

SYNOPSIS INC
Form 10-K
December 17, 2018
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K
(Mark One)

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended October 31, 2018

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

For the transition period from _____ to _____
Commission File Number 0-19807

SYNOPSIS, INC.
(Exact name of registrant as specified in its charter)
Delaware 56-1546236
(State or other jurisdiction of (I.R.S. Employer
incorporation or organization) Identification No.)
690 East Middlefield Road, Mountain View, California 94043
(Address of principal executive offices, including zip code)
(650) 584-5000
(Registrant's telephone number, including area code)

Securities Registered Pursuant to Section 12(b) of the Act:
Title of Each Class Name of Each Exchange on Which Registered
Common Stock, \$0.01 par value Nasdaq Global Select Market
Securities Registered Pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

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

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 No

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted 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 and post such files). Yes 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.

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

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filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer Accelerated filer Non-accelerated filer Smaller Reporting Company
Emerging growth company

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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 ý

The aggregate market value of the voting and non-voting common equity held by non-affiliates computed by reference to the price at which the common equity was last sold as of the last business day of the registrant's most recently completed second fiscal quarter was approximately \$10.5 billion. Aggregate market value excludes an aggregate of approximately 29.2 million shares of common stock held by the registrant's executive officers and directors and by each person known by the registrant to own 5% or more of the outstanding common stock on such date. Exclusion of shares held by any of these persons should not be construed to indicate that such person possesses the power, direct or indirect, to direct or cause the direction of the management or policies of the registrant, or that such person is controlled by or under common control with the registrant.

On December 12, 2018, 149,515,012 shares of the registrant's Common Stock, \$0.01 par value, were outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's Proxy Statement relating to the registrant's 2019 Annual Meeting of Stockholders, scheduled to be held on April 8, 2019, are incorporated by reference into Part III of this Annual Report on Form 10-K where indicated. Except as expressly incorporated by reference, the registrant's Proxy Statement shall not be deemed to be part of this report.

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ANNUAL REPORT ON FORM 10-K
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Cautionary Note Regarding Forward-Looking Statements

This Annual Report on Form 10-K (this Form 10-K or Annual Report) contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended (the Securities Act), Section 21E of the Securities Exchange Act of 1934, as amended (the Exchange Act), and the Private Securities Litigation Reform Act of 1995. Any statements herein that are not statements of historical fact are forward-looking statements. Words such as “may,” “will,” “could,” “would,” “can,” “should,” “anticipate,” “expect,” “intend,” “believe,” “estimate,” “project,” “continue,” “forecast,” “potential,” “seek,” or the negatives of such terms, and similar expressions are intended to identify forward-looking statements. This Form 10-K includes, among others, forward-looking statements regarding:

- our business, product and platform strategies;
- our business outlook;
- the continuation of current industry trends towards customer and vendor consolidation, and the impact of such consolidation;
- prior and future acquisitions, including the expected benefits and risks of completed acquisitions;
 - the impact of macroeconomic conditions on our business and our customers’ businesses;
 - demand for our products and our customers’ products;
- the expected realization of our backlog;
- customer license renewals;
- the completion of development of our unfinished products, or further development or integration of our existing products;
- technological trends in integrated circuit design;
- our ability to successfully compete in the markets in which we serve;
- our license mix, our business model, and variability in our revenue;
- litigation;
- our ability to protect our intellectual property;
- our cash, cash equivalents and cash generated from operations;
- our available-for-sale securities; and
- our future liquidity requirements.

These statements are based on our current expectations about future events and involve certain known and unknown risks, uncertainties and other factors that could cause our actual results, time frames or achievements to differ materially from those expressed or implied in our forward-looking statements. Accordingly, we caution readers not to place undue reliance on these statements. Such risks and uncertainties include, among others, those listed in Part I, Item 1A, Risk Factors of this Form 10-K. The information included herein represents our estimates and assumptions as of the date of this filing. Unless required by law, we undertake no obligation to update publicly any forward-looking statements, or to update the reasons actual results could differ materially from those anticipated in these forward-looking statements, even if new information becomes available in the future. All subsequent written or oral forward-looking statements attributable to Synopsys, Inc. or persons acting on our behalf are expressly qualified in their entirety by these cautionary statements. Readers are urged to carefully review and consider the various disclosures made in this report and in other documents we file from time to time with the Securities and Exchange Commission (SEC) that attempt to advise interested parties of the risks and factors that may affect our business.

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Fiscal Year End

Our fiscal year ends on the Saturday nearest to October 31 and consists of 52 weeks, with the exception that approximately every five years, we have a 53-week year. Fiscal 2018 was a 53-week year and ended on November 3, 2018. Fiscal 2017 and 2016 were 52-week years and ended on October 28, 2017 and October 29, 2016, respectively. Fiscal 2019 will be a 52-week year.

For presentation purposes, this Form 10-K refers to the closest calendar month end.

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PART I

Item 1. Business

Company Overview

Synopsys, Inc. provides products and services used by designers across the entire silicon to software spectrum, from engineers creating advanced semiconductors to software developers seeking to ensure the security and quality of their code. We are a global leader in supplying the electronic design automation (EDA) software that engineers use to design and test integrated circuits (ICs), also known as chips. We also offer semiconductor intellectual property (IP) products, which are pre-designed circuits that engineers use as components of larger chip designs rather than designing those circuits themselves. We provide software and hardware used to validate the electronic systems that incorporate chips and the software that runs on them. To complement these offerings, we provide technical services and support to help our customers develop advanced chips and electronic systems. We are also a leading provider of software tools and services that improve the security and quality of software code in a wide variety of industries, including electronics, financial services, media, automotive, medicine, energy and industrials.

Corporate Information

We incorporated in 1986 in North Carolina and reincorporated in 1987 in Delaware. Our headquarters are located at 690 East Middlefield Road, Mountain View, California 94043, and our headquarters' telephone number is (650) 584-5000. We have approximately 120 offices worldwide.

Our annual and quarterly reports on Forms 10-K and 10-Q (including related filings in XBRL format), current reports on Form 8-K, and Proxy Statements relating to our annual meetings of stockholders (including any amendments to these reports, as well as filings made by our executive officers and directors) are available through the Investor Relations page of our website (www.synopsys.com) free of charge as soon as practicable after we file them with, or furnish them to, the SEC (www.sec.gov). We use our Investor Relations page as a routine channel for distribution of important information, including news releases, investor presentations, and financial information. The contents of our website are not part of this Form 10-K.

Background

Recent years have seen a remarkable proliferation of consumer and wireless electronic products, particularly mobile devices. The growth of the Internet and cloud computing has provided people with new ways to create, store and share information. At the same time, the increasing use of electronics in cars, buildings, appliances and other consumer products is creating a connected landscape of "smart" devices. Numerous software applications (apps) have been developed to expand the potential of these connected devices. The increasing viability of artificial intelligence and machine learning is driving an increase in the activity of new and existing chip design companies around the world.

These developments have been fueled by innovation in the semiconductor and software industries. It is common for a single chip to combine many components (processor, communications, memory, custom logic, input/output) and embedded software into a single system-on-chip (SoC), necessitating highly complex chip designs. The most complex chips today contain more than a billion transistors. Transistors are the basic building blocks for ICs, each of which may have features that are less than 1/1,000th the diameter of a human hair. At such small dimensions, the wavelength of light itself can become an obstacle to production, proving too big to create such dense features and requiring creative and complicated new approaches from designers. Designers have turned to new manufacturing techniques to solve these problems, such as multiple-patterning lithography and FinFET transistors, which in turn have introduced new challenges to design and production.

The popularity of mobile devices and other electronic products has increased demand for chips and systems with greater functionality and performance, reduced size, and lower power consumption. Our customers are the designers of those products and are facing intense pressure to deliver innovative products in shorter timeframes and at lower prices. In other words, innovation in chip and system design often hinges on providing products “better,” “sooner,” and “cheaper” than competitors. The designs of these chips and systems are extremely complex and necessitate state-of-the-art design solutions.

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A similar dynamic is at work in the software arena, where the pace of innovation often requires developers—also our customers—to deliver more secure, high-quality software, which can include millions of lines of code, in increasingly frequent release cycles. Bugs, defects, and security vulnerabilities in code can be difficult to detect and expensive to fix. But, at a time when software is prevalent in many industries across a growing array of smart devices, it is crucial to have high-quality, secure code to ensure consumers' privacy and safety.

Our Role—The Silicon to Software™ Partner

Synopsys' products and services enable innovators across a variety of markets—from mobile electronics and finance to media, medical, energy, industrial, and automotive—to develop smart and secure products and applications. Across all industries, our customers face tremendous pressure to build differentiated chips and develop robust code more quickly and cost-effectively than ever before. With the increasing amount of embedded software in today's devices, security and quality are top concerns. Synopsys technologies and services are designed to help our customers—both hardware designers and software developers—to speed time to market, achieve the highest quality of results, mitigate risk, and maximize profitability. Our offerings span from silicon to software.

The task of the chip and system designer is to determine how best to design, locate, and connect the building blocks of chips, and to verify that the resulting design behaves as intended and can be manufactured efficiently and cost-effectively. This task is a complex, multi-step process that is both expensive and time-consuming. We offer a wide range of products that help designers at different steps in the overall design process, both for the design of individual ICs and for the design of larger systems. Our products can increase designer productivity and efficiency by automating tasks, keeping track of large amounts of design data, adding intelligence to the design process, facilitating reuse of past designs and reducing errors. Our IP products offer proven, high-quality pre-configured circuits that are ready-to-use in a chip design, saving customers time and enabling them to direct resources to features that differentiate their products. Our global service and support engineers also provide expert technical support and design assistance to our customers.

The task of the software developer is to write code that not only accomplishes the developer's goal as efficiently as possible, but also runs securely and is free of defects. We offer products that can help developers write higher quality, more secure code by analyzing their code for quality defects and known security vulnerabilities, adding intelligence and automation to the software testing process, and helping to eliminate defects in a systematic manner. To the extent that developers make use of open source software in their code, our products can help developers better manage the composition and security of the code. Our products enable software developers to catch flaws earlier in the development cycle, when they are less costly to fix.

Products and Services

Revenue from our products and services is categorized into four groups:

- Core EDA, which includes digital, custom and Field Programmable Gate Array (FPGA) IC design and verification products;
- IP, Systems and Software Integrity, which includes our DesignWare® IP portfolio, system-level products, and software security and quality testing solutions;
- Manufacturing Solutions; and
- Professional Services and Other.

Core EDA

The process of designing ICs contains many complex steps: architecture definition, register transfer level (RTL) design, functional/RTL verification, logic design or synthesis, gate-level verification, floorplanning, and place and route, to name just a few. Designers use our Core EDA products to automate the IC design process and to reduce errors. We offer a platform that features a large number of Core EDA products intended to address the process comprehensively. Our Core EDA products generally fall into the following categories:

• Digital, custom and FPGA IC design, which includes software tools to design an IC; and

Verification, which includes technology to verify that an IC design behaves as intended.

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Digital and Custom IC Design

Our Fusion Design Platform™ provides customers with a comprehensive digital design implementation solution that includes industry-leading products and incorporates common libraries and consistent timing, delay calculation, UPF power intent descriptions, and constraints throughout the design process. The Fusion Design Platform, which was launched in the fall of 2018, redefines conventional design tool boundaries to deliver a more integrated flow than ever before, with better quality of results and time to results. The platform gives designers the flexibility to integrate internally developed and third-party tools. With innovative technologies, a common foundation, and flexibility, our Fusion Design Platform helps reduce design times, decrease uncertainties in the design steps, and minimize the risks inherent in advanced, complex IC design. The platform supports multiple technology nodes, including most advanced technology nodes such as 16/14nm, 12nm, 10nm, and 7/8nm, with technology collaborations at 5nm and below.

Key design products, available as part of the Fusion Design Platform, include Design Compiler® logic synthesis, IC Compiler™ II physical design, Fusion Compiler™ RTL to GDSII design implementation, PrimeTime® static timing analysis, StarRC™ parasitic extraction, Ansys RedHawk fusion rail analysis, and IC Validator physical verification.

Our Custom Design Platform™ is a unified suite of design and verification tools that accelerates the development of robust custom and AMS designs. Anchored by the Custom Compiler custom design environment, the platform features industry-leading circuit simulation performance, a fast, easy-to-use custom layout editor complemented with best-in-class technologies for parasitic extraction, reliability analysis, and physical verification. Key features of the Custom Design Platform include reliability-aware verification, visually-assisted layout automation, extraction fusion, and DRC fusion technologies. The platform supports multiple technology nodes, including most advanced technology nodes such as 16/14nm, 12nm, 10nm, and 7/8nm.

Our Custom Design Platform is based on the OpenAccess database and includes open APIs for third-party tool integration. Platform tools include HSPICE® and FineSim® SPICE circuit simulators, CustomSim™ FastSPICE, Custom Compiler layout and schematic editor, StarRC parasitic extraction, and IC Validator physical verification.

FPGA Design

FPGAs are complex chips that can be customized or programmed to perform a specific function after they are manufactured. For FPGA design, we offer Synplify® (Pro® and Premier) implementation and Identify® debug software tools.

Verification

Our Verification Continuum™ platform is built from our industry-leading and fastest verification technologies, providing virtual prototyping, static and formal verification, simulation, emulation, FPGA-based prototyping, and debug in a unified environment with verification IP and planning and coverage technology. By providing a consistent model and debug environment across the flow of verification tasks and by enabling seamless transitions between simulation, emulation, and prototyping, the platform helps our customers accelerate hardware verification, bring up software earlier, and get to market sooner with advanced SoCs.

