renewal Rates for Annual Lease and Maintenance Contracts. A substantial portion of the Company's license and maintenance revenue is derived from annual lease and maintenance contracts. These contracts are generally renewed on an annual basis and typically have a high rate of customer renewal. In addition to the recurring revenue base associated with these contracts, a majority of customers purchasing new perpetual licenses also purchase related annual maintenance contracts. If the rate of renewal for these contracts is adversely affected by economic or other factors, the Company's lease license and maintenance growth will be adversely affected. As a result, the Company's business, financial position, results of operations and cash flows may also be adversely impacted during those periods.

Risks Associated with Acquisitions. Historically, the Company has consummated acquisitions in order to support the Company's long-term strategic direction, accelerate innovation, provide increased capabilities to existing products, supply new products and services, expand its customer base and enhance its distribution channels. The Company has completed a number of acquisitions in recent years and expects to make additional acquisitions in the future, but may not be able to identify suitable acquisition candidates or, if suitable candidates are identified, the Company may not be able to complete the business combination on commercially acceptable terms. The process of exploring and pursuing acquisition opportunities may result in devotion of significant management and financial resources.

Even if the Company is able to consummate acquisitions that it believes will be successful, such transactions present many risks including, among others, difficulty in integrating the management teams, strategies, cultures and operations of the companies; failing to achieve anticipated synergies and revenue increases; difficulty incorporating and integrating the acquired technologies or products with the Company's existing product lines; difficulty in coordinating, establishing or expanding sales, distribution and marketing functions, as necessary; difficulty in training the global sales team to sell the acquired products; failure to develop new products and services that utilize the technologies and resources of the companies; disruption of the Company's ongoing business and diversion of management's attention to transition or integration issues; unanticipated and unknown liabilities; the loss of key employees, customers, partners and channel partners of the Company or of the acquired company, resulting in the loss of key information, expertise or know-how, and unanticipated additional recruitment and training costs; infringement of intellectual property rights; difficulties implementing and maintaining sufficient controls, policies and procedures over the systems, products and processes of the acquired company; and cybersecurity risks. If the Company does not achieve the anticipated benefits of its acquisitions as rapidly or to the extent anticipated by the Company's management and financial or industry analysts, there could be a material adverse effect on the Company's stock price, business, financial position, results of operations and cash flows.

In addition, for companies acquired, limited experience will exist for several quarters following the acquisition relating to how the acquired company's sales pipelines will convert into sales or revenues, and the conversion rate post-acquisition may be quite different than the historical conversion rate. Because a substantial portion of the Company's sales are completed in the latter part of a quarter, and its cost structure is largely fixed in the short-term, revenue shortfalls may have a negative impact on the Company's profitability. A delay in a small number of large, new software license transactions could cause the Company's quarterly software license revenues to fall significantly short of its predictions.

The Company may periodically be involved in business combinations with enterprises that are developmental in nature. While these entities have leading-edge technology, they may not have developed direct or indirect distribution channels and may not have software revenues which cover the ongoing expenses. Therefore, the Company may have a decrease in operating margin and profitability while these types of acquisitions are integrated and the distribution channel incorporates the new product offerings.

As the Company continues to expand through acquisition or strategic transactions, the acquisition of entities or entry into strategic partnerships with companies that will be viewed as competitors by other strategic partners may become more likely. Such acquisitions could have an adverse effect on partnerships or impact sales of the Company's products, which could negatively impact the Company’s results.

Disruption of Operations or Infrastructure Failures. A significant portion of the Company's software development personnel, source code and computer equipment is located at operating facilities in the United States, Canada, India, Japan and throughout Europe. The occurrence of a natural disaster or other unforeseen catastrophe at any of these facilities could cause interruptions in the Company's operations, services and product development activities.

Additionally, if the Company experiences problems that impair its business infrastructure, such as a computer virus, telephone system failure or an intentional disruption of its information technology systems by a third party, these interruptions could have a material adverse effect on the Company's business, financial position, results of operations, cash flows and the ability to meet financial reporting deadlines. Further, because the Company's sales are not generally linear during any quarterly period, the potential adverse effects resulting from any of the events described above or any other disruption of the Company's business could be accentuated if it occurs close to the end of a fiscal quarter.

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Risks Associated with Significant Sales to Existing Customers. A significant portion of the Company's sales includes follow-on sales to existing customers that invest in the Company's broad suite of engineering simulation software and services. If a significant number of current customers were to become dissatisfied with the Company's products and services, or choose to license or utilize competitive offerings, the Company's follow-on sales, and recurring lease and maintenance revenues, could be materially, adversely impacted, resulting in reduced revenue, operating margins, net income and cash flows.

Industry Consolidation. Consolidation in industries that utilize the Company’s software may result in combined workforces
where economies of scale and synergies are achieved, and fewer ANSYS software licenses are required. Consolidation may
also result in the newly combined/surviving entity wanting the most favorable pricing from the former contracts and expecting
larger volume discounts on future purchases. If a customer is acquired by an entity that does not utilize ANSYS in favor of a competing product, the Company may not have future orders from the enterprise. Further, consolidation of the Company's competitors may result in synergies that allow those competitors to benefit from broader sales channels and increased access to capital. Any of these impacts could adversely affect the Company's business, financial position, results of operations and cash flows.

Periodic Reorganization of Sales Force. The Company relies heavily on its direct sales force. From time to time, the Company reorganizes and makes adjustments to its sales leadership and/or its sales force in response to such factors as management changes, performance issues, market opportunities and other considerations. These changes may result in a temporary lack of sales production and may adversely impact revenue in future quarters. There can be no assurance that the Company will not restructure its sales force in future periods or that the transition issues associated with such a restructuring will not occur.

Governmental Revenue Sources. The Company's sales to the United States government must comply with Federal Acquisition Regulations. Failure to comply with these regulations could result in penalties being assessed against the Company or an order preventing the Company from making future sales to the United States government. Further, the Company's international activities must comply with the export control laws of the United States and other countries, the Foreign Corrupt Practices Act, the United Kingdom Bribery Act of 2010 and a variety of other laws and regulations of the United States and other countries in which the Company operates. Failure to comply with any of these laws and regulations could adversely affect the Company's business, financial position, results of operations and cash flows.

In certain circumstances, the United States government, state and local governments and their respective agencies, and certain foreign governments may have the right to terminate contractual arrangements at any time, without cause. The United States, European Union and certain other government contracts, as well as the Company's state and local level contracts, are subject to the approval of appropriations or funding authorizations. Certain of these contracts permit the imposition of various civil and criminal penalties and administrative sanctions, including, but not limited to, termination of contracts, refund of a portion of fees received, forfeiture of profits, suspension of payments, fines and suspensions or debarment from future government business, any of which could have an adverse effect on the Company's results of operations and cash flows.

Contingencies. The Company is subject to various investigations, claims and legal proceedings that arise in the ordinary course of business, including commercial disputes, labor and employment matters, tax audits and litigations, alleged infringement of intellectual property rights and other matters. Use or distribution of the Company’s products could generate product liability, regulatory infraction, or similar claims by the customers or end users of the Company or its indirect sales partners, government entities, or other third parties. Each of these matters is subject to various uncertainties, and it is possible that an unfavorable resolution of one or more of these matters could materially affect the Company's results of operations, cash flows and financial position.

Income Tax Estimates. The Company makes significant estimates in determining its worldwide income tax provision. These estimates involve complex tax regulations in a number of jurisdictions across the Company's global operations and are subject to many transactions and calculations in which the ultimate tax outcome is uncertain. The final

outcome of tax matters could be different than the estimates reflected in the historical income tax provision and related accruals. Such differences could have a material impact on income tax expense and net income in the periods in which such determinations are made.
The amount of income tax paid by the Company is subject to ongoing audits by federal, state and foreign tax authorities. These audits can result in additional assessments, including interest and penalties. The Company's estimate for liabilities associated with uncertain tax positions is highly judgmental and actual future outcomes may result in favorable or unfavorable adjustments to the Company's estimated tax liabilities, including estimates for uncertain tax positions, in the period the assessments are made or resolved, audits are closed or when statutes of limitation on potential assessments expire. As a result, the Company's effective tax rate may fluctuate significantly on a quarterly or annual basis.
The Company allocates a portion of its purchase price to goodwill and intangible assets. Impairment charges associated with goodwill are generally not tax-deductible and will result in an increased effective income tax rate in the period the impairment is recorded. The Company has recorded significant deferred tax liabilities related to acquired intangible assets that are not

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deductible for tax purposes. These deferred tax liabilities are based on future statutory tax rates in the locations in which the intangible assets are recorded. Any future changes in statutory tax rates would be recorded as an adjustment to the deferred tax liabilities in the period the change is announced, and could have a material impact on the Company's effective tax rate during that period.

Changes in Tax Law. The Company's operations are subject to income and transaction taxes in the United States and in multiple foreign jurisdictions. A change in the tax law in the jurisdictions in which the Company does business, including an increase in tax rates, an adverse change in the treatment of an item of income or expense, or a decrease in tax rates in a jurisdiction in which the Company has significant deferred tax assets, could result in a material increase in tax expense. Currently, a substantial portion of the Company's revenue is generated from customers located outside the United States, and a substantial portion of assets are located outside the United States. Changes in existing taxation rules or practices, new taxation rules, or varying interpretations of current taxation practices could have a material adverse effect on the Company's results of operations or the manner in which the Company conducts its business.

Interest Rates. Borrowings under the Company's revolving credit facility use the London Interbank Offering Rate (LIBOR) as a benchmark for establishing the interest rate. LIBOR is the subject of recent national, international and other regulatory guidance and proposals for reform. These reforms and other pressures may cause LIBOR to disappear entirely or to perform differently than in the past. The consequences of these developments cannot be entirely predicted, but could include an increase in the cost of the Company's variable rate indebtedness.

Changes in Existing Financial Accounting Standards. Changes in existing accounting rules or practices, new accounting pronouncements, or varying interpretations of current accounting pronouncements could have a significant adverse effect on the Company's results of operations or the manner in which the Company conducts its business.

In addition, the Company could incur significant costs for changes to its business systems, processes and internal controls as a result of the transition. These costs could have a significant adverse impact on the Company's results of operations and cash flows. The transition could also cause management to divert time from the day-to-day operations of the Company, which could impact the Company's business. If the Company is unable to successfully transition its business systems, processes and internal controls before the guidance effective date, it could impact the ability to meet financial reporting deadlines. For further information on the impact of recently issued accounting guidance on the Company, see Note 2 to the consolidated financial statements included in Part IV, Item 15 of this Annual Report on Form 10-K.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

The Company's executive offices and those related to certain domestic product development, marketing, production and administration are located in a LEED certified, 186,000 square foot office facility in Canonsburg, Pennsylvania. The lease for this facility was effective as of September 14, 2012 and expires on December 31, 2029, excluding any renewal or termination options.

The Company owns: a 70,000 square foot office facility in Lebanon, New Hampshire; a 62,000 square foot office building near its current Canonsburg headquarters; a 59,000 square foot facility in Pune, India; and a 5,000 square foot facility in Apex, North Carolina.

The Company and its subsidiaries also lease office space in various locations throughout the world. The Company owns substantially all equipment used in its facilities. Management believes that, in most geographic locations, its facilities allow for sufficient space to support present and future foreseeable needs, including such expansion and growth as the business may require. In other geographic locations, the Company expects that it will be required to expand capacity beyond that which it currently owns or leases.

The Company's properties and equipment are in good operating condition and are adequate for the Company's current needs. The Company does not anticipate difficulty in renewing existing leases as they expire or in finding alternative facilities.