The individual products included in the Verification Continuum platform are reported in our Core EDA and IP, Systems & Software Integrity revenue categories. The solutions reported in our Core EDA revenue include the following:

- SpyGlass® family of static verification technologies including lint, CDC (clock domain crossing), RDC (reset domain crossing), DFT (design for test), and low-power analysis and verification;
- VCS® functional verification solution, our comprehensive RTL and gate-level simulation technology, including Fine-Grained Parallelism (FGP);
- Verdi® debug technology, the industry's most compressive SoC debug;

- ✓VC Formal, our next-generation formal verification product;
- ✓Verdi Coverage, our verification planning and coverage technology;

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ZeBu® emulation systems, which use high-performance hardware to emulate SoC designs so that designers can accelerate verification of large complex SoCs and perform earlier verification of the SoC together with software; and Other principal individual verification solutions, including CustomSim™ FastSPICE and FineSimSPICE/FastSPICE circuit simulation and analysis products, HSPICE® circuit simulator, and CustomExplorer™ Ultra mixed-signal regression and analysis environment.

The verification IP, virtual prototyping and FPGA-based prototyping solutions that are part of our Verification Continuum platform are included in our IP, Systems & Software Integrity category and further described below.

IP, Systems and Software Integrity

IP Products

As more functionality converges into a single device or even a single chip, and as chip designs grow more complex, the number of third-party IP blocks incorporated into designs is rapidly increasing. We are a leading provider of high-quality, silicon-proven IP solutions for SoCs. Our broad DesignWare IP portfolio includes:

High-quality solutions for widely used wired and wireless interfaces such as USB, PCI Express, DDR, Ethernet, SATA, MIPI, HDMI, and Bluetooth Low Energy;

Logic libraries and embedded memories, including memory compilers, non-volatile memory, standard cells, and integrated test and repair;

Processor solutions, including configurable ARC® processor cores, software, Embedded Vision processor cores and application-specific instruction-set processor (ASIP) tools for embedded applications;

IP subsystems for audio, sensor, and data fusion functionality that combine IP blocks, an efficient processor, and software into an integrated, pre-verified subsystem;

Security IP solutions, including cryptographic cores and software, security subsystems, platform security and content protection IP;

Analog IP including data converters and audio codecs; and

SoC infrastructure IP, datapath and building block IP, mathematical and floating point components, ARM® AMBA® interconnect fabric and peripherals, and verification IP.

Our IP Accelerated initiative augments our established, broad portfolio of silicon-proven DesignWare IP with IP Prototyping Kits and customized IP subsystems to accelerate prototyping, software development, and integration of IP into SoCs.

We also offer a broad portfolio of IP that has been optimized to address specific application requirements for the mobile, automotive, digital home, internet of things, and cloud computing markets, enabling designers to quickly develop SoCs in these areas.

Our Verification IP portfolio, part of our Verification Continuum platform, is also part of the IP Products category.

System-Level Solutions

Our System-Level verification solutions include the following elements of our Verification Continuum platform:

HAPS® FPGA-based prototyping systems, which provide design and verification teams with an integrated and scalable hardware-software solution for early software development and to improve their SoC schedules;

Virtualizer™ virtual prototyping solutions, which address the increasing development challenges associated with software-rich semiconductor and electronic products by accelerating both the development and deployment of virtual prototypes; and

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Platform Architect solution, which provides architects and system designers with tools and efficient methods for early analysis and optimization of multi-core SoC architectures for performance and power.

We also provide a series of tools used in the design of optical systems and photonic devices. Our CODE V® solution enables engineers to model, analyze and optimize designs for optical imaging and communication systems. Our LightTools® design and analysis software allows designers to simulate and improve the performance of a broad range of illumination systems, from vehicle lighting to projector systems.

Software Integrity Solutions

Our Software Integrity platform is a comprehensive solution for building integrity—security and quality—into our customers’ software development lifecycle and supply chain. These testing tools, services and programs enable our customers to manage open source license compliance and detect and remediate security vulnerabilities and defects across their entire software development lifecycle. Our offerings include security testing, managed services, programs and professional services, and training.

Key products in the security, quality and compliance testing space include:

Coverity® static analysis tools (including regular critical updates), which analyze software code to find crash-causing bugs, incorrect program behavior, the latest security vulnerabilities, memory leaks and other performance-degrading flaws;

Defensics® fuzz testing tools, which examine security vulnerabilities in software binaries and libraries, particularly network protocols and file formats, by systematically sending invalid or unexpected inputs to the system under test;

Black Duck™ software composition analysis tools, which scan binary and source code for license issues and other known security vulnerabilities stemming from incorporated third-party and open source code; and

Seeker® IAST tool, which identifies exploitable security vulnerabilities while web applications are running, thereby verifying results and eliminating false positives.

Managed Services allow developers to test code across many dimensions, and to rapidly respond to changing testing requirements and evolving threats. This includes Mobile AST services to find vulnerabilities in mobile applications as well as DAST services which identify security vulnerabilities while web applications are running, without the need for source code.

Programs and Professional Services address unique security and quality needs with specialized consulting by skilled experts, including the Building Security in Maturity Mode (BSIMM), which measures the effectiveness of software security initiatives by assessing the current state as compared to industry benchmarks.

Finally, training includes eLearning and instructor-led training that prepares developers and security professionals to build security and quality into their software development process and remediate found vulnerabilities and defects.

Manufacturing Solutions

Our Manufacturing Solutions software products and technologies enable semiconductor manufacturers to more quickly develop new fabrication processes that produce production-level yields. These products are used in the early research and development phase, as well as in the production phase, where designers use these products to help convert IC design layouts into the masks used to manufacture the devices.

Our Manufacturing Solutions include Sentaurus™ technology computer-aided design (TCAD) device and process simulation products, Proteus™ mask synthesis tools, CAPS™ mask data preparation software, Yield Explorer® Odyssey, and Yield-Manager® yield management solutions.

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Professional Services and Other

We provide consulting and design services that address all phases of the SoC development process. These services assist our customers with new tool and methodology adoption, chip architecture and specification development, functional and low-power design and verification, and physical implementation and signoff. We also provide a broad range of expert training and workshops on our latest tools and methodologies. Professional services related to the security and quality of the software embedded on the chip or elsewhere are included in the Software Integrity Solutions category and further described above.

Customer Service and Technical Support

A high level of customer service and support is critical to the adoption and successful use of our products. We provide technical support for our products through both field-based and corporate-based application engineering teams. Customers that purchase Technology Subscription Licenses (TSLs) receive post-contract customer support bundled with their license fee. Customers that purchase perpetual licenses may purchase these services separately, as further described in Product Sales and Licensing Agreements below.

Post-contract customer support includes providing frequent updates and upgrades to maintain the utility of the software due to rapid changes in technology. Post-contract customer support for our EDA and IP products also includes access to the SolvNet[®] portal, where customers can explore our complete design knowledge database. Updated daily, the SolvNet portal includes technical documentation, design tips, and answers to user questions. Customers can also engage, for additional charges, with our worldwide network of applications consultants for additional support needs.

In addition, we offer training workshops designed to increase customer design proficiency and productivity with our products. Workshops cover our EDA products and methodologies used in our design and verification flows, as well as specialized modules addressing system design, logic design, physical design, simulation and testing. We offer regularly scheduled public and private courses in a variety of locations worldwide, as well as online training (live or on-demand) through our Virtual Classrooms.

Product Warranties

We generally warrant our products to be free from defects in media and to substantially conform to material specifications for a period of 90 days for our software products and for up to 6 months for our hardware products. In many cases, we also provide our customers with limited indemnification with respect to claims that their use of our software products infringes on United States patents, copyrights, trademarks or trade secrets. We have not experienced material warranty or indemnity claims to date.

Support for Industry Standards

We actively create and support standards that help our EDA and IP customers increase productivity, facilitate efficient design flows, improve interoperability of tools from different vendors, and ensure connectivity, functionality and interoperability of IP building blocks. Standards in the electronic design industry can be established by formal accredited organizations, industry consortia, company licensing made available to all, de facto usage, or through open source licensing.

Synopsys' EDA products support many standards, including the most commonly used hardware description languages: SystemVerilog, Verilog, VHDL, and SystemC[®]. Our products utilize numerous industry-standard data formats, APIs, and databases for the exchange of design data among our tools, other EDA vendors' products, and applications that customers develop internally. We also comply with a wide range of industry standards within our IP product family to ensure usability and interconnectivity.

Our Software Integrity solutions support several existing and emerging industry standards for software coding and security, such as the Motor Industry Software Reliability Association (MISRA) coding standards for the automotive industry. In addition, our products support multiple major programming languages, including C/C++, Objective C, C#, JavaScript (including many commonly used frameworks), and others. In addition, we support many common compilers, development environments, frameworks, and data and file formats.

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Sales, Distribution and Backlog

Our EDA and IP customers are primarily semiconductor and electronics systems companies. The customers for our Software Integrity solutions include many of these companies as well as companies from a wider array of industries, including electronics, financial services, media, automotive, medicine, energy and industrials. We market our products and services principally through direct sales in the United States and our principal foreign markets. We typically distribute our software products and documentation to customers electronically, but provide physical media (e.g., DVD-ROMs) when requested by the customer.

We maintain sales and support centers throughout the United States. Outside the United States, we maintain sales, support or service offices in Canada, multiple countries in Europe, Israel and multiple countries in Asia, including Japan, China, Korea, and Taiwan. Our international headquarters are located in Dublin, Ireland. Our offices are further described under Part I, Item 2, Properties.

Information relating to domestic and foreign operations, including revenue and long-lived assets by geographic area, is contained in Note 13 of Notes to Consolidated Financial Statements in Part II, Item 8, Financial Statements and Supplementary Data. Risks related to our foreign operations are described in Part I, Item 1A, Risk Factors.

Our backlog was approximately \$4.0 billion on October 31, 2018, an increase from backlog of \$3.7 billion on October 31, 2017, resulting primarily from the timing of large multi-year contract renewals. Backlog represents committed orders that are expected to be recognized as revenue over the following three years. We currently expect that \$1.7 billion of our backlog will be recognized after fiscal 2019. Backlog may not be a reliable predictor of our future sales as business conditions may change and technologies may evolve, and customers may seek to renegotiate their arrangements or may default on their payment obligations. For this and other reasons, we may not be able to recognize expected revenue from backlog when anticipated.

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Revenue attributable to each of our four product categories is shown below as a percentage of total revenue for the last three fiscal years.

Aggregate revenue derived from Intel Corporation and its subsidiaries through multiple agreements accounted for 15.4%, 17.9% and 15.9% of our total revenue in fiscal 2018, 2017 and 2016, respectively. No other customer accounted for more than 10% of our revenue during such periods.

Product Sales and Licensing Agreements

We typically license our software to customers under non-exclusive license agreements that restrict use of our software to specified purposes within specified geographical areas. The majority of our licenses are network licenses that allow a number of individual users to access the software on a defined network, including, in some cases, regional or global networks. License fees depend on the type of license, product mix and number of copies of each product licensed.

In a number of cases, we provide our customers the right to “re-mix” a portion of the software they initially licensed for other specified Synopsys products. For example, a customer may use our front-end design products for a portion of the license term and then exchange such products for back-end place-and-route software for the remainder of the term in order to complete the customer’s IC design. This practice helps ensure the customer’s access to the complete design flow needed to design their product. Offering remix rights to customers gives us an advantage over competitors who offer a narrower range of products because customers can obtain more of their design flow from a single vendor. At the same time—because in such cases the customer does not need to obtain a new license and pay an additional license fee for the use of the additional products—the use of these arrangements could result in reduced revenue compared to licensing the individual products separately without re-mix rights.

We currently offer our software products under, primarily, two license types: TSLs and perpetual licenses. For a full discussion of these types of licenses, see Part II, Item 7, Management’s Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies and Estimates and Results of Operations—Revenue Background.

We typically license our DesignWare IP products under nonexclusive license agreements that provide usage rights for specific applications. Fees under these licenses are typically charged on a per design basis plus, in some cases, royalties. Royalty arrangements are not material to our total revenue.

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Our hardware products, which principally consist of our prototyping and emulation systems, are either sold or leased to our customers. Our professional services team typically provides design consulting services to our customers under consulting agreements with statements of work specific to each project.

Competition

The EDA industry is highly competitive. We compete against other EDA vendors and against our customers' own design tools and internal design capabilities. In general, we compete principally on technology leadership, product quality and features (including ease-of-use), license terms, price and payment terms, post-contract customer support, flexibility of tool use, and interoperability with our own and other vendors' products. We also deliver a significant amount of engineering and design consulting for our products. No single factor drives an EDA customer's buying decision, and we compete on all fronts to capture a higher portion of our customers' budgets. Our competitors include EDA vendors that offer varying ranges of products and services, such as Cadence Design Systems, Inc. and Mentor Graphics Corporation (now part of Siemens AG). We also compete with other EDA vendors, including new entrants to the marketplace, that offer products focused on one or more discrete phases of the IC design process, as well as with customers' internally developed design tools and capabilities.

In the area of IP products, we compete against numerous other IP providers, including Cadence Design Systems, Inc., and our customers' internally developed IP. We generally compete on the basis of product quality, reliability and features, ease of integration with customer designs, compatibility with design tools, license terms, price and payment terms, and customer support.

In the area of Software Integrity solutions, we compete with numerous other solution providers, many of which focus on specific aspects of software security or quality analysis. We also compete with frequent new entrants, which include start-up companies and more established software companies. For example, competitors named in the Gartner Magic Quadrant for Application Security Testing include Checkmarx Ltd., International Business Machines Corporation, Micro Focus International plc, and Veracode (acquired by Thoma Bravo, LLC).

Proprietary Rights

We primarily rely upon a combination of copyright, patent, trademark, and trade secret laws and license and non-disclosure agreements to establish and protect our proprietary rights. We have a diversified portfolio of more than 3,100 United States and foreign patents issued, and we will continue to pursue additional patents in the future. Our issued patents have expiration dates through 2037. Our patents primarily relate to our products and the technology used in connection with our products. Our source code is protected both as a trade secret and as an unpublished copyrighted work. However, third parties may independently develop similar technology. In addition, effective copyright and trade secret protection may be unavailable or limited in some foreign countries. While protecting our proprietary technology is important to our success, our business as a whole is not significantly dependent upon any single patent, copyright, trademark, or license.

In many cases, under our customer agreements and other license agreements, we offer to indemnify our customers if the licensed products infringe on a third party's intellectual property rights. As a result, we may from time to time need to defend claims that our customers' use of our products infringes on these third-party rights. We license software and other intellectual property from third parties, including, in several instances, for inclusion in our products. Risks related to our use of third-party technology are described in Part I, Item 1A, Risk Factors.

Employees

As of October 31, 2018, Synopsys had 13,245 employees, of which 4,679 were based in the United States.

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Executive Officers of the Registrant

The executive officers of Synopsys and their ages as of December 14, 2018 were as follows:

Name	Age	Position
Aart J. de Geus	64	Co-Chief Executive Officer and Chairman of the Board of Directors
Chi-Foon Chan	69	Co-Chief Executive Officer and President
Trac Pham	49	Chief Financial Officer
Joseph W. Logan	59	Sales and Corporate Marketing Officer
John F. Runkel, Jr.	63	General Counsel and Corporate Secretary

Aart J. de Geus co-founded Synopsys and has served as Chairman of our Board of Directors since February 1998 and Chief Executive Officer since January 1994. He has served as Co-Chief Executive Officer with Dr. Chi-Foon Chan since May 2012. Since the inception of Synopsys in December 1986, Dr. de Geus has held a variety of positions, including President, Senior Vice President of Engineering and Senior Vice President of Marketing. He has served as a member of Synopsys' Board of Directors since 1986, and served as Chairman of our Board from 1986 to 1992 and again from 1998 until present. Dr. de Geus has also served on the board of directors of Applied Materials, Inc. since July 2007. Dr. de Geus holds an M.S.E.E. from the Swiss Federal Institute of Technology in Lausanne, Switzerland and a Ph.D. in Electrical Engineering from Southern Methodist University.

Chi-Foon Chan has served as our Co-Chief Executive Officer since May 2012 and as our President and a member of our Board of Directors since February 1998. Prior to his appointment as our Co-Chief Executive Officer in May 2012, he had served as our Chief Operating Officer since April 1997. Dr. Chan joined Synopsys in May 1990 and has held various senior management positions, including Executive Vice President, Office of the President from September 1996 to February 1998 and Senior Vice President, Design Tools Group from February 1994 to April 1997. Dr. Chan has also held senior management and engineering positions at NEC Electronics and Intel Corporation. Dr. Chan holds a B.S. in Electrical Engineering from Rutgers University, and an M.S. and a Ph.D. in Computer Engineering from Case Western Reserve University.

Trac Pham is our Chief Financial Officer. Mr. Pham joined Synopsys in November 2006 as Vice President, Financial Planning and Strategy. He became our Vice President, Corporate Finance, in August 2012, assuming additional responsibility for our tax and treasury functions, before being appointed Chief Financial Officer in December 2014. Mr. Pham holds a Bachelor of Arts in Economics from the University of California, Berkeley and an MPIA (Master of Pacific International Affairs) from the University of California, San Diego. He is an active status California CPA. Joseph W. Logan serves as our Sales and Corporate Marketing Officer. He became Senior Vice President of Worldwide Sales in September 2006, and assumed responsibility for our Corporate Marketing organization in August 2013. Previously, Mr. Logan was head of sales for Synopsys' North America East region from September 2001 to September 2006. Prior to Synopsys, Mr. Logan was head of North American Sales and Support at Avant! Corporation. Mr. Logan holds a B.S.E.E. from the University of Massachusetts, Amherst.

John F. Runkel, Jr. has served as our General Counsel and Corporate Secretary since May 2014. From October 2008 to March 2013, he was Executive Vice President, General Counsel, and Corporate Secretary of Affymetrix, Inc. He served as Senior Vice President, General Counsel and Corporate Secretary of Intuitive Surgical, Inc. from 2006 to 2007. Mr. Runkel served in several roles at VISX, Inc. from 2001 to 2005, most recently as Senior Vice President of Business Development and General Counsel. Mr. Runkel was also a partner at the law firm of Sheppard, Mullin, Richter & Hampton LLP for 11 years. He holds a Bachelor of Arts and a Juris Doctorate from the University of California, Los Angeles.

There are no family relationships among any Synopsys executive officers or directors.

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Item 1A. Risk Factors

A description of the risk factors associated with our business is set forth below. Investors should carefully consider these risks and uncertainties before investing in our common stock.

The growth of our business depends primarily on the semiconductor and electronics industries.

The growth of the electronic design automation (EDA) industry as a whole, our EDA and intellectual property (IP) product sales, and to some extent our Software Integrity Solutions sales, is dependent on the semiconductor and electronics industries. A substantial portion of our business and revenue depends upon the commencement of new design projects by semiconductor manufacturers and their customers. The increasing complexity of designs of systems-on-chips and integrated circuits, and customers' concerns about managing costs, have previously led and in the future could lead to a decrease in design starts and design activity in general, with some customers focusing more on one discrete phase of the design process or opting for less advanced, but less risky, manufacturing processes that may not require the most advanced EDA products. Demand for our products and services could decrease and our financial condition and results of operations could be adversely affected if growth in the semiconductor and electronics industries slows or stalls. Additionally, as the EDA industry matures, consolidation may result in stronger competition from companies better able to compete as sole source vendors. This increased competition may cause our revenue growth rate to decline and exert downward pressure on our operating margins, which may have an adverse effect on our business and financial condition.

Furthermore, the semiconductor and electronics industries have become increasingly complex ecosystems. Many of our customers outsource the manufacture of their semiconductor designs to foundries. Our customers also frequently incorporate third-party IP, whether provided by us or other vendors, into their designs to improve the efficiency of their design process. We work closely with major foundries to ensure that our EDA, IP, and manufacturing solutions are compatible with their manufacturing processes. Similarly, we work closely with other major providers of semiconductor IP, particularly microprocessor IP, to optimize our EDA tools for use with their IP designs and to assure that their IP and our own IP products, which may each provide for the design of separate components on the same chip, work effectively together. If we fail to optimize our EDA and IP solutions for use with major foundries' manufacturing processes or major IP providers' products, or if our access to such foundry processes or third-party IP products is hampered, then our solutions may become less desirable to our customers, resulting in an adverse effect on our business and financial condition.

Consolidation among our customers and within the industries in which we operate, as well as our dependence on a relatively small number of large customers, may negatively impact our operating results.

A number of business combinations, including mergers, asset acquisitions and strategic partnerships, among our customers in the semiconductor and electronics industries have occurred over the last several years, and more could occur in the future. Consolidation among our customers could lead to fewer customers or the loss of customers, increased customer bargaining power, or reduced customer spending on software and services. Furthermore, we depend on a relatively small number of large customers, and on such customers continuing to renew licenses and purchase additional products from us, for a large portion of our revenue. Reduced customer spending or the loss of a small number of customers, particularly our large customers, could adversely affect our business and financial condition. In addition, we and our competitors from time to time acquire businesses and technologies to complement and expand our respective product offerings. If any of our competitors consolidate or acquire businesses and technologies which we do not offer, they may be able to offer a larger technology portfolio, additional support and service capability, or lower prices, which could negatively impact our business and operating results.

Uncertainty in the global economy, and its potential impact on the semiconductor and electronics industries in particular, may negatively affect our business, operating results and financial condition.

While the global economy has shown improvement in recent years, there are still uncertainties surrounding the strength of the recovery in many regions. Uncertainty caused by challenging global economic conditions could lead some of our customers to postpone their decision-making, decrease their spending and/or delay their payments to us. Such caution by customers could, among other things, limit our ability to maintain or increase our sales or recognize

revenue from committed contracts.

We cannot predict the stability of the economy as a whole or the industries in which we operate. Further economic instability could adversely affect the banking and financial services industry and result in credit downgrades of the

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banks we rely on for foreign currency forward contracts, credit and banking transactions, and deposit services, or cause them to default on their obligations. There is uncertainty regarding how proposed, contemplated or future changes to the complex laws and regulations governing our industry, the banking and financial services industry, and the economy could affect our business. In addition, economic conditions could deteriorate in the future, and, in particular, the semiconductor and electronics industries could fail to grow, including as the result of any disruption of international trade relationships. In the event of future improvements in economic conditions for our customers, the positive impact on our revenues and financial results may be deferred due to our business model. Any of the foregoing could cause adverse effects on our business, operating results and financial condition, and could cause our stock price to decline.

Our operating results may fluctuate in the future, which may adversely affect our stock price.

Our operating results are subject to quarterly and annual fluctuations, which may adversely affect our stock price. Our historical results should not be viewed as indicative of our future performance due to these periodic fluctuations.

Many factors may cause our revenue or earnings to fluctuate, including:

Changes in demand for our products—especially products, such as hardware, generating upfront revenue—due to fluctuations in demand for our customers’ products and due to constraints in our customers’ budgets for research and development and EDA products and services;

Product competition in the EDA industry, which can change rapidly due to industry or customer consolidation and technological innovation;

Our ability to innovate and introduce new products and services or effectively integrate products and technologies that we acquire;

Failures or delays in completing sales due to our lengthy sales cycle, which often includes a substantial customer evaluation and approval process because of the complexity of our products and services;

Our ability to implement effective cost control measures;

Our dependence on a relatively small number of large customers, and on such customers continuing to renew licenses and purchase additional products from us, for a large portion of our revenue;

Changes to the amount, composition and valuation of, and any impairments to or write-offs of, our inventory;

Changes in the mix of our products sold, as increased sales of our products with lower gross margins, such as our hardware products, may reduce our overall margins;

Expenses related to our acquisition and integration of businesses and technology;

Changes in tax rules, as well as changes to our effective tax rate, including the tax effects of infrequent or unusual transactions and tax audit settlements;

Delays, increased costs or quality issues resulting from our reliance on third parties to manufacture our hardware products, which includes a sole supplier for certain hardware components;

General economic and political conditions that affect the semiconductor and electronics industries, such as disruptions to international trade relationships, including tariffs, export licenses, or other trade barriers affecting our or our suppliers’ products; and

Changes in accounting standards, such as Topic 606, as discussed in Note 14 of Notes to Consolidated Financial Statements, which, for example, could impact the expected realization of our backlog.

The timing of revenue recognition may also cause our revenue and earnings to fluctuate. The timing of revenue recognition is affected by factors that include:

Cancellations or changes in levels of orders or the mix between upfront products revenue and time-based products revenue;

Delay of one or more orders for a particular period, particularly orders generating upfront products revenue, such as hardware;

Delay in the completion of professional services projects that require significant modification or customization and are accounted for using the percentage of completion method;

Delay in the completion and delivery of IP products in development as to which customers have paid for early access;

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- Customer contract amendments or renewals that provide discounts or defer revenue to later periods;
- The levels of our hardware revenues, which are recognized upfront and are primarily dependent upon our ability to provide the latest technology and meet customer requirements, and which may also impact our levels of excess and obsolete inventory expenses;
- Changes in accounting standards, such as Topic 606, as discussed in Note 14 of Notes to Consolidated Financial Statements; and
- Changes in our revenue recognition model.

These factors, or any other factors or risks discussed herein, could negatively impact our revenue or earnings and cause our stock price to decline. Additionally, our results may fail to meet or exceed the expectations of securities analysts and investors, or such analysts may change their recommendation regarding our stock, which could cause our stock price to decline. Our stock price has been, and may continue to be, volatile, which may make it more difficult for our stockholders to sell their shares at a time or a price that is favorable to them.

We operate in highly competitive industries, and if we do not continue to meet our customers' demand for innovative technology at lower costs, our products may become uncompetitive and obsolete, and our business and financial condition may be harmed.

We compete against EDA vendors that offer a variety of products and services, such as Cadence Design Systems, Inc. and Mentor Graphics Corporation (now part of Siemens AG). We also compete with other EDA vendors, including new entrants to the marketplace, that offer products focused on one or more discrete phases of the IC design process. Moreover, our customers internally develop design tools and capabilities that compete with our products, including internal designs that compete with our IP products.

In the area of IP products, we compete against numerous other IP providers as well as our customers' internally developed IP. In the area of software integrity solutions, we compete with numerous other solution providers, many of which focus on specific aspects of software security or quality analysis. We also compete with frequent new entrants, which include start-up companies and more established software companies.

The industries in which we operate are highly competitive and the demand for our products and services is dynamic and depends on a number of factors, including demand for our customers' products, design starts and our customers' budgetary constraints. Technology in these industries evolves rapidly and is characterized by frequent product introductions and improvements as well as changes in industry standards and customer requirements. Semiconductor device functionality requirements continually increase while feature widths decrease, substantially increasing the complexity, cost and risk of chip design and manufacturing. At the same time, our customers and potential customers continue to demand an overall lower total cost of design, which can lead to the consolidation of their purchases with one vendor. In order to succeed in this environment, we must successfully meet our customers' technology requirements and increase the value of our products, while also striving to reduce their overall costs and our own operating costs.

We compete principally on the basis of technology, product quality and features (including ease-of-use), license or usage terms, post-contract customer support, interoperability among products, and price and payment terms. Specifically, we believe the following competitive factors affect our success:

- Our ability to anticipate and lead critical development cycles and technological shifts, innovate rapidly and efficiently, improve our existing products, and successfully develop or acquire new products;
- Our ability to offer products that provide both a high level of integration into a comprehensive platform and a high level of individual product performance;
- Our ability to enhance the value of our offerings through more favorable terms such as expanded license usage, future purchase rights, price discounts and other differentiating rights, such as multiple tool copies, post-contract customer support, "re-mix" rights that allow customers to exchange the software they initially licensed for other Synopsys products, and the ability to purchase pools of technology;
- Our ability to compete on the basis of payment terms; and
- Our ability to provide engineering and design consulting for our products.

If we fail to successfully manage these competitive factors, fail to successfully balance the conflicting demands for innovative technology and lower overall costs, or fail to address new competitive forces, our business and financial condition will be adversely affected.

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The global nature of our operations exposes us to increased risks and compliance obligations that may adversely affect our business.