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ITEM 3. LEGAL PROCEEDINGS

The Company is subject to various investigations, claims and legal proceedings that arise in the ordinary course of business, including commercial disputes, labor and employment matters, tax audits, alleged infringement of intellectual property rights and other matters. In the opinion of the Company, the resolution of pending matters is not expected to have a material adverse effect on the Company's consolidated results of operations, cash flows or financial position. However, each of these matters is subject to various uncertainties and it is possible that an unfavorable resolution of one or more of these proceedings could materially affect the Company's results of operations, cash flows or financial position.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

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PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

The Company's common stock trades on the Nasdaq Global Select Market tier of the Nasdaq Stock Market under the symbol: "ANSS".

On February 15, 2019, there were 132 stockholders of record.

The Company has not paid cash dividends on its common stock as it has retained earnings primarily for acquisitions, for future business opportunities and to repurchase stock when authorized by the Board of Directors and when such repurchase meets the Company's objectives. The Company reviews its policy with respect to the payment of dividends from time to time; however, there can be no assurance that any dividends will be paid in the future.

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Performance Graph

Set forth below is a line graph comparing the yearly percentage change in the cumulative total stockholder return on the Company's common stock, based on the market price per share of the Company's common stock, with the total return of companies included within the Nasdaq Composite Stock Market Index, the Russell 1000 Index, the S&P 500 Stock Index and an industry peer group of four companies (Autodesk, Inc., PTC Inc., Cadence Design Systems, Inc. and Synopsys, Inc.) selected by the Company pursuant to Item 201(e) of Regulation S-K, for the period commencing December 31, 2013 and ending December 31, 2018. The calculation of total cumulative returns assumes a $100 investment in the Company's common stock, the Nasdaq Composite Stock Market Index, the Russell 1000 Index, the S&P 500 Stock Index and the peer group on December 31, 2013, and the reinvestment of all dividends, and accounts for all stock splits. The historical information set forth below is not necessarily indicative of future performance.

ASSUMES $100 INVESTED ON DECEMBER 31, 2013
ASSUMES DIVIDENDS REINVESTED
FIVE FISCAL YEARS ENDING DECEMBER 31, 2018

	As of December 31,					
	2013	2014	2015	2016	2017	2018
ANSYS, Inc.	$100	$94	$106	$106	$169	$164
Nasdaq Composite	$100	$115	$123	$134	$173	$168
Russell 1000 Index	$100	$113	$114	$128	$156	$148
S&P 500 Stock Index	$100	$114	$115	$129	$157	$150
Peer Group	$100	$116	$120	$149	$217	$249

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Equity Compensation Plan Information as of December 31, 2018

Plan Category	(a) Number of Securities to be Issued Upon Exercise of Outstanding Options, Warrants and Rights	(b) Weighted Average Exercise Price of Outstanding Options, Warrants and Rights[(1)]	(c) Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (excluding securities reflected in column (a))
Equity Compensation Plans Approved by Security Holders			
1996 Stock Option and Grant Plan	3,027,267[(2)]	$ 65.46	6,246,619[(3)]
1996 Employee Stock Purchase Plan	(4)	(5)	242,643
Equity Compensation Plans Not Approved by Security Holders[(6)]			
Ansoft Corporation 2006 Stock Incentive Plan	57,242	$ 41.02	—
Apache Design Solutions, Inc. 2001 Stock/Option Issuance Plan	46,963	$ 19.38	—
SpaceClaim Corporation 2005 Stock Incentive Plan	3,471	$ 23.81	—
Gear Design Solutions, Inc. Stock Incentive Plan	4,502	$ 12.26	—
Total	3,139,445		6,489,262

(1) The weighted average exercise price does not take into account the shares for outstanding restricted stock units or deferred stock awards, which have no exercise price.

(2) Includes 1,521,525 shares for outstanding restricted stock units for employees, 1,371,661 shares for outstanding stock options, 13,632 shares for outstanding restricted stock units for non-employee directors and 120,449 shares for deferred stock awards for non-employee directors. Restricted stock units with a performance or market condition are included based on assumed target performance, unless performance is otherwise known.

(3) The number of securities remaining available for future issuance assumes maximum attainment for awards with a performance condition or a market condition.

(4) The number of shares issuable with respect to the current offering period is not determinable until the end of the period.

(5) The per share purchase price of shares issuable with respect to the current offering period is not determinable until the end of the period.

(6) The Company no longer issues awards under equity compensation plans not approved by security holders.

Unregistered Sale of Equity Securities and Use of Proceeds

None.

Issuer Purchases of Equity Securities

Period	Total Number of Shares Purchased	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or	Maximum Number of Shares that May Yet Be Purchased Under Plans or Programs[(1)]

			Programs	
October 1 - October 31, 2018	500,000	$154.03	500,000	3,825,505
November 1 - November 30, 2018	—	$—	—	3,825,505
December 1 - December 31, 2018	—	$—	—	3,825,505
Total	500,000	$154.03	500,000	3,825,505

(1) The Company initially announced its stock repurchase program in February 2000, and subsequently announced various amendments to the program. The most recent amendment to the program, authorizing the repurchase of up to 5,000,000 shares, was approved by the Company's Board of Directors in February 2018. There is no expiration date to this amendment.

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ITEM 6. SELECTED FINANCIAL DATA

The following table sets forth selected financial data as of and for the year ended December 31 for each of the last five years. This selected financial data should be read in conjunction with the consolidated financial statements and related notes included in Part IV, Item 15 of this Annual Report on Form 10-K.

	Year Ended December 31,				
(in thousands, except per share data)	2018[(1)]	2017	2016	2015	2014
Total revenue	$1,293,636	$1,095,250	$988,465	$942,753	$936,021
Operating income	476,574	390,728	376,242	353,679	347,450
Net income	419,375	259,251	265,636	252,521	254,690
Earnings per share – basic	$4.99	$3.05	$3.05	$2.82	$2.77
Weighted average shares – basic	83,973	84,988	87,227	89,561	92,067
Earnings per share – diluted	$4.88	$2.98	$2.99	$2.76	$2.70
Weighted average shares – diluted	85,913	86,854	88,969	91,502	94,194
Total assets	$3,265,964	$2,941,623	$2,800,526	$2,729,904	$2,752,879
Working capital	786,410	661,713	630,301	592,280	617,240
Long-term liabilities	91,650	87,239	53,021	51,331	70,303
Stockholders' equity	2,649,547	2,245,831	2,208,405	2,194,427	2,217,501
Cash provided by operating activities	486,437	430,438	365,980	375,699	399,838

[(1)]Effective January 1, 2018, the Company adopted new guidance on revenue recognition. The Company elected to adopt the change in accounting principle using the modified retrospective approach. Results for reporting periods beginning after January 1, 2018 are presented under the new guidance, while prior period amounts are not adjusted and continue to be reported in accordance with previous guidance. For further information, see Note 3 to the consolidated financial statements included in Part IV, Item 15 of this Annual Report on Form 10-K.

In the table above, the comparability of information among the years presented is impacted by the Company's acquisitions. The operating results of the Company's acquisitions have been included in the results of operations since their respective acquisition dates. For further information, see the "Acquisitions" section of Management's Discussion and Analysis of Financial Condition and Results of Operations in Item 7 and Note 4 to the consolidated financial statements included in Part IV, Item 15 of this Annual Report on Form 10-K.

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ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Overview

Overall GAAP and Non-GAAP Results

The Company's growth rates of GAAP and non-GAAP results for the year ended December 31, 2018 as compared to the year ended December 31, 2017 were as follows:

	GAAP			Non-GAAP		
	Under ASC 605	Impact of ASC 606 Adoption[1]	Total	Under ASC 605	Impact of ASC 606 Adoption[1]	Total
Revenue	11.1 %	7.0 %	18.1 %	12.2 %	6.5 %	18.7 %
Operating income	2.2 %	19.8 %	22.0 %	7.4 %	13.9 %	21.3 %
Diluted earnings per share	39.3 %	24.5 %	63.8 %	32.2 %	16.9 %	49.1 %

[1]The Company adopted Accounting Standards Codification 606 (ASC 606) on January 1, 2018 using the modified retrospective approach for all contracts not completed as of the date of adoption. Results for reporting periods beginning after January 1, 2018 are presented under ASC 606, while prior period amounts are not adjusted and continue to be reported in accordance with ASC 605, Revenue Recognition (ASC 605). The adoption of ASC 606 significantly impacted the timing, allocation and presentation of lease license, perpetual license and maintenance revenue. For further information on the impact of this adoption on the Company's results, see Note 3 to the consolidated financial statements included in Part IV, Item 15 of this Annual Report on Form 10-K.

Under ASC 605, the Company experienced higher revenue during the year ended December 31, 2018 across all classes of revenue, including license revenue, maintenance and services. The Company also experienced increased operating expenses primarily due to increased personnel costs, higher stock-based compensation and OPTIS expenses for the period from the acquisition date (May 2, 2018) through December 31, 2018. These increases were partially offset by restructuring in 2017 that did not reoccur in 2018.

The non-GAAP results exclude the income statement effects of the acquisition accounting adjustment to deferred revenue, stock-based compensation, amortization of acquired intangible assets, restructuring charges, transaction costs related to business combinations, and the impact of the enactment of the Tax Cuts and Jobs Act. For further disclosure regarding non-GAAP results, see the section titled "Non-GAAP Results" immediately preceding the section titled "Liquidity and Capital Resources."

Impact of OPTIS

On May 2, 2018, the Company completed the acquisition of OPTIS. The table presented below reflects the impact of OPTIS from the date of acquisition to December 31, 2018. The operating (loss) income does not include integration costs borne directly by ANSYS, Inc. and its non-OPTIS subsidiaries as a result of the acquisition.

	Year Ended December 31, 2018			
	ASC 606		ASC 605	
(in thousands)	GAAP	Non-GAAP	GAAP	Non-GAAP
Revenue	$18,532	$ 27,261	$12,276	$ 26,703
Operating (loss) income	$(5,462)	$ 4,992	$(11,718)	$ 4,434

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Impact of Foreign Currency

The Company's comparative financial results were impacted by fluctuations in the U.S. Dollar during the year ended December 31, 2018 as compared to the year ended December 31, 2017. The impacts on the Company's revenue and operating income due to currency fluctuations are reflected in the table below. Amounts in brackets indicate an adverse impact from currency fluctuations.

	Year Ended December 31, 2018			
	ASC 606		ASC 605	
(in thousands)	GAAP	Non-GAAP	GAAP	Non-GAAP
Revenue	$14,622	$ 14,647	$14,847	$ 14,884
Operating income	$9,620	$ 9,855	$10,295	$ 10,545

Using ASC 606 and ASC 605 results for the year ended December 31, 2018 and 2017, respectively, the Company's constant currency[(1)] growth rates[(2)] were as follows:

	Year Ended December 31, 2018	
	GAAP	Non-GAAP
Revenue	16.8%	17.3 %
Operating income	19.5%	19.4 %

In constant currency, the Company's growth rates[(2)] under ASC 605 were as follows:

	Year Ended December 31, 2018	
	GAAP	Non-GAAP
Revenue	9.7 %	10.8 %
Operating income	(0.4)%	5.3 %

(1) Constant currency amounts exclude the effect of foreign currency fluctuations on the reported results. To present this information, the 2018 results for entities whose functional currency is a currency other than the U.S. Dollar were converted to U.S. Dollars at rates that were in effect for 2017, rather than the actual exchange rates in effect for 2018.

(2) The constant currency growth rates are calculated by adjusting the 2018 reported revenue and operating income amounts by the 2018 currency fluctuation impacts in the table above and comparing to the 2017 reported revenue and operating income amounts.

Other Financial Information

The Company’s financial position includes $777.4 million in cash and short-term investments, and working capital of $786.4 million as of December 31, 2018.

During the year ended December 31, 2018, the Company repurchased 1.7 million shares for $269.8 million at an average price of $161.12 per share under the Company's stock repurchase program.