We derive roughly half of our revenue from sales outside the United States, and we expect our orders and revenue to continue to depend on sales to customers outside the U.S. In addition, we have continually expanded our non-U.S. operations in the past several years. This strategy requires us to recruit and retain qualified technical and managerial employees, manage multiple remote locations performing complex software development projects and ensure intellectual property protection outside of the U.S. Our international operations and sales subject us to a number of increased risks, including:

- Ineffective or weaker legal protection of intellectual property rights;
- Uncertain economic and political conditions in countries where we do business;
- Difficulties in adapting to cultural differences in the conduct of business, which may include business practices in which we are prohibited from engaging by the Foreign Corrupt Practices Act or other anti-corruption laws;
- Financial risks such as longer payment cycles and difficulty in collecting accounts receivable;
 - Inadequate local infrastructure that could result in business disruptions;
- Government trade restrictions, including tariffs, export licenses, or other trade barriers, and changes to existing trade arrangements between various countries;
- Additional taxes, interest, and potential penalties, and uncertainty around changes in tax laws of various countries; and
- Other factors beyond our control such as natural disasters, terrorism, civil unrest, war and infectious diseases.

As our business volume increases in the Asia Pacific region, there is inherent risk, based on the complex relationships between certain Asian countries and the United States, that political, diplomatic, or military events could result in trade disruptions, including tariffs, trade embargoes, and other trade barriers. A significant trade disruption or the establishment or increase of any trade barrier in any area where we do business could increase the cost of our products, which could adversely impact the margin that we earn on sales; make our products more expensive for customers, which could make our products less competitive and reduce consumer demand; adversely restrict or delay our suppliers of hardware components and products, which could adversely impact our future revenues and financial results; or otherwise have a materially adverse impact on our future revenue and profits, our and our customers' and suppliers' businesses, and our results of operations. Furthermore, if any of the foreign economies in which we do business deteriorate or if we fail to effectively manage our global operations, our business and results of operations will be harmed.

In response to U.S. tariffs, other countries may adopt tariffs and other trade barriers that could limit our ability to offer our products and services. Additionally, political uncertainty surrounding international trade disputes could have a negative impact on consumer confidence and spending, which could adversely impact our business operations.

In addition to tariffs and other trade barriers, our global operations are subject to numerous U.S. and foreign laws and regulations, including those related to anti-corruption, tax, corporate governance, imports and exports, financial and other disclosures, privacy and labor relations. These laws and regulations are complex and may have differing or conflicting legal standards, making compliance difficult and costly. In addition, there is uncertainty regarding how proposed, contemplated or future changes to these complex laws and regulations could affect our business. We may incur substantial expense in complying with the new obligations to be imposed by these laws and regulations, and we may be required to make significant changes in our business operations, all of which may adversely affect our revenues and our business overall. If we violate these laws and regulations we could be subject to fines, penalties or criminal sanctions, and may be prohibited from conducting business in one or more countries. Although we have implemented policies and procedures to help ensure compliance with these laws and regulations, there can be no assurance that our employees, contractors, agents or partners will not violate such laws and regulations. Any violation

individually or in the aggregate could have a material adverse effect on our operations and financial condition. Our financial results are also affected by fluctuations in foreign currency exchange rates. A weakening U.S. dollar relative to other currencies increases expenses of our foreign subsidiaries when they are translated into U.S. dollars in our consolidated statement of operations. Likewise, a strengthening U.S. dollar relative to other currencies, especially the Japanese Yen, reduces revenue of our foreign subsidiaries upon translation and consolidation.

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Exchange rates are subject to significant and rapid fluctuations, and therefore we cannot predict the prospective impact of exchange rate fluctuations. Although we engage in foreign currency hedging activity, we may be unable to hedge all of our foreign currency risk, which could have a negative impact on our results of operations.

Cybersecurity threats or other security breaches could compromise sensitive information belonging to us or our customers and could harm our business and our reputation, particularly that of our security testing solutions.

We store sensitive data, including intellectual property, our proprietary business information and that of our customers, and confidential employee information, in our data centers and on our networks. Despite our security measures, our information technology and infrastructure may be vulnerable to attacks by hackers or breached due to employee error, malfeasance or other disruptions that could result in unauthorized disclosure or loss of sensitive information.

For example, in October 2015, we discovered unauthorized third-party access, which had begun in July 2015, to our products and product license files hosted on our SolvNet customer license and product delivery system. We determined that no customer project or design data had been accessed. No personally identifiable information or payment card information is stored on the system. While we identified and closed the method used to gain access, it is possible that our security measures may be circumvented again in the future, and such a breach could harm our business and reputation. 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. We may be unable to anticipate these techniques or to implement adequate preventative measures. Furthermore, in the operation of our business we also use third-party vendors that store certain sensitive data, including confidential information about our employees, and these third parties are subject to their own cybersecurity threats. While our standard vendor terms and conditions include provisions requiring the use of appropriate security measures to prevent unauthorized use or disclosure of our data, as well as other safeguards, a breach may still occur. Any security breach of our own or a third-party vendor's systems could cause us to be non-compliant with applicable laws or regulations, subject us to legal claims or proceedings, disrupt our operations, damage our reputation, and cause a loss of confidence in our products and services, any of which could adversely affect our business.

Our software products, including our hosted solutions as well as our software security and quality testing solutions, may also be vulnerable to cyber attack. An attack could disrupt the proper functioning of our software, cause errors in the output of our customers' work, allow unauthorized access to our or our customers' proprietary information, and other destructive outcomes. As a result, our reputation could suffer, customers could stop buying our products, we could face lawsuits and potential liability, and our financial performance could be negatively impacted.

We offer software security and quality testing solutions. If we fail to identify new and increasingly sophisticated methods of cyber attack, or fail to invest sufficient resources in research and development regarding new threat vectors, our security testing products and services may fail to detect vulnerabilities in our customers' software code. An actual or perceived failure to identify security flaws may harm the perceived reliability of our security testing products and services, and could result in a loss of customers or sales, or an increased cost to remedy a problem. Furthermore, our growth and recent acquisitions in the software security and quality testing space may increase our visibility as a security-focused company and may make us a more attractive target for attacks on our own information technology infrastructure. Successful attacks could damage our reputation as a security-focused company. If we fail to protect our proprietary technology, our business will be harmed.

Our success depends in part upon protecting our proprietary technology. Our efforts to protect our technology may be costly and unsuccessful. We rely on agreements with customers, employees and other third-parties as well as intellectual property laws worldwide to protect our proprietary technology. These agreements may be breached, and we may not have adequate remedies for any breach. Additionally, despite our measures to prevent piracy, other parties may attempt to illegally copy or use our products, which could result in lost revenue. Some foreign countries do not currently provide effective legal protection for intellectual property and our ability to prevent the unauthorized use of our products in those countries is therefore limited. Our trade secrets may also be stolen, otherwise become known, or be independently developed by competitors.

We may need to commence litigation or other legal proceedings in order to:

◆ Assert claims of infringement of our intellectual property;
◆ Defend our products from piracy;

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Protect our trade secrets or know-how; or

Determine the enforceability, scope and validity of the propriety rights of others.

If we do not obtain or maintain appropriate patent, copyright or trade secret protection, for any reason, or cannot fully defend our intellectual property rights in certain jurisdictions, our business and operating results would be harmed. In addition, intellectual property litigation is lengthy, expensive and uncertain. Legal fees related to such litigation will increase our operating expenses and may reduce our net income.

We may not be able to realize the potential financial or strategic benefits of the acquisitions we complete, or find suitable target businesses and technology to acquire, which could hurt our ability to grow our business, develop new products or sell our products.

Acquisitions are an important part of our growth strategy. We have completed a significant number of acquisitions in recent years. We expect to make additional acquisitions in the future, but we may not find suitable acquisition targets or we may not be able to consummate desired acquisitions due to unfavorable credit markets, commercially unacceptable terms, or other risks, which could harm our operating results. Acquisitions are difficult, time-consuming, and pose a number of risks, including:

Potential negative impact on our earnings per share;

Failure of acquired products to achieve projected sales;

Problems in integrating the acquired products with our products;

Difficulties entering into new markets in which we are not experienced or where competitors may have stronger positions;

Potential downward pressure on operating margins due to lower operating margins of acquired businesses, increased headcount costs and other expenses associated with adding and supporting new products;

Difficulties in retaining and integrating key employees;

Substantial reductions of our cash resources and/or the incurrence of debt;

Failure to realize expected synergies or cost savings;

Difficulties in integrating or expanding sales, marketing and distribution functions and administrative systems, including information technology and human resources systems;

Dilution of our current stockholders through the issuance of common stock as part of the merger consideration;

Assumption of unknown liabilities, including tax and litigation, and the related expenses and diversion of resources;

Disruption of ongoing business operations, including diversion of management's attention and uncertainty for employees and customers, particularly during the post-acquisition integration process;

Potential negative impacts on our relationships with customers, distributors and business partners;

Exposure to new operational risks, regulations, and business customs to the extent acquired businesses are located in regions where we are not currently conducting business;

The need to implement controls, processes and policies appropriate for a public company at acquired companies that may have lacked such controls, processes and policies;

Negative impact on our net income resulting from acquisition-related costs; and

Requirements imposed by government regulators in connection with their review of an acquisition, including required divestitures or restrictions on the conduct of our business or the acquired business.

If we do not manage the foregoing risks, the acquisitions that we complete may have an adverse effect on our business and financial condition.

We pursue new product and technology initiatives from time to time, and if we fail to successfully carry out these initiatives, our business, financial condition, or results of operations could be adversely impacted.

As part of the evolution of our business, we have made substantial investments to develop new products and enhancements to existing products through our acquisitions and research and development efforts. If we are unable to anticipate technological changes in our industry by introducing new or enhanced products in a timely and cost-effective manner, or if we fail to introduce products that meet market demand, we may lose our competitive position, our products may become obsolete, and our business, financial condition or results of operations could be adversely affected.

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Additionally, from time to time, we invest in expansion into adjacent markets, including software security and quality solutions. Although we believe these solutions are complementary to our EDA tools, we have less experience and a more limited operating history in offering software quality, testing, and security products and services, and our efforts in this area may not be successful. Our success in these new markets depends on a variety of factors, including the following:

- Our ability to attract a new customer base, including in industries in which we have less experience;
- Our successful development of new sales and marketing strategies to meet customer requirements;
- Our ability to accurately predict, prepare for, and promptly respond to technological developments in new fields, including, in the case of our software quality, testing, and security tools and services, identifying new security vulnerabilities in software code and ensuring support for a growing number of programming languages;
- Our ability to compete with new and existing competitors in these new industries, many of which may have more financial resources, industry experience, brand recognition, relevant intellectual property rights, or established customer relationships than we currently do, and could include free and open source solutions that provide similar software quality, testing, and security tools without fees;
- Our ability to skillfully balance our investment in adjacent markets with investment in our existing products and services;
- Our ability to attract and retain employees with expertise in new fields;
- Our ability to sell and support consulting services at profitable margins; and
- Our ability to manage our revenue model in connection with hybrid sales of licensed products and consulting services.

Difficulties in any of our new product development efforts or our efforts to enter adjacent markets could adversely affect our operating results and financial condition.

We may have to invest more resources in research and development than anticipated, which could increase our operating expenses and negatively affect our operating results.

We devote substantial resources to research and development. New competitors, technological advances in the semiconductor industry or by competitors, our acquisitions, our entry into new markets, or other competitive factors may require us to invest significantly greater resources than we anticipate. If we are required to invest significantly greater resources than anticipated without a corresponding increase in revenue, our operating results could decline. Additionally, our periodic research and development expenses may be independent of our level of revenue, which could negatively impact our financial results. Finally, there can be no guarantee that our research and development investments will result in products that create additional revenue.

Our hardware products, which primarily consist of prototyping and emulation systems, subject us to distinct risks. The growth in sales of our hardware products subjects us to several risks, including:

Increased dependence on a sole supplier for certain hardware components, which may reduce our control over product quality and pricing and may lead to delays in production and delivery of our hardware products, should our supplier fail to deliver sufficient quantities of acceptable components in a timely fashion;

Increasingly variable revenue and decreasingly accurate revenue forecasts, due to fluctuations in hardware revenue, which is recognized upfront upon shipment, as opposed to most sales of software products for which revenue is recognized over time;

Overall reductions in margins, as the gross margin for our hardware products is typically lower than those of our software products;

Longer sales cycles, which create risks of insufficient, excess or obsolete inventory and variations in inventory valuation, which can adversely affect our operating results;

Decreases or delays in customer purchases in favor of next-generation releases, which may lead to excess or obsolete inventory or require us to discount our older hardware products; and

Longer warranty periods than those of our software products, which may require us to replace hardware components under warranty, thus increasing our costs.

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Changes in United States Generally Accepted Accounting Principles (U.S. GAAP) could adversely affect our financial results and may require significant changes to our internal accounting systems and processes.

We prepare our consolidated financial statements in conformity with U.S. GAAP. These principles are subject to interpretation by the Financial Accounting Standards Board (FASB), the Securities and Exchange Commission (SEC) and various bodies formed to interpret and create appropriate accounting principles and guidance.

The FASB periodically issues new accounting standards on a variety of topics, including, for example, revenue recognition and accounting for leases. For information regarding new accounting standards, please refer to Note 14 of Notes to Consolidated Financial Statements under the heading "Effect of New Accounting Pronouncements." These and other such standards generally result in different accounting principles, which may significantly impact our reported results or could result in variability of our financial results. For example, the recent new revenue recognition standard will be applicable to us beginning in fiscal 2019 and could lead to increased volatility in our total revenue, as some of our revenue may be recognized in different periods and with less predictability than is the case under current accounting standards.

Our results could be adversely affected by a change in our effective tax rate as a result of tax law changes and related new or revised guidance and regulations, changes in our geographical earnings mix, unfavorable government reviews of our tax returns, material differences between our forecasted and actual annual effective tax rates, future changes to our tax structure, or by evolving enforcement practices.

Our operations are subject to income and transaction taxes in the United States and in multiple foreign jurisdictions, with a significant amount of our foreign earnings generated by our subsidiaries organized in Ireland and Hungary. Because we have a wide range of statutory tax rates in the multiple jurisdictions in which we operate, any changes in our geographical earnings mix, including those resulting from our intercompany transfer pricing or from changes in the rules governing transfer pricing, could materially impact our effective tax rate. Furthermore, a change in the tax law of the jurisdictions where we do business, including an increase in tax rates or an adverse change in the treatment of an item of income or expense, could result in a material increase in our tax expense and impact our financial position and cash flows.

On December 22, 2017, the President of the United States signed into law the Tax Cuts and Jobs Act (Tax Act), which significantly changed prior U.S. tax law and includes numerous provisions that affect our business in the current year and future years. Accounting for certain of these provisions requires the exercise of significant judgment. As regulations and guidance evolve with respect to the Tax Act, and as we gather more information and perform more analysis, our results may materially differ from previous estimates, and those differences may materially affect our financial position. In addition, the Tax Act includes certain new provisions that will affect our income from foreign operations beginning in fiscal 2019, as well as a lower corporate tax rate on income from domestic operations. Because guidance continues to evolve, however, the net impact of these changes is uncertain, and while we believe such changes will have an overall favorable impact on our effective tax rate, certain interpretations of the international provisions of the Tax Act could adversely affect our tax rate and cash flow in future years.

In fiscal 2018, we incurred foreign taxes of \$67.7 million as a result of reorganizing certain rights related to use of our intellectual property in our international business. Such tax was recorded as a prepaid tax on our balance sheet, in accordance with current accounting rules. The amount of tax is subject to audit by the Hungarian Tax Authority (HTA) and could increase, along with the imposition of penalties and interest, and could materially affect our financial results and cash flow.

Further changes in the tax laws of foreign jurisdictions could arise as a result of the base erosion and profit shifting (BEPS) project undertaken by the Organisation for Economic Co-operation and Development (OECD), which represents a coalition of member countries. On October 5, 2015, the OECD issued a series of reports recommending changes to numerous long-standing tax principles. Many of these recommendations are being adopted by various countries in which we do business and may increase our taxes in these countries. Changes to these and other areas in relation to international tax reform, including future actions taken by foreign governments in response to the Tax Act, could increase uncertainty and may adversely affect our tax rate and cash flow in future years.

Our income and non-income tax filings are subject to review or audit by the Internal Revenue Service and state, local and foreign taxing authorities. We are currently under examination by the tax authorities in a number of jurisdictions. We exercise significant judgment in determining our worldwide provision for income taxes and, in the ordinary course of our business, there may be transactions and calculations where the ultimate tax determination is

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uncertain. For example, we may be liable for additional withholding tax on payments made to us by customers in certain jurisdictions, and we may also be liable for potential tax liabilities of businesses we acquire, including future taxes payable related to the transition tax on earnings from their foreign operations, if any, under the Tax Act. Although we believe our tax estimates are reasonable, the final determination in an audit may be materially different than the treatment reflected in our historical income tax provisions and accruals. An assessment of additional taxes because of an audit could adversely affect our income tax provision and net income in the periods for which that determination is made.

In July 2017, the HTA issued a final assessment against our Hungarian subsidiary (Synopsys Hungary) for fiscal years 2011 through 2013. The HTA has disallowed Synopsys Hungary's tax positions taken during those years regarding the timing of the deduction of research expenses and applied withholding taxes on certain payments made to affiliates, resulting in an aggregate tax assessment of approximately \$44.5 million and interest and penalties of \$18.0 million. We paid the tax assessments, penalties and interest in the first quarter of fiscal 2018 as required by law and recorded these amounts as prepaid taxes on our balance sheet. We continue to appeal the assessment through the Hungarian Administrative Court. If the assessment is ultimately canceled, the Hungarian statutory accounting treatment could have an indirect adverse impact on certain tax benefits in the year of the cancellation. For further discussion of the Hungary audit, see Note 11 of Notes to Consolidated Financial Statements under the heading "Non-US Examinations."

We maintain significant deferred tax assets related to certain tax credits. Our ability to use these credits is dependent upon having sufficient future taxable income in the relevant jurisdiction and in the case of foreign tax credits, how such credits are treated under provisions of the Tax Act. Changes in our forecasts of future income could result in an adjustment to the deferred tax asset and a related charge to earnings that could materially affect our financial results. Liquidity requirements in our U.S. operations may require us to raise cash in uncertain capital markets, which could negatively affect our financial condition.

As of October 31, 2018, approximately 75% of our worldwide cash and cash equivalents balance is held by our international subsidiaries. We intend to meet our U.S. cash spending needs, including the Tax Act provisional transition tax, primarily through our existing U.S. cash balances, ongoing U.S. cash flows, and available credit under our term loan and revolving credit facilities. Should our cash spending needs in the U.S. rise and exceed these liquidity sources, we may be required to incur additional debt at higher than anticipated interest rates or access other funding sources, which could negatively affect our results of operations, capital structure or the market price of our common stock.

From time to time we are subject to claims that our products infringe on third-party intellectual property rights. We are from time to time subject to claims alleging our infringement of third-party intellectual property rights, including patent rights. Under our customer agreements and other license agreements, we agree in many cases to indemnify our customers if our products infringe a third party's intellectual property rights. Infringement claims can result in costly and time-consuming litigation, require us to enter into royalty arrangements, subject us to damages or injunctions restricting our sale of products, invalidate a patent or family of patents, require us to refund license fees to our customers or to forgo future payments or require us to redesign certain of our products, any one of which could harm our business and operating results.

For example, we were engaged in complex patent litigation with Mentor Graphics Corporation (Mentor) involving several actions in different forums. In June 2018, we settled all outstanding patent litigation with Mentor for a \$65.0 million payment made in the third quarter of fiscal 2018 to Siemens, which previously acquired Mentor in March 2017. Further information regarding the lawsuits and settlement are contained in Part I, Item 3, Legal Proceedings and Note 7 of Notes to Consolidated Financial Statements under the heading "Legal Proceedings." In conjunction with the settlement, we also amended an existing interoperability agreement with Mentor to collaborate on a wide range of EDA products. The amendment includes a one-time termination charge between \$0.0 and \$25.0 million, payable to Mentor under certain conditions. In the event such conditions are met, the termination charge could have an adverse

effect on our operating results.

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We may be subject to litigation proceedings that could harm our business.

We may be subject to legal claims or regulatory matters involving stockholder, consumer, employment, customer, supplier, competition, and other issues on a global basis. Litigation is subject to inherent uncertainties, and unfavorable rulings could occur. An unfavorable ruling could include monetary damages or, in cases for which injunctive relief is sought, an injunction prohibiting us from manufacturing or selling one or more products. If we were to receive an unfavorable ruling on a matter, our business and results of operations could be materially harmed. Further information regarding certain of these matters is contained in Part I, Item 3, Legal Proceedings.

Product errors or defects could expose us to liability and harm our reputation and we could lose market share. Software products frequently contain errors or defects, especially when first introduced, when new versions are released, or when integrated with technologies developed by acquired companies. Product errors, including those resulting from third-party suppliers, could affect the performance or interoperability of our products, could delay the development or release of new products or new versions of products and could adversely affect market acceptance or perception of our products. In addition, allegations of manufacturability issues resulting from use of our IP products could, even if untrue, adversely affect our reputation and our customers' willingness to license IP products from us. Any such errors or delays in releasing new products or new versions of products or allegations of unsatisfactory performance could cause us to lose customers, increase our service costs, subject us to liability for damages and divert our resources from other tasks, any one of which could materially and adversely affect our business and operating results.

We may not be able to continue to obtain licenses to third-party software and intellectual property on reasonable terms or at all, which may disrupt our business and harm our financial results.

We license third-party software and other intellectual property for use in product research and development and, in several instances, for inclusion in our products. We also license third-party software, including the software of our competitors, to test the interoperability of our products with other industry products and in connection with our professional services. These licenses may need to be renegotiated or renewed from time to time, or we may need to obtain new licenses in the future. Third parties may stop adequately supporting or maintaining their technology, or they or their technology may be acquired by our competitors. If we are unable to obtain licenses to these third-party software and intellectual property on reasonable terms or at all, we may not be able to sell the affected products, our customers' use of the products may be interrupted, or our product development processes and professional services offerings may be disrupted, which could in turn harm our financial results, our customers, and our reputation.

The inclusion of third-party intellectual property in our products can also subject us and our customers to infringement claims. Although we seek to mitigate this risk contractually, we may not be able to sufficiently limit our potential liability. Regardless of outcome, infringement claims may require us to use significant resources and may divert management's attention.

Some of our products and technology, including those we acquire, may include software licensed under open source licenses. Some open source licenses could require us, under certain circumstances, to make available or grant licenses to any modifications or derivative works we create based on the open source software. Although we have tools and processes to monitor and restrict our use of open source software, the risks associated with open source usage may not be eliminated and may, if not properly addressed, result in unanticipated obligations that harm our business.

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If we fail to timely recruit and retain senior management and key employees, our business may be harmed. We depend in large part upon the services of key members of our senior management team to drive our future success. If we were to lose the services of any member of our senior management team, our business could be adversely affected. To be successful, we must also attract and retain key technical, sales and managerial employees, including those who join us in connection with acquisitions. There are a limited number of qualified EDA and IC design engineers, and competition for these individuals is intense and has increased. Our employees are often recruited aggressively by our competitors and our customers. Any failure to recruit and retain key technical, sales and managerial employees could harm our business, results of operations and financial condition. Additionally, efforts to recruit and retain qualified employees could be costly and negatively impact our operating expenses.

We issue equity awards from employee equity plans as a key component of our overall compensation. We face pressure to limit the use of such equity-based compensation due to its dilutive effect on stockholders. If we are unable to grant attractive equity-based packages in the future, it could limit our ability to attract and retain key employees. Our business is subject to evolving corporate governance and public disclosure regulations that have increased both our compliance costs and the risk of noncompliance, which could have an adverse effect on our stock price.

We are subject to changing rules and regulations promulgated by a number of governmental and self-regulatory organizations, including the SEC, the Nasdaq Stock Market, and the FASB. These rules and regulations continue to evolve in scope and complexity and many new requirements have been created in response to laws enacted by Congress, making compliance more difficult and uncertain. For example, our efforts to comply with the Dodd-Frank Wall Street Reform and Consumer Protection Act and other regulations, including "conflict minerals" regulations affecting our hardware products, have resulted in, and are likely to continue to result in, increased general and administrative expenses and a diversion of management time and attention from revenue-generating activities to compliance activities.

There are inherent limitations on the effectiveness of our controls and compliance programs.

Regardless of how well designed and operated it is, a control system can provide only reasonable assurance that its objectives will be met. Further, the design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, have been detected. Moreover, although we have implemented compliance programs and compliance training for employees, such measures may not prevent our employees, contractors or agents from breaching or circumventing our policies or violating applicable laws and regulations. Failure of our control systems and compliance programs to prevent error, fraud or violations of law could have a material adverse impact on our business.

Our investment portfolio may be impaired by any deterioration of capital markets.

From time to time, our cash equivalent and short-term investment portfolio consists of investment-grade U.S. government agency securities, asset-backed securities, corporate debt securities, commercial paper, certificates of deposit, money market funds, municipal securities and other securities, and bank deposits. Our investment portfolio carries both interest rate risk and credit risk. Fixed rate debt securities may have their market value adversely impacted due to a credit downgrade or a rise in interest rates, while floating rate securities may produce less income than expected if interest rates fall or a credit downgrade occurs. As a result of capital pressures on certain banks, especially in Europe, and the continuing low interest rate environment, some of our financial instruments may become impaired. Our future investment income may fall short of expectations due to changes in interest rates or if the decline in fair value of investments held by us is judged to be other-than-temporary. In addition, we may suffer losses in principal if we are forced to sell securities that decline in market value due to changes in the issuer's credit quality or changes in interest rates.

In preparing our financial statements we make certain assumptions, judgments and estimates that affect amounts reported in our consolidated financial statements, which, if not accurate, may significantly impact our financial results.

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We make assumptions, judgments and estimates for a number of items, including the fair value of financial instruments, goodwill, long-lived assets and other intangible assets, the realizability of deferred tax assets, the recognition of revenue and the fair value of stock awards. We also make assumptions, judgments and estimates in determining the accruals for employee-related liabilities, including commissions and variable compensation, and in determining the accruals for uncertain tax positions, valuation allowances on deferred tax assets, allowances for doubtful accounts, and legal contingencies. These assumptions, judgments and estimates are drawn from historical experience and various other factors that we believe are reasonable under the circumstances as of the date of the consolidated financial statements. Actual results could differ materially from our estimates, and such differences could significantly impact our financial results.

Catastrophic events may disrupt our business and harm our operating results.

Due to the global nature of our business, our operating results may be negatively impacted by catastrophic events throughout the world. We rely on a global network of infrastructure applications, enterprise applications and technology systems for our development, marketing, operational, support and sales activities. A disruption or failure of these systems in the event of a major earthquake, fire, telecommunications failure, cybersecurity attack, terrorist attack, epidemic, or other catastrophic event could cause system interruptions, delays in our product development and loss of critical data and could prevent us from fulfilling our customers' orders. Moreover, our corporate headquarters, a significant portion of our research and development activities, our data centers, and certain other critical business operations are located in California, near major earthquake faults. A catastrophic event that results in the destruction or disruption of our data centers or our critical business or information technology systems would severely affect our ability to conduct normal business operations and, as a result, our operating results would be adversely affected.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Our principal offices are located in two adjacent buildings in Mountain View, California, which together provide approximately 341,000 square feet of available space. This space is leased through August 2030, and we have two options to extend the lease term, the first to extend the term by ten years, followed by a second option to extend by approximately nine additional years. We also lease approximately 238,000 square feet of space in three separate buildings in Sunnyvale, California, with lease expiration dates ranging from September 2019 to October 2019. We are in the process of consolidating the space in these three separate buildings into a single location in Sunnyvale, California in 2019. We own one building in Sunnyvale, California with approximately 120,000 square feet of space. These buildings in Mountain View and Sunnyvale are used for research and development, sales and support, marketing, and administrative activities.

We currently lease 33 other offices throughout the United States, and own 2 office buildings in Oregon, one of which is leased to a tenant. These offices are used primarily for sales and support activities as well as research and development.

International Facilities

We lease additional space for sales, service, and research and development activities in approximately 29 countries throughout the world, including 25,000 square feet in Dublin, Ireland for our international headquarters, as well as significant sites in Yerevan, Armenia, Bangalore, India, Shanghai and Wuhan, China. In addition, we own two buildings in Hsinchu, Taiwan with approximately 212,000 square feet of combined space.