Business

ANSYS, a Delaware corporation formed in 1994, develops and globally markets engineering simulation software and services widely used by engineers, designers, researchers and students across a broad spectrum of industries and academia, including aerospace and defense, automotive, electronics, semiconductors, energy, materials and chemical processing, turbomachinery, consumer products, healthcare, and sports. Headquartered south of Pittsburgh, Pennsylvania, the Company and its subsidiaries employed approximately 3,400 people as of December 31, 2018. The Company focuses on the development of open and flexible solutions that enable users to analyze designs directly on the desktop, providing a common platform for fast, efficient and cost-conscious product development, from design concept to final-stage testing and validation. The Company distributes its ANSYS suite of simulation technologies through a global network of independent resellers and distributors (collectively, channel partners) and direct sales offices in strategic, global locations. It is the Company's intention to continue to maintain this hybrid sales and distribution model.

The Company licenses its technology to businesses, educational institutions and governmental agencies. Growth in the Company's revenue is affected by the strength of global economies, general business conditions, currency exchange rate fluctuations, customer budgetary constraints and the competitive position of the Company's products. Please see

Item 1A. Risk

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Factors for a complete discussion of factors that might impact the Company's financial condition and operating results. The Company believes that the features, functionality and integrated multiphysics capabilities of its software products are as strong as they have ever been. However, the software business is generally characterized by long sales cycles. These long sales cycles increase the difficulty of predicting sales for any particular quarter. The Company makes many operational and strategic decisions based upon short- and long-term sales forecasts that are impacted not only by these long sales cycles, but also by current global economic conditions. As a result, the Company believes that its overall performance is best measured by fiscal year results rather than by quarterly results. Please see the sub-section entitled "Sales Forecasts" under Item 1A. Risk Factors for a complete discussion of the potential impact of the Company's sales forecasts on the Company's financial condition, cash flows and operating results.

The Company's management considers the competition and price pressure that it faces in the short- and long-term by focusing on expanding the breadth, depth, ease of use and quality of the technologies, features, functionality and integrated multiphysics capabilities of its software products as compared to its competitors; investing in research and development to develop new and innovative products and increase the capabilities of its existing products; supplying new products and services; focusing on customer needs, training, consulting and support; and enhancing its distribution channels. From time to time, the Company also considers acquisitions to supplement its global engineering talent, product offerings and distribution channels.

Geographic Trends

Compared to the ASC 605 revenue for the year ended December 31, 2017, the Company's geographic revenue growth during the year ended December 31, 2018 was as follows:

	Year Ended December 31, 2018			
	ASC 606		ASC 605	
	Reporting Currency	Constant Currency	Reporting Currency	Constant Currency
Americas	19.4 %	19.4 %	13.7 %	13.7 %
Europe, Middle East and Africa (EMEA)	22.3 %	18.3 %	12.4 %	8.6 %
Asia-Pacific	12.2 %	11.7 %	6.1 %	5.4 %
Total	18.1 %	16.8 %	11.1 %	9.7 %

Due to the change in revenue recognition under ASC 606, the ASC 606 growth rates presented above, which compare the 2018 results under ASC 606 to the 2017 results under ASC 605, are less representative of the underlying operations of each region than those presented under ASC 605.

The Company continues to focus on a number of sales improvement activities across the geographic regions, including sales hiring, pipeline building, productivity initiatives and customer engagement activities.

Industry Commentary:

Due to the continued investments in autonomous vehicles and electrification, the automotive industry remained strong throughout 2018. Investments in smart, connected products and 5G by companies around the globe bolstered the high-tech industry during the year. Increased defense spending in both the United States and Europe supported strong performance in aerospace and defense. The industrial equipment sector saw growth due to the continued focus on efficiency and reliability.

Acquisitions

In February 2019, the Company acquired 100% of the shares of Granta Design Limited (Granta Design) and Helic, Inc. (Helic) for a combined purchase price of approximately $261.5 million. The acquisition of Granta Design, the premier provider of materials information technology, expands the Company's portfolio into this important area, giving customers access to material intelligence, including data that is critical to successful simulations. The acquisition of Helic, the industry-leading provider of electromagnetic crosstalk solutions for systems on chips, combined with the Company's flagship electromagnetic and semiconductor solvers, will provide a comprehensive solution for on-chip, 3D integrated circuit and chip-package-system electromagnetics and noise analysis.

During the year ended December 31, 2018, the Company completed the acquisition of 100% of the shares of OPTIS, a premier provider of software for scientific simulation of light, human vision and physics-based visualization, for a purchase price of $291.0 million, paid in cash. The acquisition extended the Company's portfolio into the area of optical simulation to provide comprehensive sensor solutions, covering visible and infrared light, electromagnetics and acoustics for camera, radar and lidar.

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During the years ended December 31, 2017 and 2016, the Company completed various acquisitions to expand its customer base and accelerate the development of new and innovative products to the marketplace while lowering design and engineering costs for customers. The acquisitions were not individually significant. The combined purchase prices of the acquisitions purchased during the years ended December 31, 2017 and 2016 were approximately $67.0 million and $10.3 million, respectively.

For further information on the Company's business combinations during the years ended December 31, 2018, 2017 and 2016, see Note 4 to the consolidated financial statements included in Part IV, Item 15 of this Annual Report on Form 10-K.

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Results of Operations

For purposes of the following discussion and analysis, the table below sets forth certain consolidated financial data for the years 2018, 2017 and 2016. The operating results of the Company's acquisitions have been included in the results of operations since their respective acquisition dates.

	Year Ended December 31,			
(in thousands)	2018 (ASC 606)	2018 (ASC 605)	2017 (ASC 605)	2016 (ASC 605)
Revenue:				
Software licenses	$576,717	$676,846	$624,964	$568,174
Maintenance and service	716,919	539,623	470,286	420,291
Total revenue	1,293,636	1,216,469	1,095,250	988,465
Cost of sales:				
Software licenses	18,619	36,852	34,421	28,860
Amortization	27,034	27,034	36,794	38,092
Maintenance and service	110,232	91,999	78,949	79,908
Total cost of sales	155,885	155,885	150,164	146,860
Gross profit	1,137,751	1,060,584	945,086	841,605
Operating expenses:				
Selling, general and administrative	413,580	413,580	338,640	269,515
Research and development	233,802	233,802	202,746	183,093
Amortization	13,795	13,795	12,972	12,755
Total operating expenses	661,177	661,177	554,358	465,363
Operating income	476,574	399,407	390,728	376,242
Interest income	11,419	11,419	6,962	4,209
Other expense, net	(908)	(908)	(1,996)	(136)
Income before income tax provision	487,085	409,918	395,694	380,315
Income tax provision	67,710	53,067	136,443	114,679
Net income	$419,375	$356,851	$259,251	$265,636

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Year Ended December 31, 2018 Compared to Year Ended December 31, 2017

Revenue:

	Year Ended December 31,		Change		
(in thousands, except percentages)	2018 (ASC 606)	2017 (ASC 605)	Amount	%	Constant Currency %
Revenue:					
Lease licenses	$275,619	$376,886	$(101,267)	(26.9)	(27.4)
Perpetual licenses	301,098	248,078	53,020	21.4	20.2
Software licenses	576,717	624,964	(48,247)	(7.7)	(8.5)
Maintenance	676,883	440,428	236,455	53.7	51.6
Service	40,036	29,858	10,178	34.1	33.1
Maintenance and service	716,919	470,286	246,633	52.4	50.4
Total revenue	$1,293,636	$1,095,250	$198,386	18.1	16.8

The adoption of ASC 606 significantly impacted the timing, allocation and presentation of lease license, perpetual license and maintenance revenue. For further information on the impact of this adoption on the Company's results, see Note 3 to the consolidated financial statements included in Part IV, Item 15 of this Annual Report on Form 10-K.

For purposes of comparability, the changes in the following table and the related discussion that follows are presented in accordance with ASC 605.

	Year Ended December 31,		Change		
(in thousands, except percentages)	2018 (ASC 605)	2017 (ASC 605)	Amount	%	Constant Currency %
Revenue:					
Lease licenses	$421,268	$376,886	$44,382	11.8	10.7
Perpetual licenses	255,578	248,078	7,500	3.0	2.0
Software licenses	676,846	624,964	51,882	8.3	7.2
Maintenance	499,510	440,428	59,082	13.4	11.6
Service	40,113	29,858	10,255	34.3	33.4
Maintenance and service	539,623	470,286	69,337	14.7	13.0
Total revenue	$1,216,469	$1,095,250	$121,219	11.1	9.7

The Company’s ASC 605 revenue in the year ended December 31, 2018 increased 11.1% as compared to the year ended December 31, 2017, while revenue grew 9.7% in constant currency. The growth rate was favorably impacted by the Company’s continued investment in its global sales, support and marketing organizations; continued progress with market segmentation and go-to-market adjustments; and the May 2018 acquisition of OPTIS. Lease license revenue increased 11.8%, or 10.7% in constant currency, as compared to the year ended December 31, 2017. Perpetual license revenue, which is derived primarily from new sales during the year, increased 3.0%, or 2.0% in constant currency, as compared to the year ended December 31, 2017. Annual maintenance contracts that were sold with new perpetual licenses, along with maintenance contracts for perpetual licenses sold in previous quarters, contributed to maintenance revenue growth of 13.4%, or 11.6% in constant currency. Service revenue, driven primarily by a focus on service offerings that provide on-site mentorship on simulation best practices, training and expanding simulation adoption, increased 34.3%, or 33.4% in constant currency, as compared to the year ended December 31, 2017.

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With respect to revenue, on average for the year ended December 31, 2018, the U.S. Dollar was approximately 2.3% weaker and 2.6% weaker, when measured against the Company’s primary foreign currencies, than for the year ended December 31, 2017 under ASC 606 and ASC 605, respectively. The table below presents the impacts of currency fluctuations on revenue for the year ended December 31, 2018. Amounts in brackets indicate a net adverse impact from currency fluctuations.

	Year Ended December 31, 2018	
(in thousands)	ASC 606	ASC 605
Euro	$12,498	$11,915
Japanese Yen	2,088	2,075
South Korean Won	918	1,182
British Pound	870	1,083
Indian Rupee	(1,623)	(1,372)
Other	(129)	(36)
Total	$14,622	$14,847

The net overall weaker U.S. Dollar also resulted in increased operating income of $9.6 million and $10.3 million for the year ended December 31, 2018 as compared to the year ended December 31, 2017 under ASC 606 and ASC 605, respectively.

A substantial portion of the Company's lease license and maintenance revenue is derived from annual lease and maintenance contracts. These contracts are generally renewed on an annual basis and have a high rate of customer renewal. In addition to the recurring revenue base associated with these contracts, a majority of customers purchasing new perpetual licenses also purchase related annual maintenance contracts. As a result of the significant recurring revenue base, the Company's lease license and maintenance revenue growth rate in any period does not necessarily correlate to the growth rate of new licenses sold during that period under ASC 605. The same is true for maintenance revenue growth under ASC 606. However, under ASC 606, lease license revenue is entirely attributed to license sales completed during the period, resulting in a higher correlation of lease license revenue growth to the growth rate of new lease license sales than that under ASC 605. To the extent the rate of customer renewal for lease and maintenance contracts is high, incremental lease contracts, and maintenance contracts sold with new perpetual licenses, will result in lease license and maintenance growth in constant currency. Conversely, if the rate of renewal for these contracts is adversely affected by economic or other factors, the Company's lease license and maintenance growth will be adversely affected.

The Company has been experiencing an increased interest by some of its larger customers in enterprise agreements that often include longer-term, time-based licenses involving a larger number of the Company's software products. While these arrangements typically involve a higher overall transaction price, the revenue from these contracts is typically deferred and recognized over the period of the contract under ASC 605, resulting in increased deferred revenue and backlog. To the extent these types of contracts replace sales of perpetual licenses, there could be a near-term adverse impact on software license and maintenance revenue growth. Under ASC 606, the upfront recognition of license revenue related to these larger, multi-year transactions can result in significantly higher lease license revenue volatility. As software products, across a large variety of applications and industries, become increasingly distributed in software-as-a-service, cloud and other subscription environments in which the licensing approach is time-based rather than perpetual, the Company is also experiencing a shifting preference from perpetual licenses to time-based licenses across a broader spectrum of its customers, particularly in the more mature geographic markets, such as the U.S. and Japan.