We believe that our existing facilities, including both owned and leased properties, are in good condition and suitable for the current conduct of our business.

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Item 3. Legal Proceedings

We are subject to routine legal proceedings, as well as demands, claims and threatened litigation that arise in the normal course of our business. The ultimate outcome of any litigation is often uncertain and unfavorable outcomes could have a negative impact on our results of operations and financial condition. Regardless of outcome, litigation can have an adverse impact on Synopsys because of the defense costs, diversion of management resources and other factors.

We regularly review the status of each significant matter and assess its potential financial exposure. If the potential loss from any claim or legal proceeding is considered probable and the amount is estimable, we accrue a liability for the estimated loss. Legal proceedings are inherently uncertain and as circumstances change, it is possible that the amount of any accrued liability may increase, decrease, or be eliminated.

Mentor Patent Litigation

Prior to the legal settlement as further described below, we were engaged in complex patent litigation with Mentor Graphics Corporation (Mentor) involving several actions in different forums. We succeeded to the litigation when we acquired Emulation & Verification Engineering S.A. on October 4, 2012.

Legal Settlement

In March 2017, Siemens PLM Software (Siemens) acquired Mentor. On June 29, 2018, Synopsys, Siemens and Mentor settled all outstanding patent litigation between Synopsys and Mentor for a \$65.0 million payment made in the third quarter from Synopsys to Mentor. Synopsys had previously accrued \$39.0 million and recorded the remaining \$26.0 million as an expense in the quarter ended July 31, 2018. As a result of the settlement, the litigation with Mentor was dismissed and the injunction entered in connection with that litigation was vacated.

The settlement included mutual seven-year patent cross-licenses between Synopsys and Siemens, and between Synopsys and Mentor. Synopsys and Mentor also amended an existing interoperability agreement to collaborate on a wide range of EDA products for the benefit of their mutual customers. The amendment includes a one-time termination charge between \$0.0 and \$25.0 million, payable to Mentor under certain conditions.

Other Proceedings

In July 2017, the Hungarian Tax Authority (HTA) issued a final assessment against Synopsys' Hungarian subsidiary (Synopsys Hungary) for fiscal years 2011 through 2013. The HTA has disallowed Synopsys Hungary's tax positions taken during these years regarding the timing of the deduction of research expenses and applied withholding taxes on certain payments made to affiliates, resulting in an aggregate tax assessment of approximately \$44.5 million and interest and penalties of \$18.0 million. On August 2, 2017, Synopsys Hungary filed a claim contesting the final assessment with the Hungarian Administrative Court. On November 16, 2017, Synopsys Hungary paid the assessment as required by law, while continuing its challenge to the assessment in court. Hearings were held in February and July 2018, and Synopsys expects further hearings to be scheduled after the court's expert submits an opinion relevant to the withholding tax issue in January 2019. On December 10, 2018, Synopsys withdrew its claim contesting the final assessment with regard to the timing of the deduction of research expenses.

For further discussion of the Hungary audit, see Note 11 of Notes to Consolidated Financial Statements under the heading "Non-US Examinations."

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

Our common stock trades on the Nasdaq Global Select Market under the symbol “SNPS.” As of December 12, 2018, we had 278 stockholders of record.

Performance Graph

The following graph compares the five-year total return to stockholders of our common stock relative to the cumulative total returns of the S&P 500 Index, the S&P Information Technology Index and the Nasdaq Composite Index. The graph assumes that \$100 was invested in Synopsys common stock on October 31, 2013 (the last trading day before the beginning of our fifth preceding fiscal year) and in each of the indexes on October 31, 2013 (the closest month end) and that all dividends were reinvested. No cash dividends were declared on our common stock during such time. The comparisons in the table are not intended to forecast or be indicative of possible future performance of our common stock.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*

*\$100 invested on October 31, 2013 in stock or index, including reinvestment of dividends.

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The information presented above in the stock performance graph shall not be deemed to be “soliciting material” or to be “filed” with the SEC or subject to Regulation 14A or 14C, except to the extent that we subsequently specifically request that such information be treated as soliciting material or specifically incorporate it by reference into a filing under the Securities Act or Exchange Act.

Stock Repurchase Program

Our Board of Directors (Board) previously approved a stock repurchase program pursuant to which we were authorized to purchase up to \$500.0 million of our common stock, and has periodically replenished the stock repurchase program to such amount. Our Board replenished the stock repurchase program up to \$500.0 million on April 5, 2018. The program does not obligate us to acquire any particular amount of common stock, and the program may be suspended or terminated at any time by our Chief Financial Officer or our Board. We repurchase shares to offset dilution caused by ongoing stock issuances from existing equity plans for equity compensation awards and issuances related to acquisitions, and when management believes it is a good use of cash. Repurchases are transacted in accordance with Rule 10b-18 of the Securities Exchange Act of 1934, as amended (the Exchange Act) and may be made through any means including, but not limited to, open market purchases, plans executed under Rule 10b5-1(c) of the Exchange Act and structured transactions. As of October 31, 2018, \$325.0 million remained available for further repurchases under the program.

In September 2017, we entered into an accelerated share repurchase agreement (the September 2017 ASR) to repurchase an aggregate of \$100.0 million of our common stock. Pursuant to the September 2017 ASR, we made a prepayment of \$100.0 million and received initial share deliveries valued at \$80.0 million. The remaining balance of \$20.0 million was settled in November 2017. Total shares repurchased under the September 2017 ASR were approximately 1.2 million shares, at an average purchase price of \$83.80 per share.

In December 2017, we entered into two simultaneous accelerated share repurchase agreements (the December 2017 ASRs) to repurchase an aggregate of \$200.0 million of our common stock. Pursuant to the December 2017 ASRs, we made a prepayment of \$200.0 million and received initial share deliveries of shares valued at \$160.0 million. In February 2018, we received additional deliveries of shares valued at \$20.0 million for one of the two December 2017 ASRs. The remaining balance of \$20.0 million was settled in March 2018. Total shares repurchased under the December 2017 ASRs were approximately 2.3 million shares, at an average purchase price of \$87.08 per share.

In May 2018, we entered into an accelerated share repurchase agreement (the May 2018 ASR) to repurchase an aggregate of \$165.0 million of our common stock. Pursuant to the May 2018 ASR, we made a prepayment of \$165.0 million and received initial share deliveries valued at \$132.0 million. The remaining balance of \$33.0 million was settled in October 2018. Total shares repurchased under the May 2018 ASR were approximately 1.8 million shares, at an average purchase price of \$92.42 per share.

The table below sets forth information regarding our repurchases of our common stock during the three months ended October 31, 2018:

Period	Total number of shares purchased (1)	Average price paid per share (1)	Total number of shares purchased as part of publicly announced programs	Maximum dollar value of shares that may yet be purchased under the programs
Month #1				
August 5, 2018 through September 8, 2018	—	\$ —	—	\$ 325,000,050
Month #2				
September 9, 2018 through October 6, 2018	—	\$ —	—	\$ 325,000,050
Month #3				
October 7, 2018 through November 3, 2018	276,755	\$ 119.24	276,755	\$ 325,000,050
Total	276,755	\$ 119.24	276,755	\$ 325,000,050

(1) Amounts are calculated based on the trade date.

See Note 9 of Notes to Consolidated Financial Statements for further information regarding our stock repurchase program.

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Item 6. Selected Financial Data

	Fiscal Year Ended October 31,(1)				
	2018	2017	2016	2015	2014
	(in thousands, except per share data)				
Revenue	\$3,121,058	\$2,724,880	\$2,422,532	\$2,242,211	\$2,057,472
Income before provisions for income taxes	363,543	383,098	329,548	281,610	272,142
Provision (benefit) for income taxes(2)	(68,975)	246,535	62,722	55,676	13,018
Net income	432,518	136,563	266,826	225,934	259,124
Net income per share:					
Basic	2.90	0.91	1.76	1.46	1.67
Diluted	2.82	0.88	1.73	1.43	1.64
Working capital (deficit)(3)	(558,618)	68,484	1,992	(109,546)	6,527
Total assets	6,145,974	5,396,414	5,240,365	5,045,739	4,775,499
Long-term debt	125,535	134,063	—	—	45,000
Stockholders' equity	3,485,015	3,279,724	3,195,146	3,133,989	3,056,170

(1) Our fiscal year ends on the Saturday nearest to October 31 and consists of 52 weeks, with the exception that approximately every five years, we have a 53-week year. Fiscal 2018 was a 53-week year and ended on November 3, 2018. Fiscal 2017, 2016, 2015, and 2014 were 52-week years ending on October 28, 2017, October 29, 2016, October 31, 2015, and November 1, 2014, respectively.

(2) Includes \$14.7 million, \$7.1 million, \$16.5 million, \$6.3 million, and \$19.6 million in net tax benefits from tax settlements received in fiscal years 2018, 2017, 2016, 2015, and 2014, respectively. Fiscal 2018 additionally includes a \$57.8 million net benefit from tax reform and tax restructuring. Fiscal 2017 additionally includes a \$166.2 million expense from our repatriation of foreign earnings. See Note 11 of Notes to Consolidated Financial Statements.

(3) Includes reclassifications of deferred tax assets and liabilities for fiscal years 2014 through 2015 related to ASU 2015-17 "Income Taxes (Topic 740): Balance Sheet Classification of Deferred Taxes." See Note 11 of Notes to Consolidated Financial Statements.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

Overview

The following summary of our financial condition and results of operations is qualified in its entirety by the more complete discussion contained in this Item 7 and by the risk factors set forth in Item 1A of this Form 10-K. Please also see the cautionary language at the beginning of Part I of this Form 10-K regarding forward-looking statements.

Business Summary

Synopsys, Inc. provides products and services used by designers across the entire silicon to software spectrum, from engineers creating advanced semiconductors to software developers seeking to ensure the security and quality of their code. We are a global leader in supplying the electronic design automation (EDA) software that engineers use to design and test integrated circuits (ICs), also known as chips. We also offer semiconductor intellectual property (IP) products, which are pre-designed circuits that engineers use as components of larger chip designs rather than designing those circuits themselves. We provide software and hardware used to validate the electronic systems that incorporate chips and the software that runs on them. To complement these offerings, we provide technical services and support to help our customers develop advanced chips and electronic systems. We

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are also a leading provider of software tools and services that improve the security and quality of software code in a wide variety of industries, including electronics, financial services, media, automotive, medicine, energy and industrials.

Our EDA and IP customers are generally semiconductor and electronics systems companies. Our solutions help these companies overcome the challenges of developing increasingly advanced electronics products while also helping them reduce their design and manufacturing costs. While our products are an important part of our customers' development process, their research and development budget and spending decisions may be affected by their business outlook and willingness to invest in new and increasingly complex chip designs. In addition, a number of consolidations have taken place in the semiconductor industry over the past several years. While we do not believe customer consolidations have had a material impact on our results, the future impact of ongoing consolidation is uncertain. For a discussion of potential risks, please see the risk factor titled "Consolidation among our customers and within the industries in which we operate, as well as our dependence on a relatively small number of large customers, may negatively impact our operating results" in Part I, Item 1A. Risk Factors.

Despite global economic uncertainty, we have consistently grown our revenue since 2005. We achieved these results not only because of our solid execution, leading technologies and strong customer relationships, but also because of our time-based revenue business model. Under this model, a substantial majority of our customers pay over time and we typically recognize this revenue over the life of the contract, which averages approximately three years. Time-based revenue consists of time-based products, maintenance and service revenue. The revenue we recognize in a particular period generally results from selling efforts in prior periods rather than the current period. Due to our business model, decreases or increases in customer spending do not immediately affect our revenues in a significant way.

Our growth strategy is based on building on our leadership in our EDA products, expanding and proliferating our IP offerings, and driving growth in the software security and quality market. As we continue to expand our product portfolio and our total addressable market, for instance in the software security and quality space, and as hardware product sales grow, we expect to experience increased variability in our total revenue. In addition, due to our adoption of Topic 606 in fiscal 2019, as further described in Note 14 of Notes to Consolidated Financial Statements, the way in which we are required to account for certain types of arrangements will increase the variability in our total revenue from period to period. Nevertheless, this accounting impact will not affect our cash generation or change the way we operate our business. Based on our leading technologies, customer relationships, business model, diligent expense management, and acquisition strategy, we believe that we will continue to execute our strategies successfully.

Fiscal Year End

Our fiscal year ends on the Saturday nearest to October 31 and consists of 52 weeks, with the exception that approximately every five years, we have a 53-week year. Fiscal 2018 was a 53-week year and ended on November 3, 2018. Fiscal 2017 and 2016 were 52-week years ending on October 28, 2017 and October 29, 2016, respectively. Fiscal 2019 will be a 52-week year.

For presentation purposes, this Form 10-K refers to the closest calendar month end.

Fiscal 2018 Financial Performance Summary

In fiscal 2018, compared to fiscal 2017, our financial performance reflects the following:

Revenues were \$3.1 billion, an increase of \$396.2 million or 15%, primarily driven by the overall growth in our business mainly due to higher TSL revenue, acquisitions, and professional services revenue. The increase also included additional revenue of approximately \$46.0 million due to the extra week in fiscal 2018;

Total cost of revenue and operating expenses were \$2.8 billion, an increase of \$383.5 million or 16%, primarily due to increases in headcount, including those from acquisitions. The increase also included one additional week of expenses of approximately \$33.7 million;

Higher operating income of \$360.2 million, an increase of \$12.7 million or 4%; and

Benefit for income taxes of \$69.0 million in fiscal 2018 compared to provision for income taxes of \$246.5 million in fiscal 2017, primarily due to the expense recorded for repatriation in fiscal 2017,

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compared to the benefit recorded for restructuring of foreign IP rights, and a decrease in the statutory federal corporate income tax rate in fiscal 2018.

Critical Accounting Policies and Estimates

Our discussion and analysis of our financial results under Results of Operations below are based on our audited results of operations, which we have prepared in accordance with U.S. GAAP. In preparing these financial statements, we make assumptions, judgments and estimates that can affect the reported amounts of assets, liabilities, revenues and expenses, and net income. On an ongoing basis, we evaluate our estimates based on historical experience and various other assumptions we believe are reasonable under the circumstances. Our actual results may differ from these estimates. For further information on our significant accounting policies, see Note 2 of Notes to Consolidated Financial Statements.

The accounting policies that most frequently require us to make assumptions, judgments and estimates, and therefore are critical to understanding our results of operations, are:

• Revenue recognition;

• Valuation of business combinations; and

• Income taxes.

Revenue Recognition

We generate our revenue from the sale of products that include software licenses and to a lesser extent, hardware products, maintenance and services. Time-based products revenue consists of fees associated with the licensing of our software. Maintenance and service revenue consists of maintenance fees associated with perpetual licenses and hardware products, and professional services fees. Upfront products revenue includes hardware revenue consisting of sales of Field Programmable Gate Array (FPGA)-based emulation and prototyping products and perpetual software licenses.

Most of our customer arrangements are complex, involving hundreds of products and various license rights, bundled with post-contract customer support and additional meaningful rights that provide a complete end-to-end solution to the customer. Throughout the contract, our customers are typically using a myriad of products to complete each phase of a chip design and are concurrently working on multiple chip designs, or projects, in different phases of the design. During this time, the customer looks to us to release state-of-the-art technology as we keep up with the pace of change, to address requested enhancements to our tools to meet customer specifications, to provide support at each stage of the customer's design, including the final manufacturing of the chip (the tape-out stage), and other important services.

With respect to software licenses, we primarily utilize two license types:

Technology Subscription Licenses (TSLs). TSLs are time-based licenses for a finite term, and generally provide the customer with limited rights to receive, or to exchange certain quantities of licensed software for, unspecified future technology. The majority of our arrangements are TSLs due to the nature of the business and customer requirements.

In addition to the licenses, the arrangements also include: post-contract customer support, which includes providing frequent updates and upgrades to maintain the utility of the software due to rapid changes in technology; other intertwined services such as multiple copies of the tools; assistance to our customers in applying our technology in their development environment; and rights to remix licenses for other licenses.

Perpetual licenses. Perpetual licenses continue as long as the customer renews maintenance plus an additional 20 years. Perpetual licenses do not provide the customer any rights to receive, or to exchange licensed software for, unspecified future technology. Customers purchase maintenance separately for the first year and may renew annually.

For the two software license types, we recognize revenue as follows:

TSLs. We typically recognize revenue from TSL fees ratably over the term of the license period, or as customer installments become due and payable, whichever is later. Revenue attributable to TSLs is reported as "time-based products revenue" in the consolidated statements of operations.

Perpetual licenses. We recognize revenue from perpetual licenses in full upon shipment of the software if payment terms require the customer to pay at least 75% of the license fee and 100% of

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the maintenance fee within one year from shipment and all other revenue recognition criteria are met. Revenue attributable to these perpetual licenses is reported as “upfront products revenue” in the consolidated statements of operations. For perpetual licenses in which less than 75% of the license fee and 100% of the maintenance fee is payable within one year from shipment, we recognize revenue as customer installments become due and payable. Such revenue is reported as “time-based products revenue” in the consolidated statements of operations.

Our maintenance and service revenue consists of maintenance fees associated with perpetual licenses and hardware products, and professional services fees. We recognize revenue from maintenance arrangements ratably over the maintenance period to the extent cash has been received or fees become due and payable, and recognize revenue from professional services and training fees as such services are performed and accepted by the customers as needed. Revenue attributable to maintenance, professional services and training is reported as “maintenance and service revenue” in the consolidated statements of operations.

Hardware revenue consists of sales of FPGA-based emulation and prototyping products. We recognize revenue from sales of hardware products in full upon shipment if all other revenue recognition criteria are met. Revenue attributable to these sales is reported as “upfront products revenue” in the consolidated statements of operations.

We also enter into arrangements in which portions of revenue are contingent upon the occurrence of uncertain future events, such as royalty arrangements. We refer to this revenue as “contingent revenue.” Contingent revenue is recognized if and when the event that removes the contingency occurs. Such revenue is reported as “time-based products revenue” in the consolidated statements of operations. These arrangements are not material to our total revenue.

We infrequently enter into multiple-element arrangements that contain both software and non-software deliverables such as hardware. We have determined that the software and non-software deliverables in our contracts are separate units of accounting. We recognize revenue for the separate units of accounting when all revenue recognition criteria are met. Revenue allocated to hardware units of accounting is recognized upon shipment when all other revenue recognition criteria are met. Revenue allocated to software units of accounting is recognized depending on the software license type (TSL or perpetual license). Such arrangements have not had a material effect on our consolidated financial statements and are not expected to have a material effect in future periods.

We also enter into arrangements to deliver software products, either alone or together with other products or services, that require significant modification or customization of the software. We account for such arrangements using the percentage of completion method as we have the ability to make reasonably dependable estimates that relate to the extent of progress toward completion, contract revenues and costs. We measure the progress towards completion using the labor hours incurred to complete the project. Revenue attributable to these arrangements is reported as “maintenance and service revenue” in the consolidated statements of operations.

We determine the fair value of each element in multiple element software arrangements that only contain software and software-related deliverables based on vendor-specific objective evidence (VSOE). We limit our assessment of VSOE of fair value for each element to the price charged when such element is sold separately. We have analyzed all of the elements included in our multiple-element software arrangements and have determined that we have sufficient VSOE to allocate revenue to the maintenance components of our perpetual license products and to professional services.

Accordingly, assuming all other revenue recognition criteria are met, we recognize license revenue from perpetual licenses upon delivery using the residual method, recognize revenue from maintenance ratably over the maintenance term, and recognize revenue from professional services as services are performed and accepted by the customer. With respect to TSL arrangements, due to the complexity of the tools, the complexity of the arrangement terms and intertwined services, the license, maintenance and other services are not separable and are considered as a combined unit. Additionally, we do not have sufficient VSOE of fair value to allocate the fee between these services. Therefore, we recognize revenue from TSLs ratably over the term of the license, assuming all other revenue recognition criteria are met.

Revenue recognition involves certain judgments. Specifically, in connection with each transaction involving our products, we must evaluate whether: (1) persuasive evidence of an arrangement exists, (2) delivery of software or services has occurred, (3) the fee for such software or services is fixed or determinable, and (4) collectability of the full license or service fee is probable. All four of these criteria must be met in order for us to recognize revenue with

respect to a particular arrangement. We apply these revenue recognition criteria as follows:

• **Persuasive Evidence of an Arrangement Exists.** Prior to recognizing revenue on an arrangement, our customary policy is to have a written contract, signed by both the customer and by us, or a

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purchase order from those customers that have previously negotiated a standard end-user license arrangement or purchase agreement.

- **Delivery Has Occurred.** We deliver our products to our customers electronically or physically. For electronic deliveries, delivery occurs when we provide access to our customers to take immediate possession of the software through downloading it to the customer's hardware. For physical deliveries, the standard transfer terms are typically Freight on Board (FOB) shipping point. We generally ship our products or license keys promptly after acceptance of customer orders. However, a number of factors can affect the timing of product shipments and, as a result, timing of revenue recognition, including the delivery dates requested by customers and our operational capacity to fulfill product orders at the end of a fiscal quarter.

The Fee Is Fixed or Determinable. Our determination that an arrangement fee is fixed or determinable depends principally on the arrangement's payment terms. Our standard payment terms for perpetual licenses require 75% or more of the license fee and 100% of the maintenance fee to be paid within one year. If the arrangement includes these terms, we regard the fee as fixed or determinable, and recognize all license revenue under the arrangement in full upon delivery (assuming all other revenue recognition criteria are met). If the arrangement does not include these terms, we do not consider the fee to be fixed or determinable and generally recognize revenue when customer installments are due and payable. In the case of a TSL, because of the right to exchange products or receive unspecified future technology and because VSOE for maintenance services does not exist for a TSL, we recognize revenue ratably over the term of the license, but not in advance of when customers' installments become due and payable.

Collectability Is Probable. We judge collectability of the arrangement fees on a customer-by-customer basis pursuant to our credit review policy. We typically sell to customers with whom we have a history of successful collection. For a new customer, or when an existing customer substantially expands its commitments, we evaluate the customer's financial position and ability to pay and typically assign a credit limit based on that review. We increase the credit limit only after we have established a successful collection history with the customer. If we determine at any time that collectability is not probable under a particular arrangement based upon our credit review process or the customer's payment history, we recognize revenue under that arrangement as customer payments are actually received.

Valuation of Business Combinations

We allocate the fair value of purchase consideration to tangible assets, liabilities including contingencies assumed, and intangible assets acquired in a business combination. Any excess fair value of purchase consideration over the estimated fair value of assets acquired and liabilities assumed is recorded as goodwill. The allocation of the purchase consideration requires management to make estimates and assumptions, based in part on our judgments, in determining the fair value of assets acquired and liabilities assumed, especially with respect to intangible assets. Our estimates and assumptions may include, but are not limited to, future cash flows of an acquired business, other assumptions and the appropriate discount rate. These estimates are inherently difficult, subjective and unpredictable, and if different estimates were used, the fair value allocation to the acquired intangible assets could be different. Therefore, our assessment of the estimated fair value of each of these assets can have a material effect on our consolidated financial statements.

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Income Taxes

We recognize deferred tax assets and liabilities for the temporary differences between the book and tax bases of assets and liabilities using enacted tax rates in effect for the year in which we expect the differences to reverse, and for tax loss and credit carryovers. Determining whether a valuation allowance is necessary to reduce deferred tax assets require assumptions, judgments, and estimates. We record a valuation allowance to reduce the deferred tax assets to the amount that is more likely than not to be realized. In evaluating our ability to utilize our deferred tax assets, we consider all available positive and negative evidence, including our past operating results, our forecast of future taxable income on a jurisdiction by jurisdiction basis, as well as feasible and prudent tax planning strategies. In fiscal 2018, we also considered the impact of the Tax Cuts and Jobs Act. We believe that the net deferred tax assets of approximately \$397.4 million, which are recorded on our balance sheet as of October 31, 2018, based on current tax law, will ultimately be realized. However, if we determine in the future that it is more likely than not that we will not be able to realize a portion or the full amount of deferred tax assets, we would record an adjustment to the deferred tax asset or a valuation allowance as a charge to earnings in the period that such determination is made.

Uncertain tax positions are recorded by applying a two-step approach. The first step is to evaluate the tax position for recognition by determining whether it is more likely than not that the position will be sustained on audit, including resolution of related appeals or litigation processes, if any. The second step is to measure the tax benefit as the largest amount that is more than 50% likely of being realized upon ultimate settlement. An uncertain tax position is considered effectively settled on completion of an examination by a taxing authority if certain other conditions are satisfied.

Effect of New Accounting Pronouncements Not Yet Adopted

See Note 14 of Notes to Consolidated Financial Statements.

Results of Operations

Revenue Background

We generate our revenue from the sale of products that include software licenses, maintenance and services, and to a lesser extent, hardware products. Under current accounting rules and policies, we recognize revenue from orders we receive for software licenses, services and hardware products at varying times.

In most instances, we recognize revenue on a TSL software license order over the license term and on a perpetual software license order in the quarter in which the license is delivered. The weighted-average term of the TSLs is typically three years, but varies from quarter to quarter due to the nature and timing of the arrangements entered into during the quarter. The weighted-average term of the TSLs we entered into in fiscal 2018, 2017, and 2016 was 2.7 years, 2.7 years and 3.0 years, respectively.

Revenue on contracts requiring significant modification or development is accounted for using the percentage of completion method over the period of modification or development.

Revenue on hardware product orders is generally recognized in full at the time the product is shipped and when title is transferred.

Contingent revenue is recognized if and when the event that removes the contingency occurs.

Revenue on maintenance orders is recognized ratably over the maintenance period (normally one year).

Revenue on professional services orders is generally recognized as the services are performed.

Infrequently, we enter into certain license arrangements wherein licenses are provided for a finite term without any other services or rights, including rights to receive, or to exchange licensed software for, unspecified future technology. We recognize revenue from these term licenses in full upon shipment of the software and when all other revenue recognition criteria are met.

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Our revenue in any period is equal to the sum of our time-based products, upfront products, and maintenance and services revenues for the period. We derive time-based products revenue largely from TSL orders received and delivered in prior quarters and to a smaller extent from contracts in which revenue is recognized as customer installments become due and payable and from contingent revenue arrangements. We derive upfront products revenue directly from perpetual license and hardware product orders mostly booked and shipped during the period. We derive maintenance revenue largely from maintenance orders received in prior periods since our maintenance orders generally yield revenue ratably over a term of one year. We also derive professional services revenue primarily from orders received in prior quarters, since we recognize revenue from professional services as those services are delivered and accepted or on percentage of completion for arrangements requiring significant modification of our software, and not when they are booked.

Our revenue is sensitive to the mix of TSLs and perpetual licenses delivered during a reporting period. A TSL order typically yields lower current quarter revenue but contributes to revenue in future periods. For example, a \$120,000 order for a three-year TSL delivered on the last day of a quarter typically generates no revenue in that quarter, but \$10,000 in each of the 12 succeeding quarters. Conversely, a \$120,000 order for perpetual licenses with greater than 75% of the license fee due within one year from shipment typically generates \$120,000 in revenue in the quarter the product is delivered, but no future revenue. Additionally, revenue in a particular quarter may also be impacted by perpetual licenses in which less than 75% of the license fees and 100% of the maintenance fees are payable within one year from shipment as the related revenue will be recognized as revenue in the period when customer payments become due and payable.

Most of our customer arrangements are complex, involving hundreds of products and various license rights, and our customers bargain with us over many aspects of these arrangements. For example, they often demand a broader portfolio of solutions, support and services and seek more favorable terms such as expanded license usage, future purchase rights and other unique rights at an overall lower total cost. No single factor typically drives our customers' buying decisions, and we compete on all fronts to serve customers in a highly competitive EDA market. Customers generally negotiate the total value of the arrangement rather than just unit pricing or volumes.