As a percentage of revenue, the Company's international and domestic revenues, and the Company's direct and indirect revenues, are as follows:

	Year Ended December 31,		
	2018	2018	2017

	(ASC 606)	(ASC 605)	(ASC 605)
International	60.9%	60.5%	61.9%
Domestic	39.1%	39.5%	38.1%
Direct revenue	77.6%	76.5%	75.2%
Indirect revenue	22.4%	23.5%	24.8%

In valuing deferred revenue on the balance sheets of the Company's recent acquisitions as of their respective acquisition dates, the Company applied the fair value provisions applicable to the accounting for business combinations, resulting in a reduction

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of deferred revenue as compared to its historical carrying amount. As a result, the Company's post-acquisition revenue will be less than the sum of what would have otherwise been reported by ANSYS and each acquiree absent the acquisitions. Under ASC 606, the impacts on reported revenue were $9.4 million for the year ended December 31, 2018. The expected impacts on reported revenue, including an estimate for the Granta and Helic acquisitions, are $2.2 million and $6.5 million for the quarter ending March 31, 2019 and the year ending December 31, 2019, respectively. The Company has not yet performed a valuation of the Granta and Helic acquired deferred revenue. Until such valuation is completed, the expected impacts on revenue will remain preliminary estimates that are likely to change. Under ASC 605, the impacts on reported revenue were $15.6 million and $2.9 million for the years ended December 31, 2018 and 2017, respectively.

Cost of Sales and Operating Expenses:

The tables below reflect the Company's operating results as presented on the consolidated statements of income, which are inclusive of foreign currency translation impacts. The adoption of ASC 606 resulted in a reclassification of expenses within cost of sales from software licenses to maintenance and service. Amounts included in the discussion that follows are provided in constant currency and do not include the impact of the OPTIS acquisition. The impact of the OPTIS acquisition on each expense line is provided separately, where material. The impact, where material, of foreign exchange translation on each expense line is also provided separately and is inclusive of the OPTIS acquisition.

	Year Ended December 31,					
	2018		2017		Change	
(in thousands, except percentages)	Amount	% of Revenue	Amount	% of Revenue	Amount	%
Cost of sales:						
Software licenses	$18,619	1.4	$34,421	3.1	$(15,802)	(45.9)
Amortization	27,034	2.1	36,794	3.4	(9,760)	(26.5)
Maintenance and service	110,232	8.5	78,949	7.2	31,283	39.6
Total cost of sales	155,885	12.1	150,164	13.7	5,721	3.8
Gross profit	$1,137,751	87.9	$945,086	86.3	$192,665	20.4

Software Licenses: The net decrease in the cost of software licenses was primarily due to the following:

- Reclassification of $18.2 million of cost of sales, previously reflected within software licenses, to maintenance and service due to the adoption of ASC 606 in 2018.
- OPTIS-related software license expenses of $1.6 million for the period from the acquisition date (May 2, 2018) through December 31, 2018.

Amortization: The decrease in amortization expense was primarily due to a net decrease in the amortization of trade names and acquired technology due to assets that became fully amortized.

Maintenance and Service: The increase in maintenance and service costs was primarily due to the following:

- Reclassification of $18.2 million of cost of sales, previously reflected within software licenses, to maintenance and service due to the adoption of ASC 606 in 2018.
- Increased third-party technical support of $5.5 million.
- OPTIS-related maintenance and service expenses of $2.8 million for the period from the acquisition date (May 2, 2018) through December 31, 2018.
- Increased salaries of $2.1 million.

The improvement in gross profit was a result of the increase in revenue, partially offset by the increase in the related cost of sales.

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(in thousands, except percentages)	Year Ended December 31, 2018 Amount	% of Revenue	2017 Amount	% of Revenue	Change Amount	%
Operating expenses:						
Selling, general and administrative	$413,580	32.0	$338,640	30.9	$74,940	22.1
Research and development	233,802	18.1	202,746	18.5	31,056	15.3
Amortization	13,795	1.1	12,972	1.2	823	6.3
Total operating expenses	$661,177	51.1	$554,358	50.6	$106,819	19.3

Selling, General and Administrative: The net increase in selling, general and administrative costs was primarily due to the following:

- Increased salaries, incentive compensation and other headcount-related costs of $35.2 million.
- Increased stock-based compensation of $15.3 million.
- OPTIS-related selling, general and administrative expenses of $13.8 million for the period from the acquisition date (May 2, 2018) through December 31, 2018.
- Increased business travel of $3.9 million.
- Increased severance expenses of $3.7 million.
- Decreased consulting costs of $7.1 million.

The Company anticipates that it will continue to make targeted investments in its global sales and marketing organizations and its global business infrastructure to enhance and support its revenue-generating activities.

Research and Development: The net increase in research and development costs was primarily due to the following:

- Increased salaries, incentive compensation and other headcount-related costs of $15.2 million.
- Increased stock-based compensation of $11.6 million.
- OPTIS-related research and development expenses of $5.9 million for the period from the acquisition date (May 2, 2018) through December 31, 2018.
- Increased IT maintenance and software hosting costs of $1.5 million.
- Restructuring costs of $6.8 million related to 2017 workforce realignment activities that did not reoccur in 2018.

The Company has traditionally invested significant resources in research and development activities and intends to continue to make investments in expanding the ease of use and capabilities of its broad portfolio of simulation software products.

Interest Income: Interest income for the year ended December 31, 2018 was $11.4 million as compared to $7.0 million for the year ended December 31, 2017. Interest income increased as a result of an increase in the average rate of return on invested cash balances.

Other Expense, net: The Company's other expense, net consists of the following:

(in thousands)	Year Ended December 31, 2018	2017
Foreign currency losses, net	$(3,058)	$(1,935)
Investment gains, net	2,204	24
Other	(54)	(85)
Total other expense, net	$(908)	$(1,996)

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Income Tax Provision: The Company's income before income tax provision, income tax provision and effective tax rate were as follows:

(in thousands, except percentages)	Year Ended December 31, 2018 (ASC 606)	2018 (ASC 605)	2017 (ASC 605)
Income before income tax provision	$487,085	$409,918	$395,694
Income tax provision	$67,710	$53,067	$136,443
Effective tax rate	13.9 %	12.9 %	34.5 %

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (Tax Reform). Tax Reform makes broad and complex changes to the U.S. tax code, including, but not limited to, (1) reducing the U.S. federal corporate tax rate from 35 percent to 21 percent; (2) requiring companies to pay a one-time federal income tax on certain unrepatriated earnings of foreign subsidiaries (transition tax); (3) generally eliminating U.S. federal income taxes on dividends from foreign subsidiaries; (4) creating a new provision designed to tax global intangible low-taxed income (GILTI) which allows for the possibility of using foreign tax credits (FTCs) and a deduction of up to 50 percent to offset the income tax liability (subject to some limitations); (5) repealing the domestic production activity deduction; (6) creating the foreign-derived intangible income deduction; (7) creating the base erosion anti-abuse tax, a new minimum tax; (8) allowing for full expensing of qualified property through bonus depreciation; and (9) creating limitations on the deductibility of certain executive compensation.

The SEC staff issued Staff Accounting Bulletin (SAB) 118, which provides guidance on accounting for the tax effects of Tax Reform. SAB 118 provided a measurement period that was limited to one year from enactment for companies to complete the accounting under ASC 740, Income Taxes. In accordance with SAB 118, throughout the measurement period, a company must reflect the income tax effects of those aspects of Tax Reform for which the accounting under ASC 740 was complete in the financial statements. To the extent that a company's accounting for certain income tax effects of Tax Reform was incomplete, but a reasonable estimate was able to be made, the company must record a provisional estimate in the financial statements. If a company could not determine a provisional estimate to be included in the financial statements, it should continue to apply ASC 740 on the basis of the tax laws that were in effect immediately before the enactment of Tax Reform.

As further discussed below, the Company finalized its provisional Tax Reform calculations as of the end of the measurement period, based on guidance and information available as of the reporting date. The U.S. government has not yet issued final guidance related to the new rules enacted as part of Tax Reform. Subsequent adjustments, if any, will be recorded in the period in which guidance is finalized.

The Company's accounting for the impact of the reduction in the U.S. federal corporate tax rate on the Company's deferred tax assets and liabilities is complete. Tax Reform reduced the corporate tax rate to 21 percent, effective January 1, 2018. Consequently, the Company recorded a net adjustment to deferred income tax expense of $1.9 million for the year ended December 31, 2017 to revalue the Company's deferred tax assets and liabilities. No further adjustments were recorded for the year ended December 31, 2018.

The Company's accounting for the transition tax is complete. Reasonable estimates of certain effects were calculated and a provisional adjustment of $16.0 million was recorded in the December 31, 2017 financial statements. To determine the amount of the transition tax, the Company determined, in addition to other factors, the amount of post-1986 earnings and profits (E&P) of the relevant subsidiaries, as well as the amount of non-U.S. income taxes paid on such earnings. Based on revised E&P calculations updated during the measurement period, the Company recognized an additional measurement-period adjustment of $0.9 million to the transition tax obligation and a corresponding adjustment to tax expense, resulting in a total transition tax obligation of $16.9 million. The Company has elected to pay this liability over eight years; however, in accordance with IRS issued guidance, tax overpayments from the year ended December 31, 2017 are required to be applied to the transition tax obligation. Based on this guidance, $15.6 million of the obligation has been paid, with the remaining $1.3 million recorded in other long-term liabilities at December 31, 2018.

The Company's accounting for the indefinite reinvestment assertion is complete. In general, it is the practice and intention of the Company to repatriate previously taxed earnings in excess of working capital needs and to reinvest all other earnings of its non-U.S. subsidiaries. As part of Tax Reform, the Company incurred U.S. tax on substantially all of the earnings of its non-U.S. subsidiaries as part of the transition tax. This tax increased the Company's previously taxed earnings and allows for the repatriation of the majority of its foreign earnings without any residual U.S. federal tax. The Company does not believe that there is an excess of the financial reporting basis over the tax basis of investments in foreign subsidiaries. Accordingly, any repatriation in excess of previously taxed earnings will be a non-taxable return of basis. During the year ended December 31, 2018, the Company repatriated $144.3 million of foreign cash. The Company has not made any measurement-period adjustments related to its indefinite reinvestment assertion during the year ended December 31, 2018.

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The Company’s accounting policy choice for GILTI is complete. Under U.S. GAAP, the Company is allowed to make an accounting policy choice of either (1) treating taxes due on future U.S. inclusions in taxable income related to GILTI as a current-period expense when incurred (the period cost method) or (2) factoring such amounts into the Company’s measurement of its deferred taxes (the deferred method). The Company selected the period cost method and recorded GILTI tax expense of $0.4 million in the financial statements for the year ended December 31, 2018.
The decrease in the effective tax rate from the prior year is primarily due to the reduction in the U.S. federal corporate tax rate from 35 percent to 21 percent enacted as part of Tax Reform, the additional $15.1 million of transition tax in 2017 when compared to 2018, and a net $6.7 million benefit related to global legal entity restructuring activities. The effective tax rate was also reduced by the foreign-derived intangible income deduction, increased research and development credits and increased stock-based compensation benefits, partially offset by the loss of the domestic manufacturing deduction, which was repealed as part of Tax Reform. When compared to the federal and state combined statutory rate, the effective tax rates for the years ended December 31, 2018 and 2017 were favorably impacted by tax benefits from stock-based compensation and research and development credits.
Net Income: The Company's net income, diluted earnings per share and weighted average shares used in computing diluted earnings per share were as follows:

	Year Ended December 31,		
(in thousands, except per share data)	2018 (ASC 606)	2018 (ASC 605)	2017 (ASC 605)
Net income	$419,375	$356,851	$259,251
Diluted earnings per share	$4.88	$4.15	$2.98
Weighted average shares outstanding - diluted	85,913	85,913	86,854

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Year Ended December 31, 2017 Compared to Year Ended December 31, 2016
Revenue:

	Year Ended December 31,		Change		
(in thousands, except percentages)	2017	2016	Amount	%	Constant Currency %
Revenue:					
Lease licenses	$376,886	$340,331	$36,555	10.7	10.8
Perpetual licenses	248,078	227,843	20,235	8.9	7.6
Software licenses	624,964	568,174	56,790	10.0	9.5
Maintenance	440,428	394,745	45,683	11.6	11.0
Service	29,858	25,546	4,312	16.9	16.0
Maintenance and service	470,286	420,291	49,995	11.9	11.3
Total revenue	$1,095,250	$988,465	$106,785	10.8	10.3

The Company's revenue increased 10.8%, or 10.3% in constant currency, during the year ended December 31, 2017 as compared to the year ended December 31, 2016. The growth rate was favorably impacted by the Company's continued investment in its global sales, support and marketing organizations. Lease license revenue increased 10.7%, or 10.8% in constant currency, as compared to the prior year. Perpetual license revenue, which is derived primarily from new sales, increased 8.9%, or 7.6% in constant currency, as compared to the prior year. Annual maintenance contracts that were sold with new perpetual licenses, along with maintenance contracts sold with new perpetual licenses in previous years, contributed to maintenance revenue growth of 11.6%, or 11.0% in constant currency. Service revenue, primarily composed of consulting projects, increased 16.9%, or 16.0% in constant currency.

With respect to revenue, on average for the year ended December 31, 2017, the U.S. Dollar was 1.0% weaker, when measured against the Company's primary foreign currencies, than for the year ended December 31, 2016. The table below presents the impacts of currency fluctuations on revenue for the year ended December 31, 2017. Amounts in brackets indicate a net adverse impact from currency fluctuations.

(in thousands)	Year Ended December 31, 2017
Euro	$ 6,634
South Korean Won	1,439
Taiwan Dollar	886
Indian Rupee	838
Japanese Yen	(3,416)
British Pound	(1,316)
Other	329
Total	$ 5,394

The net overall weaker U.S. Dollar also resulted in increased operating income of $3.5 million for the year ended December 31, 2017 as compared to the year ended December 31, 2016.

As a percentage of revenue, the Company's international and domestic revenues, and the Company's direct and indirect revenues, are as follows:

	Year Ended December 31,	
	2017	2016
International	61.9%	62.8%
Domestic	38.1%	37.2%
Direct revenue	75.2%	75.6%
Indirect revenue	24.8%	24.4%

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In valuing deferred revenue on the balance sheets of the Company's recent acquisitions as of their respective acquisition dates, the Company applied the fair value provisions applicable to the accounting for business combinations, resulting in a reduction of deferred revenue as compared to its historical carrying amount. As a result, the Company's post-acquisition revenue will be less than the sum of what would have otherwise been reported by ANSYS and each acquiree absent the acquisitions. The impacts on reported revenue for the years ended December 31, 2017 and 2016 were $2.9 million and $0.1 million, respectively.

Cost of Sales and Operating Expenses:

The tables below reflect the Company's operating results as presented on the consolidated statements of income, which are inclusive of foreign currency translation impacts. Amounts included in the discussion that follows are provided in constant currency. The impact, where material, of foreign exchange translation on each expense line is provided separately.

	Year Ended December 31,					
	2017		2016		Change	
(in thousands, except percentages)	Amount	% of Revenue	Amount	% of Revenue	Amount	%
Cost of sales:						
Software licenses	$34,421	3.1	$28,860	2.9	$5,561	19.3
Amortization	36,794	3.4	38,092	3.9	(1,298)	(3.4)
Maintenance and service	78,949	7.2	79,908	8.1	(959)	(1.2)
Total cost of sales	150,164	13.7	146,860	14.9	3,304	2.2
Gross profit	$945,086	86.3	$841,605	85.1	$103,481	12.3

Software Licenses: The increase in the cost of software licenses was primarily due to the following:

- Increased third-party royalties of $2.9 million.
- Increased salaries and other headcount-related costs of $1.6 million.
- Increased restructuring costs of $0.6 million.

Amortization: The decrease in amortization expense was primarily due to a net decrease in the amortization of acquired technology, partially offset by an increase in the amortization of trade names.

Maintenance and Service: The net decrease in maintenance and service costs was primarily due to the following:

- Decreased salaries and other headcount-related costs of $4.0 million, primarily due to a redeployment of technical personnel resources to pre-sales activities.
- Decreased depreciation and facility costs, each of $0.6 million.
- Increased third-party technical support of $2.1 million.
- Increased restructuring costs of $1.7 million.
- Increased stock-based compensation of $1.0 million.

The improvement in gross profit was a result of the increase in revenue, partially offset by the increase in the related cost of sales.

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	Year Ended December 31,					
	2017		2016		Change	
(in thousands, except percentages)	Amount	% of Revenue	Amount	% of Revenue	Amount	%
Operating expenses:						
Selling, general and administrative	$338,640	30.9	$269,515	27.3	$69,125	25.6
Research and development	202,746	18.5	183,093	18.5	19,653	10.7
Amortization	12,972	1.2	12,755	1.3	217	1.7
Total operating expenses	$554,358	50.6	$465,363	47.1	$88,995	19.1

Selling, General and Administrative: The increase in selling, general and administrative costs was primarily due to the following:

- Increased salaries, incentive compensation and other headcount-related costs of $42.1 million.
- Increased stock-based compensation of $14.8 million.
- Increased consulting costs of $7.3 million.

Research and Development: The increase in research and development costs was primarily due to the following:

- Increased salaries, incentive compensation and other headcount-related costs of $9.6 million.
- Increased restructuring costs of $6.5 million.
- Increased stock-based compensation of $3.8 million.

Interest Income: Interest income for the year ended December 31, 2017 was $7.0 million as compared to $4.2 million for the year ended December 31, 2016. Interest income increased as a result of an increase in both the Company's average invested cash balances and the average rate of return on those balances.

Other Expense, net: The Company's other expense, net consists of the following:

	Year Ended December 31,	
(in thousands)	2017	2016
Foreign currency (losses) gains, net	$(1,935)	$77
Other	(61)	(213)
Total other expense, net	$(1,996)	$(136)

Income Tax Provision: The Company's income before income tax provision, income tax provision and effective tax rate were as follows:

	Year Ended December 31,	
(in thousands, except percentages)	2017	2016
Income before income tax provision	$395,694	$380,315
Income tax provision	$136,443	$114,679
Effective tax rate	34.5 %	30.2 %

The increase in the effective tax rate from the prior year is primarily due to tax charges of $17.9 million related to Tax Reform, partially offset by increased tax benefits of $13.1 million related to stock-based compensation in 2017. In addition, the 2016 effective tax rate was reduced by entity structuring and related repatriation benefits of $10.8 million that did not reoccur in 2017. In the first quarter of 2017, the Company adopted ASU 2016-09, Compensation - Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting, which requires excess tax benefits and deficiencies related to stock-based compensation to be reflected in the income statement as a component of the provision for income taxes. Previously, these tax effects were reflected in stockholders' equity.

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When compared to the federal and state combined statutory rate, the effective tax rates for the years ended December 31, 2017 and 2016 were favorably impacted by the domestic manufacturing deduction and research and development credits. The rates were also favorably impacted by the recurring item of lower statutory tax rates in many of the Company's foreign jurisdictions.

Net Income: The Company's net income, diluted earnings per share and weighted average shares used in computing diluted earnings per share were as follows:

	Year Ended December 31,	
(in thousands, except per share data)	2017	2016
Net income	$259,251	$265,636
Diluted earnings per share	$2.98	$2.99
Weighted average shares outstanding - diluted	86,854	88,969

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Non-GAAP Results

The Company provides non-GAAP revenue, non-GAAP operating income, non-GAAP operating profit margin, non-GAAP net income and non-GAAP diluted earnings per share as supplemental measures to GAAP regarding the Company's operational performance. These financial measures exclude the impact of certain items and, therefore, have not been calculated in accordance with GAAP. A detailed explanation and a reconciliation of each non-GAAP financial measure to its most comparable GAAP financial measure are described below.

	ASC 606			
	Year Ended December 31, 2018			
(in thousands, except percentages and per share data)	GAAP Results	Adjustments		Non-GAAP Results
Total revenue	$1,293,636	$ 9,442	(1)	$1,303,078
Operating income	476,574	141,442	(2)	618,016
Operating profit margin	36.8 %			47.4 %
Net income	$419,375	$ 94,510	(3)	$513,885
Earnings per share – diluted:				
Earnings per share	$4.88			$5.98
Weighted average shares	85,913			85,913

(1) Amount represents the revenue not reported during the period as a result of the acquisition accounting adjustment associated with the accounting for deferred revenue in business combinations.

(2) Amount represents $83.3 million of stock-based compensation expense, $4.3 million of excess payroll taxes related to stock-based awards, $40.8 million of amortization expense associated with intangible assets acquired in business combinations, $3.5 million of transaction expenses related to business combinations and the $9.4 million adjustment to revenue as reflected in (1) above.

(3) Amount represents the impact of the adjustments to operating income referred to in (2) above, decreased for the related income tax impact of $47.9 million and increased for a measurement-period adjustment related to the Tax Cuts and Jobs Act of $0.9 million and rabbi trust expense of $0.1 million.

	ASC 605							
	Year Ended December 31,							
	2018				2017			
(in thousands, except percentages and per share data)	As Reported	Adjustments		Non-GAAP Results	As Reported	Adjustments		Non-GAAP Results
Total revenue	$1,216,469	$ 15,583	(1)	$1,232,052	$1,095,250	$ 2,856	(4)	$1,098,106
Operating income	399,407	147,583	(2)	546,990	390,728	118,567	(5)	509,295
Operating profit margin	32.8 %			44.4 %	35.7 %			46.4 %
Net income	$356,851	$ 98,832	(3)	$455,683	$259,251	$ 88,663	(6)	$347,914
Earnings per share – diluted:								
Earnings per share	$4.15			$5.30	$2.98			$4.01
Weighted average shares	85,913			85,913	86,854			86,854

(1) Amount represents the revenue not reported during the period as a result of the acquisition accounting adjustment associated with the accounting for deferred revenue in business combinations.

(2) Amount represents $83.3 million of stock-based compensation expense, $4.3 million of excess payroll taxes related to stock-based awards, $40.8 million of amortization expense associated with intangible assets acquired in business combinations, $3.5 million of transaction expenses related to business combinations and the $15.6 million adjustment to revenue as reflected in (1) above.

(3) Amount represents the impact of the adjustments to operating income referred to in (2) above, decreased for the related income tax impact of $49.7 million and increased for a measurement-period adjustment related to the Tax Cuts and Jobs Act of $0.9 million and rabbi trust expense of $0.1 million.

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(4) Amount represents the revenue not reported during the period as a result of the acquisition accounting adjustment associated with the accounting for deferred revenue in business combinations.

(5) Amount represents $53.2 million of stock-based compensation expense, $49.8 million of amortization expense associated with intangible assets acquired in business combinations, $11.7 million of restructuring charges, $1.1 million of transaction expenses related to business combinations and the $2.9 million adjustment to revenue as reflected in (4) above.

(6) Amount represents the impact of the adjustments to operating income referred to in (5) above, decreased for the related income tax impact of $52.5 million, excluding the impact of the Tax Cuts and Jobs Act, and rabbi trust income of $0.1 million, and increased for total net impacts of the Tax Cuts and Jobs Act of $22.7 million.

	ASC 605									
	Year Ended December 31,									
	2017					2016				
(in thousands, except percentages and per share data)	As Reported	Adjustments		Non-GAAP Results		As Reported	Adjustments		Non-GAAP Results	
Total revenue	$1,095,250	$ 2,856	(1)	$1,098,106		$988,465	$ 103	(4)	$988,568	
Operating income	390,728	118,567	(2)	509,295		376,242	88,114	(5)	464,356	
Operating profit margin	35.7 %			46.4	%	38.1 %			47.0	%
Net income	$259,251	$ 88,663	(3)	$347,914		$265,636	$ 57,286	(6)	$322,922	
Earnings per share – diluted:										
Earnings per share	$2.98			$4.01		$2.99			$3.63	
Weighted average shares	86,854			86,854		88,969			88,969	

(1) Amount represents the revenue not reported during the period as a result of the acquisition accounting adjustment associated with the accounting for deferred revenue in business combinations.

(2) Amount represents $53.2 million of stock-based compensation expense, $49.8 million of amortization expense associated with intangible assets acquired in business combinations, $11.7 million of restructuring charges, $1.1 million of transaction expenses related to business combinations and the $2.9 million adjustment to revenue as reflected in (1) above.

(3) Amount represents the impact of the adjustments to operating income referred to in (2) above, decreased for the related income tax impact of $52.5 million, excluding the impact of the Tax Cuts and Jobs Act, and rabbi trust income of $0.1 million, and increased for total net impacts of the Tax Cuts and Jobs Act of $22.7 million.

(4) Amount represents the revenue not reported during the period as a result of the acquisition accounting adjustment associated with the accounting for deferred revenue in business combinations.

(5) Amount represents $50.8 million of amortization expense associated with intangible assets acquired in business combinations, $33.3 million of stock-based compensation expense, $3.4 million of restructuring charges, $0.4 million of transaction expenses related to business combinations and the $0.1 million adjustment to revenue as reflected in (4) above.

(6) Amount represents the impact of the adjustments to operating income referred to in (5) above, adjusted for the related income tax impact of $30.8 million.

Non-GAAP Measures

Management uses non-GAAP financial measures (a) to evaluate the Company's historical and prospective financial performance as well as its performance relative to its competitors, (b) to set internal sales targets and spending budgets, (c) to allocate resources, (d) to measure operational profitability and the accuracy of forecasting, (e) to assess financial discipline over operational expenditures and (f) as an important factor in determining variable compensation for management and its employees. In addition, many financial analysts that follow the Company focus on and publish both historical results and future projections based on non-GAAP financial measures. The Company believes that it is in the best interest of its investors to provide this information to analysts so that they accurately report the non-GAAP financial information. Moreover, investors have historically requested, and the Company has historically reported, these non-GAAP financial measures as a means of providing consistent and comparable information with past reports of financial results.

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While management believes that these non-GAAP financial measures provide useful supplemental information to investors, there are limitations associated with the use of these non-GAAP financial measures. These non-GAAP financial measures are not prepared in accordance with GAAP, are not reported by all the Company's competitors and may not be directly comparable to similarly titled measures of the Company's competitors due to potential differences in the exact method of calculation. The Company compensates for these limitations by using these non-GAAP financial measures as supplements to GAAP financial measures and by reviewing the reconciliations of the non-GAAP financial measures to their most comparable GAAP financial measures.

The adjustments to these non-GAAP financial measures, and the basis for such adjustments, are outlined below:

Acquisition accounting for deferred revenue and its related tax impact. Historically, the Company has consummated acquisitions in order to support its strategic and other business objectives. In accordance with the fair value provisions applicable to the accounting for business combinations, acquired deferred revenue is often recorded on the opening balance sheet at an amount that is lower than the historical carrying value. Although this acquisition accounting requirement has no impact on the Company's business or cash flow, it adversely impacts the Company's reported GAAP revenue in the reporting periods following an acquisition. In order to provide investors with financial information that facilitates comparison of both historical and future results, the Company provides non-GAAP financial measures which exclude the impact of the acquisition accounting adjustment. The Company believes that this non-GAAP financial adjustment is useful to investors because it allows investors to (a) evaluate the effectiveness of the methodology and information used by management in its financial and operational decision-making, and (b) compare past and future reports of financial results of the Company as the revenue reduction related to acquired deferred revenue will not recur when related annual lease licenses and software maintenance contracts are renewed in future periods.

Amortization of intangible assets from acquisitions and its related tax impact. The Company incurs amortization of intangible assets, included in its GAAP presentation of amortization expense, related to various acquisitions it has made. Management excludes these expenses and their related tax impact for the purpose of calculating non-GAAP operating income, non-GAAP operating profit margin, non-GAAP net income and non-GAAP diluted earnings per share when it evaluates the continuing operational performance of the Company because these costs are fixed at the time of an acquisition, are then amortized over a period of several years after the acquisition and generally cannot be changed or influenced by management after the acquisition. Accordingly, management does not consider these expenses for purposes of evaluating the performance of the Company during the applicable time period after the acquisition, and it excludes such expenses when making decisions to allocate resources. The Company believes that these non-GAAP financial measures are useful to investors because they allow investors to (a) evaluate the effectiveness of the methodology and information used by management in its financial and operational decision-making, and (b) compare past reports of financial results of the Company as the Company has historically reported these non-GAAP financial measures.

Stock-based compensation expense and its related tax impact. The Company incurs expense related to stock-based compensation included in its GAAP presentation of cost of software licenses; cost of maintenance and service; research and development expense; and selling, general and administrative expense. This non-GAAP adjustment also includes excess payroll tax expense related to stock-based compensation. Stock-based compensation expense (benefit) incurred in connection with the Company's deferred compensation plan held in a rabbi trust includes an offsetting benefit (charge) recorded in other income (expense). Although stock-based compensation is an expense of the Company and viewed as a form of compensation, management excludes these expenses for the purpose of calculating non-GAAP operating income, non-GAAP operating profit margin, non-GAAP net income and non-GAAP diluted earnings per share when it evaluates the continuing operational performance of the Company. Management similarly excludes income (expense) related to assets held in a rabbi trust in connection with the Company's deferred compensation plan. Specifically, the Company excludes stock-based compensation and income (expense) related to assets held in the deferred compensation plan rabbi trust during its annual budgeting process and its quarterly and annual assessments of the Company's and management's performance. The annual budgeting process is the primary mechanism whereby the Company allocates resources to various initiatives and operational requirements. Additionally, the annual review by the board of directors during which it compares the Company's historical business model and profitability to the planned business model and profitability for the forthcoming year excludes the impact of stock-based compensation. In evaluating the performance of senior management and department managers, charges related to stock-based compensation are excluded from expenditure and profitability results. In fact, the Company records stock-based compensation expense into a stand-alone cost center for which no single operational manager is responsible or accountable. In this way, management can review, on a period-to-period basis, each manager's performance and assess financial discipline over operational expenditures without the effect of stock-based compensation. The Company believes that these non-GAAP financial measures are useful to investors because they allow investors to (a) evaluate the Company's operating results and the effectiveness of the methodology used by management to review the Company's operating results, and (b) review historical comparability in the Company's financial reporting as well as comparability with competitors' operating results.

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Restructuring charges and the related tax impact. The Company occasionally incurs expenses for restructuring its workforce included in its GAAP presentation of cost of software licenses; cost of maintenance and service; research and development expense; and selling, general and administrative expense. Management excludes these expenses for the purpose of calculating non-GAAP operating income, non-GAAP operating profit margin, non-GAAP net income and non-GAAP diluted earnings per share when it evaluates the continuing operational performance of the Company, as it generally does not incur these expenses as a part of its operations. The Company believes that these non-GAAP financial measures are useful to investors because they allow investors to (a) evaluate the Company's operating results and the effectiveness of the methodology used by management to review the Company's operating results, and (b) review historical comparability in the Company's financial reporting as well as comparability with competitors' operating results.

Transaction costs related to business combinations. The Company incurs expenses for professional services rendered in connection with business combinations, which are included in its GAAP presentation of selling, general and administrative expense. These expenses are generally not tax-deductible. Management excludes these acquisition-related transaction expenses, derived from announced acquisitions, for the purpose of calculating non-GAAP operating income, non-GAAP operating profit margin, non-GAAP net income and non-GAAP diluted earnings per share when it evaluates the continuing operational performance of the Company, as it generally would not have otherwise incurred these expenses in the periods presented as a part of its operations. The Company believes that these non-GAAP financial measures are useful to investors because they allow investors to (a) evaluate the Company's operating results and the effectiveness of the methodology used by management to review the Company's operating results, and (b) review historical comparability in the Company's financial reporting as well as comparability with competitors' operating results.

Tax Cuts and Jobs Act. The Company recorded charges in its income tax provision related to the enactment of the Tax Cuts and Jobs Act, specifically for the transition tax related to unrepatriated cash and the impacts of the tax rate change on net deferred tax assets. Management excludes these charges for the purpose of calculating non-GAAP net income and non-GAAP diluted earnings per share when it evaluates the continuing operational performance of the Company, as (i) the charges are not expected to recur as part of its normal operations and (ii) the charges resulted from the extremely infrequent event of major U.S. tax reform, the last such reform having occurred in 1986. The Company believes that these non-GAAP financial measures are useful to investors because they allow investors to (a) evaluate the Company's operating results and the effectiveness of the methodology used by management to review the Company's operating results, and (b) review historical comparability in the Company's financial reporting.

Non-GAAP financial measures are not in accordance with, or an alternative for, GAAP. The Company's non-GAAP financial measures are not meant to be considered in isolation or as a substitute for comparable GAAP financial measures and should be read only in conjunction with the Company's consolidated financial statements prepared in accordance with GAAP.

The Company has provided a reconciliation of the non-GAAP financial measures to the most directly comparable GAAP financial measures as listed below:

GAAP Reporting Measure	Non-GAAP Reporting Measure
Revenue	Non-GAAP Revenue
Operating Income	Non-GAAP Operating Income
Operating Profit Margin	Non-GAAP Operating Profit Margin
Net Income	Non-GAAP Net Income
Diluted Earnings Per Share	Non-GAAP Diluted Earnings Per Share

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Liquidity and Capital Resources

	As of December 31,		Change	
(in thousands, except percentages)	2018	2017	Amount	%
Cash, cash equivalents and short-term investments	$777,364	$881,787	$(104,423)	(11.8)
Working capital	$786,410	$661,713	$124,697	18.8

Cash, cash equivalents and short-term investments decreased during the current fiscal year primarily due to cash utilized in the May 2, 2018 acquisition of OPTIS, partially offset by the excess of cash provided by operating activities over cash used in financing activities.

Cash, Cash Equivalents and Short-Term Investments

Cash and cash equivalents consist primarily of highly liquid investments such as money market funds and deposits held at major banks. Short-term investments consist primarily of deposits held by certain foreign subsidiaries of the Company with original maturities of three months to one year. The following table presents the Company's foreign and domestic holdings of cash, cash equivalents and short-term investments:

	As of December 31,			
(in thousands, except percentages)	2018	% of Total	2017	% of Total
Domestic	$616,249	79.3	$561,417	63.7
Foreign	161,115	20.7	320,370	36.3
Total	$777,364		$881,787	

In general, it is the practice and intention of the Company to repatriate previously taxed earnings in excess of working capital needs and to reinvest all other earnings of its non-U.S. subsidiaries. As part of Tax Reform, the Company incurred U.S. tax on substantially all of the earnings of its non-U.S. subsidiaries as part of the transition tax. This tax increased the Company’s previously taxed earnings and allows for the repatriation of the majority of its foreign earnings without any residual U.S. federal tax. The Company does not believe that there is an excess of the financial reporting basis over the tax basis of investments in foreign subsidiaries. Accordingly, any repatriation in excess of previously taxed earnings will be a non-taxable return of basis. During the year ended December 31, 2018, the Company repatriated $144.3 million of foreign cash, which increased the percentage of domestic cash, cash equivalents and short-term investments at December 31, 2018.

The amount of cash, cash equivalents and short-term investments held by foreign subsidiaries is subject to translation adjustments caused by changes in foreign currency exchange rates as of the end of each respective reporting period, the offset to which is recorded in accumulated other comprehensive loss on the Company's consolidated balance sheet.

Cash Flows from Operating Activities

	Year Ended December 31,			Change	
(in thousands)	2018	2017	2016	2018 vs. 2017	2017 vs. 2016
Net cash provided by operating activities	$486,437	$430,438	$365,980	$55,999	$64,458

Fiscal year 2018 as compared to fiscal year 2017

Net cash provided by operating activities increased during the current fiscal year due to increased net income (net of non-cash operating adjustments) of $151.4 million, partially offset by decreased net cash flows from operating assets and liabilities of $95.4 million.

Fiscal year 2017 as compared to fiscal year 2016

Net cash provided by operating activities increased during the prior fiscal year due to increased net cash flows from operating assets and liabilities of $46.5 million and increased net income (net of non-cash operating adjustments) of $17.9 million.

Cash Flows from Investing Activities

(in thousands)	Year Ended December 31, 2018	2017	2016	Change 2018 vs. 2017	2017 vs. 2016
Net cash used in investing activities	$(313,680)	$(97,443)	$(32,173)	$(216,237)	$(65,270)

Fiscal year 2018 as compared to fiscal year 2017

Net cash used in investing activities increased during the current fiscal year due primarily to increased acquisition-related net cash outlays of $219.1 million, primarily related to OPTIS. The Company currently plans capital spending of $35 million to $40 million during fiscal year 2019 as compared to the $21.8 million that was spent in 2018. The level of spending will depend on various factors, including the growth of the business and general economic conditions.

Fiscal year 2017 as compared to fiscal year 2016

Net cash used in investing activities increased during the prior fiscal year due to increased acquisition-related net cash outlays of $56.0 million and increased capital expenditures of $6.7 million.

Cash Flows from Financing Activities

(in thousands)	Year Ended December 31, 2018	2017	2016	Change 2018 vs. 2017	2017 vs. 2016
Net cash used in financing activities	$(262,675)	$(294,651)	$(288,630)	$31,976	$(6,021)

Fiscal year 2018 as compared to fiscal year 2017

Net cash used in financing activities decreased during the current fiscal year due primarily to decreased stock repurchases of $66.2 million, partially offset by increased restricted stock unit withholding taxes paid in lieu of issuing shares of $17.8 million and decreased proceeds from shares issued for stock-based compensation of $11.5 million.

Fiscal year 2017 as compared to fiscal year 2016

Net cash used in financing activities increased during the prior fiscal year due primarily to increased restricted stock unit withholding taxes paid in lieu of issuing shares of $6.1 million.

Other Cash Flow Information

The Company believes that existing cash and cash equivalent balances of $777.1 million, together with cash generated from operations, will be sufficient to meet the Company's working capital and capital expenditure requirements through the next twelve months. The Company's cash requirements in the future may also be financed through additional equity or debt financings. There can be no assurance that additional financings can be obtained on favorable terms, if at all.

Under the Company's stock repurchase program, the Company repurchased shares as follows:

(in thousands, except per share data)	Year Ended December 31, 2018	2017	2016
Number of shares repurchased	1,674	2,750	3,700
Average price paid per share	$161.12	$122.20	$90.90
Total cost	$269,801	$336,042	$336,335

The most recent amendment to the program, authorizing the repurchase of up to 5,000,000 shares, was approved by the Company's Board of Directors in February 2018. There is no expiration date to this amendment. As of December 31, 2018, 3.8 million shares remained available for repurchase under the program.

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The Company continues to generate positive cash flows from operating activities and believes that the best uses of its excess cash are to invest in the business and acquire or make investments in complementary companies, products, services and technologies. Any future acquisitions may be funded by available cash and investments, cash generated from operations, credit facilities, or the issuance of additional securities. Additionally, the Company has in the past, and expects in the future, to repurchase stock in order to both offset dilution and return capital, in excess of its requirements, to stockholders with the goal of increasing stockholder value.

In February 2019, the Company acquired 100% of the shares of Granta Design and Helic for a combined purchase price of approximately $261.5 million. The acquisition of Granta Design, the premier provider of materials information technology, expands the Company's portfolio into this important area, giving customers access to material intelligence, including data that is critical to successful simulations. The acquisition of Helic, the industry-leading provider of electromagnetic crosstalk solutions for systems on chips, combined with the Company's flagship electromagnetic and semiconductor solvers, will provide a comprehensive solution for on-chip, 3D integrated circuit and chip-package-system electromagnetics and noise analysis.

Also in February 2019, the Company entered into a $500 million unsecured revolving credit facility. The revolving credit facility will be available for general corporate purposes, including, among others, to finance acquisitions, share repurchases and capital expenditures, and becomes payable in full in February 2024.

Off-Balance-Sheet Arrangements

The Company does not have any special-purpose entities or off-balance-sheet arrangements.

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Contractual Obligations

The Company's significant contractual obligations as of December 31, 2018 are summarized below:

	Payments Due by Period				
(in thousands)	Total	Within 1 year	2 – 3 years	4 – 5 years	After 5 years
Global headquarters operating lease[(1)]	$31,946	$ 4,294	$ 8,928	$ 8,928	$ 9,796
Other operating leases[(2)]	37,776	12,687	14,210	6,408	4,471
Unconditional purchase obligations[(3)]	37,511	24,182	13,221	108	—
Obligations related to uncertain tax positions, including interest and penalties[(4)]	—	—	—	—	—
Other long-term obligations[(5)]	16,171	2,836	2,686	2,328	8,321
Total contractual obligations	$123,404	$ 43,999	$ 39,045	$ 17,772	$ 22,588

(1) The Company previously entered into a lease agreement for 186,000 square feet of rentable space located in an office facility in Canonsburg, Pennsylvania, which serves as the Company's headquarters. The term of the lease is 183 months, beginning on October 1, 2014 and expiring on December 31, 2029. The Company has a one-time right to terminate the lease effective upon the last day of the tenth full year following the date of possession (December 31, 2024) by providing the landlord with at least 18 months' prior written notice of such termination.

(2) Other operating leases primarily include noncancellable lease commitments for the Company's other domestic and international offices as well as certain operating equipment.

(3) Unconditional purchase obligations primarily include royalties, software licenses and long-term purchase contracts for network, communication and office maintenance services, which are unrecorded as of December 31, 2018.

(4) The Company has $29.3 million of unrecognized tax benefits, including estimated interest and penalties, that have been recorded as liabilities in accordance with income tax accounting guidance for which the Company is uncertain as to if or when such amounts may be settled. As a result, such amounts are excluded from the table above.

(5) Other long-term obligations primarily include post-employment benefits, including pension obligations, of $9.7 million for certain foreign locations of the Company, office space restoration of $2.3 million, federal transition tax related to Tax Reform of $1.3 million and deferred compensation of $1.1 million. These amounts include the related current portions when applicable.

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Critical Accounting Policies and Estimates

The Company believes that the following critical accounting policies affect the more significant judgments and estimates used in the preparation of its consolidated financial statements.

Revenue Recognition: The Company's revenue is derived principally from the licensing of computer software products and from related maintenance contracts. The Company adopted ASC 606 on January 1, 2018 using the modified retrospective approach for all contracts not completed as of the date of adoption. Results for reporting periods beginning after January 1, 2018 are presented under ASC 606, while prior period amounts are not adjusted and continue to be reported in accordance with ASC 605, Revenue Recognition (ASC 605). The adoption of ASC 606 represents a change in accounting principle that will more closely align revenue recognition with the delivery of the Company’s software licenses, maintenance and services.

Revenue Recognition Policy 2018 (ASC 606)

The Company enters into contracts that include combinations of products, maintenance and services, which are accounted for as separate performance obligations with differing revenue recognition patterns.

Revenue from perpetual licenses is classified as software license revenue. Software license revenue is recognized up front upon delivery of the licensed product and/or the utility that enables the customer to access authorization keys, provided that a signed contract has been received. Typically, the Company’s perpetual licenses are sold with post-contract support (PCS), which includes unspecified technical enhancements and customer support. The Company allocates value in bundled perpetual and PCS arrangements based on the standalone selling prices of the perpetual license and PCS. Revenue from PCS is classified as maintenance revenue and is recognized ratably over the term of the contract, as the Company satisfies the PCS performance obligation over time.

In addition to perpetual licenses, the Company sells time-based lease licenses. Lease licenses are sold only as a bundled arrangement that includes the rights to a term software license and PCS. Utilizing observable inputs, the Company determined that 50% of the estimated standalone selling price of the lease license is attributable to the term license and 50% is attributable to the PCS. Consistent with the perpetual sales, the license component is classified as software license revenue and recognized as revenue up front at the commencement of the lease. The PCS is classified as maintenance revenue and is recognized ratably over the term of the contract, as the Company provides the PCS benefit over time.

Revenue from training, support and other services is recognized as the services are performed. For contracts in which the service consists of a single performance obligation, such as providing a training class to a customer, the Company recognizes revenue upon completion of the performance obligation. For service contracts that are longer in duration and often include multiple performance obligations (for example, both training and consulting), the Company measures the progress toward completion of the obligations and recognizes revenue accordingly. In measuring progress towards the completion of performance obligations, the Company typically utilizes output-based estimates for services with contractual billing arrangements that are not based on time and materials, and estimates output based on the total tasks completed as compared to the total tasks required for each work contract. Input-based estimates are utilized for services that involve general consultations with contractual billing arrangements based on time and materials, utilizing direct labor as the input measure.

The Company also executes arrangements through independent channel partners in which the channel partners are authorized to market and distribute the Company's software products to end users of the Company's products and services in specified territories. In sales facilitated by channel partners, the channel partner bears the risk of collection from the end-user customer. The Company recognizes revenue from transactions with channel partners at a point in time or over time as appropriate when the channel partner submits a purchase commitment, collectability from the channel partner is probable, a license agreement signed by the end-user customer is received and the performance obligation was met. Revenue from channel partner transactions is the amount remitted to the Company by the channel partners. This amount includes a fee for PCS that is compensation for providing technical enhancements and the second level of technical support to the end user, which is recognized over the period that PCS is to be provided. The Company does not offer right of return, product rotation or price protection to any of its channel partners.

Non-income related taxes collected from customers and remitted to governmental authorities are recorded on the consolidated balance sheet as accounts receivable and accrued expenses. The collection and payment of these amounts

are reported on a net basis in the consolidated statements of income and do not impact reported revenues or expenses.
The Company warrants to its customers that its software will perform substantially as specified in the Company's current user manuals. The Company has not experienced significant claims related to software warranties beyond the scope of maintenance support, which the Company is already obligated to provide. The warranty is not sold, and cannot be purchased, separately. The warranty does not provide any type of additional service to the customer or performance obligation for the Company.
The Company's agreements with its customers generally require it to indemnify the customer against claims that the Company's software infringes third-party patent, copyright, trademark or other proprietary rights. Such indemnification obligations are

generally limited in a variety of industry-standard respects, including the Company's right to replace an infringing product. As of December 31, 2018, the Company had not experienced any losses related to these indemnification obligations and no claims with respect thereto were outstanding. The Company does not expect significant claims related to these indemnification obligations, and, consequently, the Company has not established any related reserves.

Significant Judgments (ASC 606)

The Company’s contracts with customers typically include promises to transfer licenses and services to a customer. Judgment is required to determine if the promises are separate performance obligations, and if so, the allocation of the transaction price to each performance obligation. The Company uses the estimated standalone selling price method to allocate the transaction price for items that are not sold separately, particularly lease licenses sold with PCS. The estimated standalone selling price is determined using all information reasonably available to the Company, including market conditions and other observable inputs. The corresponding revenues are recognized as the related performance obligations are satisfied.

The Company applies a practical expedient to expense sales commissions as incurred when the amortization period would have been one year or less. Sales commissions associated with the initial year of multi-year contracts are expensed as incurred due to their immateriality. Sales commissions associated with multi-year contracts beyond the initial year are subject to an employee service requirement and are expensed as incurred as they are not considered incremental costs to obtain a contract.

The Company is required to adjust promised amounts of consideration for the effects of the time value of money if the timing of the payments provides the customer or the Company with a significant financing benefit. The Company considers various factors in assessing whether a financing component exists, including the duration of the contract, market interest rates and the timing of payments. The Company’s contracts do not include a significant financing component requiring adjustment to the transaction price.

Revenue Recognition Policy 2017 and 2016 (ASC 605)

Revenue from perpetual licenses was classified as license revenue and was recognized upon delivery of the licensed product and/or the utility that enabled the customer to access authorization keys, provided that acceptance had occurred and a signed contractual obligation was received, the price was fixed and determinable, and collectibility of the receivable was probable. The Company determined the fair value of PCS sold together with perpetual licenses based on the rate charged for PCS when sold separately. Revenue from PCS contracts was classified as maintenance and service revenue and was recognized ratably over the term of the contract.

Revenue for software lease licenses was classified as license revenue and was recognized over the period of the lease contract. Typically, the Company's software leases include PCS which, due to the short term (principally one year or less) of the Company's software lease licenses, could not be separated from lease revenue for accounting purposes. As a result, both the lease licenses and PCS were recognized ratably over the lease period. The Company included the revenue for the entire lease arrangement within software license revenue in the consolidated statements of income. Many of the Company's semiconductor products were typically licensed via longer term leases of 24–36 months. The Company recognized revenue for these licenses over the term of the lease contract. Because the Company did not have vendor-specific objective evidence of the fair value of these leases, the Company also recognized revenue from perpetual licenses over the term of the lease contract during the infrequent occurrence of these licenses being sold with semiconductor leases in multiple-element arrangements.

Revenue from training, support and other services was recognized as the services were performed. The Company applied the specific performance method to contracts in which the service consisted of a single act, such as providing a training class to a customer, and the proportional performance method to other service contracts that were longer in duration and often included multiple acts (for example, both training and consulting). In applying the proportional performance method, the Company typically utilized output-based estimates for services with contractual billing arrangements that were not based on time and materials, and estimated output based on the total tasks completed as compared to the total tasks required for each work contract. Input-based estimates were utilized for services that involved general consultations with contractual billing arrangements based on time and materials, utilizing direct labor as the input measure.

The accounting treatment under ASC 605 associated with arrangements through independent channel partners, non-income related taxes, warranties and indemnification obligations is consistent with ASC 606 described above.
Allowance for Doubtful Accounts: The Company makes judgments as to its ability to collect outstanding receivables and provides allowances for a portion of receivables when collection becomes doubtful. Provisions are made based upon a specific review of all significant outstanding invoices from both value and delinquency perspectives. For those invoices not specifically reviewed, provisions are provided at differing rates based upon the age of the receivable and the geographic area of origin. In determining these percentages, the Company considers its historical collection experience and current economic trends in the

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customer's industry and geographic region. If the historical data used to calculate the allowance for doubtful accounts does not reflect the future ability to collect outstanding receivables, additional provisions for doubtful accounts may be needed and future results of operations could be materially affected.

Income Taxes: The Company accounts for income taxes under the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial statements. Under this method, deferred tax assets and liabilities are determined based on the differences between the financial statement and tax bases of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. The effect of a change in tax rates on deferred tax assets and liabilities is recognized in income in the period of the enactment date.

The Company records net deferred tax assets to the extent it believes these assets will more likely than not be realized. In making such determination, the Company considers all available positive and negative evidence, including scheduled reversals of deferred tax liabilities, projected future taxable income, tax planning strategies and recent financial operations. In the event the Company determines that it will be able to realize deferred tax assets for which a valuation allowance was used to reduce their carrying value, the adjustment to the valuation allowance will be recorded as a reduction to the provision for income taxes.

Tax benefits related to uncertain tax positions taken or expected to be taken on a tax return are recorded when such benefits meet a more-likely-than-not threshold. Otherwise, these tax benefits are recorded when a tax position has been effectively settled, which means that the statute of limitations has expired or the appropriate taxing authority has completed their examination even though the statute of limitations remains open.

The Company recognizes interest and penalties related to income taxes within the income tax expense line in the consolidated statements of income. Accrued interest and penalties are included within the related tax liability line in the consolidated balance sheets.

Goodwill and Indefinite-Lived Intangible Assets: The Company tests goodwill and indefinite-lived intangible assets for impairment at least annually by performing a quantitative assessment of whether the fair value of each reporting unit or asset exceeds its carrying amount. The Company has one reporting unit. Goodwill is tested at this reporting unit level and indefinite-lived intangible assets are tested at the individual asset level. This requires the Company to assess and make judgments regarding a variety of factors which impact the fair value of the reporting unit or asset being tested, including business plans, anticipated future cash flows, economic projections and other market data. Because there are inherent uncertainties involved in these factors, significant differences between these estimates and actual results could result in future impairment charges and could materially impact the Company's future financial results. During the first quarter of 2018, the Company completed the annual impairment test for goodwill and the indefinite-lived intangible asset and determined that these assets had not been impaired as of the test date, January 1, 2018. No other events or circumstances changed during the year ended December 31, 2018 that would indicate that the fair values of the Company's reporting unit and indefinite-lived intangible asset are below their carrying values.

Contingencies: The Company is involved in various investigations, claims and legal proceedings that arise in the ordinary course of business, including commercial disputes, labor and employment matters, tax audits, alleged infringement of intellectual property rights and other matters. The Company reviews the status of these matters, assesses its financial exposure and records a related accrual if the potential loss from an investigation, claim or legal proceeding is probable and the amount is reasonably estimable. Significant judgment is involved in the determination of probability and in the determination of whether an exposure is reasonably estimable. As a result of the uncertainties involved in making these estimates, the Company may have to revise its estimates as facts and circumstances change. The revision of these estimates could have a material impact on the Company's financial position and results of operations.

Stock-Based Compensation: The Company grants restricted stock units and other stock awards to employees and directors under the Company's equity incentive plan. Eligible employees can also purchase shares of the Company's common stock at a discount under the Company's employee stock purchase plan. The benefits provided under these plans are share-based payments subject to the provisions of share-based payment accounting guidance. The Company uses the fair value method to apply the provisions of share-based payment accounting guidance. Stock-based compensation expense for 2018, 2017 and 2016 was $83.3 million, $53.2 million and $33.3 million, respectively. As of December 31, 2018, total unrecognized estimated compensation expense related to unvested stock options and awards granted prior to that date was $141.1 million, which is expected to be recognized over a weighted average period of 1.6 years.

The value of each stock option award was estimated on the date of grant, or date of acquisition for options issued in a business combination, using the Black-Scholes option pricing model (Black-Scholes model). The determination of the fair value of share-based payment awards using an option pricing model is affected by the Company's stock price as well as assumptions

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regarding a number of complex and subjective variables. These variables include the Company's expected stock price volatility over the term of the awards, actual and projected employee stock option exercise behaviors, risk-free interest rates and expected dividends. The table below presents the weighted average input assumptions used and resulting fair values for options granted or issued in business combinations during each respective year. The stock-based compensation expense for options is recorded ratably over the requisite service period. The interest rate assumptions were determined by using the five-year U.S. Treasury Note yield on the date of grant or date of acquisition. The Company did not grant stock option awards during 2018 or 2017.

	Year Ended December 31,
	2016
Risk-free interest rate	1.19% to 1.93%
Expected dividend yield	—%
Expected volatility	24%
Expected term	5.7 years
Weighted average fair value per share	$23.96

The Company issues various restricted stock unit awards which contain a market condition, a performance condition, a service condition, or any combination of the three. Restricted stock unit awards are valued based on the grant-date fair value of the award. Stock-based compensation expense is recognized over the employee's requisite service period for awards with only a service condition. For awards with a performance condition, stock-based compensation expense is recorded from the service inception date through the conclusion of the measurement period based on management's estimates concerning the probability of vesting.

Vesting of restricted stock unit awards with a market condition is based on the Company's performance as measured by total shareholder return relative to the appreciation of a specified stock index over the measurement period, subject to each participant's continued employment with the Company through the conclusion of the measurement period. The fair value of the restricted stock unit awards with a market condition is estimated using a Monte Carlo simulation model. The determination of the fair value of the awards is affected by the grant date and a number of variables, each of which has been identified in the chart below for awards granted during each respective period. Share-based compensation expense based on the fair value of the award is being recorded from the grant date through the conclusion of the measurement period.

	Year Ended December 31,		
Assumptions used in Monte Carlo lattice pricing model	2018	2017	2016
Risk-free interest rate	2.4%	1.5%	1.0%
Expected dividend yield	—%	—%	—%
Expected volatility—ANSYS stock price	21%	19%	21%
Expected volatility—Nasdaq Composite Index	15%	15%	16%
Expected term	2.8 years	2.8 years	2.8 years
Correlation factor	0.65	0.70	0.65
Weighted average fair value per share	$191.76	$120.94	$78.71

The Company also grants restricted stock units to non-employee Directors, which vest upon the earlier of one year from the date of grant or the date of the next regular annual meeting of stockholders.

To the extent the Company changes the terms of its stock-based compensation programs, experiences market volatility in the pricing of its common stock that increases the implied volatility assumption used in the Black-Scholes model, refines different assumptions, or assumes stock awards from acquired companies that are different in nature than the Company's stock award arrangements, among other potential impacts, the stock-based compensation expense recorded in future periods and the related tax benefits may differ significantly from what was recorded in previous reporting periods. The Company accounts for forfeitures of stock-based awards as they occur.

Estimates of stock-based compensation expense are significant to the Company's financial statements, but this expense is partially based on the aforementioned option valuation and Monte Carlo simulation models and will never result in the payment of cash by the Company other than through the payment of withholding taxes in lieu of additional share issuance. For this reason, and because the Company does not view stock-based compensation as related to its operational performance, the Board of Directors and management exclude stock-based compensation expense when evaluating the Company's underlying business performance.

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Recent Accounting Guidance

For information regarding recent accounting guidance and its impact on the Company's consolidated financial statements, see Note 2 to the consolidated financial statements in Part IV, Item 15 of this Annual Report on Form 10-K.

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ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Interest Income Rate Risk. Changes in the overall level of interest rates affect the interest income that is generated from the Company's cash, cash equivalents and short-term investments. For the year ended December 31, 2018, total interest income was $11.4 million. Cash and cash equivalents consist primarily of highly liquid investments such as money market funds and deposits held at major banks. Short-term investments consist primarily of deposits held by certain foreign subsidiaries of the Company with original maturities of three months to one year.

Foreign Currency Transaction Risk. As the Company operates in international regions, a portion of its revenue, expenses, cash, accounts receivable and payment obligations are denominated in foreign currencies. As a result, changes in currency exchange rates will affect the Company's financial position, results of operations and cash flows. With respect to revenue, on average for the year ended December 31, 2018, the U.S. Dollar was approximately 2.3% weaker and 2.6% weaker, when measured against the Company’s primary foreign currencies, than for the year ended December 31, 2017 under ASC 606 and ASC 605, respectively. The table below presents the impacts of currency fluctuations on revenue for the year ended December 31, 2018. Amounts in brackets indicate a net adverse impact from currency fluctuations.

	Year Ended December 31, 2018	
(in thousands)	ASC 606	ASC 605
Euro	$12,498	$11,915
Japanese Yen	2,088	2,075
South Korean Won	918	1,182
British Pound	870	1,083
Indian Rupee	(1,623)	