Total Revenue

Year Ended October 31,		\$ Change	% Change	\$ Change	% Change
2018	2017	2016	2017 to 2018	2016 to 2017	

(dollars in millions)

\$3,121.1	\$2,724.9	\$2,422.5	\$396.2	15	%	\$302.4	12	%
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The overall growth of our business, including contributions from acquisitions, has been the primary driver of the increase in our revenue. Our revenues are subject to fluctuations, primarily due to customer requirements, including payment terms and the timing and value of contract renewals. For example, we experience variability in our revenue due to factors such as the timing of IP consulting projects, royalties, and variability in hardware sales, and due to certain contracts where revenue is recognized when customer installment payments are due. As revenue from hardware sales is recognized upfront, customer demand and timing requirements for such hardware may result in increased variability of our total revenue.

The increase in total revenue for fiscal 2018 compared to fiscal 2017 was primarily attributable to the overall growth of our business, mainly due to higher TSL license revenue from arrangements booked in prior periods, an increase in professional services, additional revenue of approximately \$46.0 million due to an extra week in the first quarter of fiscal 2018 compared to fiscal 2017, and contributions from acquired companies.

The increase in total revenue for fiscal 2017 compared to fiscal 2016 was primarily attributable to the overall growth of our business mainly due to higher TSL revenues, hardware sales, and IP consulting projects and, to a lesser extent, due to revenue from acquired companies.

For a discussion of revenue by geographic areas, see Note 13 of Notes to Consolidated Financial Statements.

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Time-Based Products Revenue

	Year Ended October 31,			\$ Change	% Change	\$ Change	% Change
	2018	2017	2016	2017 to 2018		2016 to 2017	
	(dollars in millions)						
	\$2,303.3	\$2,021.8	\$1,910.9	\$281.5	14 %	\$110.9	6 %
Percentage of total revenue	74	% 74	% 79	%			

The increase in time-based products revenue for fiscal 2018 compared to fiscal 2017 was primarily attributable to an increase in TSL license revenue due to arrangements booked in prior periods, including contributions from acquired companies, and additional revenue due to an extra week in fiscal 2018 compared to fiscal 2017.

The increase in time-based products revenue for fiscal 2017 compared to fiscal 2016 was primarily attributable to an increase in TSL license revenue due to arrangements booked in prior periods.

Upfront Products Revenue

	Year Ended October 31,			\$ Change	% Change	\$ Change	% Change
	2018	2017	2016	2017 to 2018		2016 to 2017	
	(dollars in millions)						
	\$357.7	\$338.2	\$248.1	\$19.5	6 %	\$90.1	36 %
Percentage of total revenue	11	% 12	% 10	%			

Changes in upfront products revenue are generally attributable to normal fluctuations in customer requirements, which can drive the amount of upfront orders and revenue in any particular period.

The increase in upfront products revenue for fiscal 2018 compared to fiscal 2017 was primarily attributable to an increase in the sale of IP products driven by higher demand from customers.

The increase in upfront products revenue for fiscal 2017 compared to fiscal 2016 was primarily attributable to an increase in the sale of hardware products driven by timing of customer requirements.

Upfront products revenue as a percentage of total revenue will likely fluctuate modestly based on the timing of IP products and hardware sales. Such fluctuations will continue to be impacted by the timing of shipments due to customer requirements.

Maintenance and Service Revenue

	Year Ended October 31,			\$ Change	% Change	\$ Change	% Change
	2018	2017	2016	2017 to 2018		2016 to 2017	
	(dollars in millions)						
Maintenance revenue	\$100.4	\$84.1	\$74.4	\$16.3	19 %	\$9.7	13 %
Professional service and other revenue	359.6	280.8	189.1	78.8	28 %	91.7	48 %
Total	\$460.0	\$364.9	\$263.5	\$95.1	26 %	\$101.4	38 %
Percentage of total revenue	15	% 14	% 11	%			

The increase in maintenance revenue for fiscal 2018 compared to fiscal 2017, and for fiscal 2017 compared to fiscal 2016, was primarily due to an increase in the volume of arrangements that include maintenance.

The increase in professional services and other revenue for fiscal 2018 compared to fiscal 2017 was primarily due to an increase in consulting projects, including contributions from acquisitions, and to a lesser extent, the impact of the extra week in fiscal 2018.

The increase in professional services and other revenue for fiscal 2017 compared to fiscal 2016 was primarily due to an increase in, and the timing of, IP consulting projects that are accounted for using the percentage of completion method and contributions from acquisitions.

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Cost of Revenue and Operating Expenses

	Year Ended October 31,			\$ Change		% Change	
	2018	2017	2016	2017 to 2018	2016 to 2017		
	(dollars in millions)						
Cost of revenue	\$735.9	\$654.2	\$543.0	\$81.7	\$111.2	12%	20%
Operating expenses	2,024.9	1,723.1	1,562.2	301.8	160.9	18%	10%
Total	\$2,760.8	\$2,377.3	\$2,105.2	\$383.5	\$272.1	16%	13%
Total expenses as a percentage of total revenue	88	% 87	% 87	%			

Our expenses are generally impacted by changes in personnel-related costs including salaries, benefits, stock-based compensation and variable compensation; changes in amortization; and changes in selling and marketing expenses. The increase in our expenses compared to prior fiscal years was primarily due to an increase in personnel-related costs, driven by increased headcount from our overall growth, including those from acquisitions, and related fixed charges including facilities, as well as higher product costs due to increased hardware sales. We allocate certain human resource programs, information technology and facility expenses among our functional income statement categories based on headcount within each functional area. Annually, or upon a significant change in headcount (such as a workforce reduction, realignment or acquisition) or other factors, management reviews the allocation methodology and expenses included in the allocation pool.

Foreign currency fluctuations, net of hedging, did not have a significant impact on expenses during fiscal 2018 as compared to fiscal 2017, or fiscal 2017 as compared to fiscal 2016. See Note 5 of Notes to Consolidated Financial Statements for details on our foreign exchange hedging programs.

Cost of Revenue

	Year Ended October 31,			\$ Change		% Change	
	2018	2017	2016	2017 to 2018	2016 to 2017		
	(dollars in millions)						
Cost of products revenue	\$448.4	\$413.2	\$346.9	\$35.2	\$66.3	9%	19%
Cost of maintenance and service revenue	203.5	164.9	94.0	38.6	70.9	23%	75%
Amortization of intangible assets	84.0	76.1	102.1	7.9	(26.0)	10%	(25)%
Total	\$735.9	\$654.2	\$543.0	\$81.7	\$111.2	12%	20%
Percentage of total revenue	24	% 24	% 22	%			

We divide cost of revenue into three categories: cost of products revenue, cost of maintenance and service revenue, and amortization of intangible assets. We segregate expenses directly associated with consulting and training services from cost of products revenue associated with internal functions providing license delivery and post-customer contract support services. We then allocate these group costs between cost of products revenue and cost of maintenance and service revenue based on products and maintenance and service revenue reported.

Cost of products revenue. Cost of products revenue includes costs related to products sold and software licensed, allocated operating costs related to product support and distribution costs, royalties paid to third-party vendors, and the amortization of capitalized research and development costs associated with software products that had reached technological feasibility.

Cost of maintenance and service revenue. Cost of maintenance and service revenue includes operating costs related to maintaining the infrastructure necessary to operate our services and costs to deliver our consulting services, such as hotline and on-site support, production services and documentation of maintenance updates. We expect our cost of maintenance and service revenue to increase in future periods because of recent acquisitions, but we do not expect the impact to be material to our total cost of revenue.

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Amortization of intangible assets. Amortization of intangible assets, which is recorded to cost of revenue and operating expenses, includes the amortization of core/developed technology, trademarks, trade names, customer relationships, covenants not to compete related to acquisitions and certain contract rights related to acquisitions. The increase in cost of revenue for fiscal 2018 compared to fiscal 2017 was primarily due to an increase of \$47.7 million in personnel-related costs as a result of headcount increases, including those from acquisitions, an increase of \$11.3 million in costs related to servicing IP consulting arrangements, and an increase of \$7.9 million in amortization of intangible assets, as well as one additional week of expenses of approximately \$4.5 million.

The increase in cost of revenue for fiscal 2017 compared to fiscal 2016 was primarily due to an increase of \$62.4 million in personnel-related costs as a result of headcount increases, including those from acquisitions, an increase of \$37.5 million in hardware product costs due to increases in, and timing of, shipments, an increase of \$24.8 million in costs related to servicing IP consulting arrangements, and functionally allocated expenses that were higher by \$8.6 million. The increases were partially offset by decreases of \$26.0 million in amortization of intangible assets. Changes in other cost of revenue categories for the above-mentioned periods were not individually material.

Operating Expenses

Research and Development

Year Ended October 31,			\$ Change	% Change	\$ Change	% Change
2018	2017	2016	2017 to 2018		2016 to 2017	
(dollars in millions)						
\$1,084.8	\$908.8	\$856.7	\$176.0	19 %	\$52.1	6 %

Percentage of total revenue 35 % 33 % 35 %

The increase in research and development expense in fiscal 2018 compared to fiscal 2017 was primarily due to an increase of \$114.4 million in personnel-related costs as a result of headcount increases, including those from acquisitions, and one additional week of expenses of approximately \$19.3 million.

The increase in research and development expense in fiscal 2017 compared to fiscal 2016 was primarily due to an increase of \$47.4 million in personnel-related costs as a result of headcount increases, including those from acquisitions.

Changes in other research and development expense categories for the above-mentioned periods were not individually material.

Sales and Marketing

Year Ended October 31,			\$ Change	% Change	\$ Change	% Change
2018	2017	2016	2017 to 2018		2016 to 2017	
(dollars in millions)						
\$623.0	\$549.2	\$502.4	\$73.8	13 %	\$46.8	9 %

Percentage of total revenue 20 % 20 % 21 %

The increase in sales and marketing expense for fiscal 2018 compared to fiscal 2017 was primarily attributable to an increase of \$51.0 million in personnel costs as a result of headcount increases, an increase of \$7.5 million due to timing of marketing events, and one additional week of expenses of approximately \$5.8 million.

The increase in sales and marketing expense for fiscal 2017 compared to fiscal 2016 was primarily attributable to an increase of \$40.8 million in personnel costs as a result of higher headcount and higher variable compensation primarily based on timing of shipments.

Changes in other sales and marketing expense categories for the above-mentioned periods were not individually material.

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General and Administrative

	Year Ended October 31,			\$ Change		% Change	
	2018	2017	2016	2017 to 2018	2016 to 2017		
	(dollars in millions)						
	\$262.6	\$196.8	\$166.0	\$65.8	33	%	\$30.8 19 %
Percentage of total revenue	8	% 7	% 7	%			

The increase in general and administrative expenses for fiscal 2018 compared with fiscal 2017 was primarily due to an increase of \$21.5 million in personnel-related costs as a result of headcount increases, an increase of \$22.1 million in professional service costs primarily due to additional legal, accounting, and tax services related to various projects, an increase of \$18.2 million in net litigation settlement costs primarily due to a \$26.0 million litigation settlement recorded in fiscal 2018 compared with \$7.6 million net litigation charges recorded in fiscal 2017, an increase of \$11.0 million in facilities expenses, and one additional week of expenses of approximately \$4.1 million.

The increase in general and administrative expenses for fiscal 2017 compared with fiscal 2016 was primarily due to an increase of \$38.0 million for accrued loss contingencies as a result of litigation, an increase of \$18.8 million in personnel-related costs as a result of headcount increases, and an increase of \$5.5 million in facilities expenses, partially offset by a \$30.4 million gain as a result of a legal settlement.

Changes in other general and administrative expense categories for the above-mentioned periods were not individually material.

Change in Fair Value of Deferred Compensation

The income or loss arising from the change in fair value of our non-qualified deferred compensation plan obligation is recorded in cost of sales and each functional operating expense, with the offsetting change in the fair value of the related assets recorded in other income (expense), net. These assets are classified as trading securities. There is no overall impact to our net income from the income or loss of our deferred compensation plan obligation and asset.

Amortization of Intangible Assets

Amortization of intangible assets includes the amortization of contract rights and the amortization of core/developed technology, trademarks, trade names, customer relationships, and in-process research and development related to acquisitions completed in prior years. Amortization expense is included in the consolidated statements of operations as follows:

	Year Ended October 31,			\$ Change		% Change	
	2018	2017	2016	2017 to 2018	2016 to 2017		
	(dollars in millions)						
Included in cost of revenue	\$84.0	\$76.1	\$102.1	\$7.9	10	%	\$(26.0) (25)%
Included in operating expenses	41.6	31.6	27.5	10.0	32	%	4.1 15 %
Total	\$125.6	\$107.7	\$129.6	\$17.9	17	%	\$(21.9) (17)%
Percentage of total revenue	4	% 4	% 5	%			

The increase in amortization of intangible assets for fiscal 2018 compared to fiscal 2017 was primarily due to the additions of acquired intangible assets, partially offset by certain intangible assets being fully amortized.

The decrease in amortization of intangible assets for fiscal 2017 compared to fiscal 2016 was primarily due to intangible assets that were fully amortized, partially offset by additions of acquired intangible assets.

Restructuring Charges

During fiscal 2018, we recorded \$12.9 million of restructuring charges as part of a business realignment. The restructuring actions were undertaken to position us for future growth, reallocate resources to priority areas and, to a lesser extent, eliminate operational redundancy. These charges consisted primarily of severance and benefits. The remaining balance of \$8.1 million is expected to be paid in fiscal 2019.

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During fiscal 2017, we recorded \$36.6 million of restructuring charges for severance and benefits due to involuntary and voluntary employee termination actions. The restructuring actions were undertaken to position us for future growth, reallocate resources to priority areas and, to a lesser extent, eliminate operational redundancy. These charges consisted primarily of severance and retirement benefits. As of the end of fiscal 2018, there were no unpaid balances remaining of the 2017 restructuring charges.

During fiscal 2016, we recorded \$9.6 million of restructuring charges for severance and benefits due to involuntary employee terminations, which was fully paid in fiscal 2017.

The following is a summary of our restructuring activities:

Fiscal Year	Balance at Beginning of Period	Costs Incurred (Reduced)	Cash Payments	Others	Balance at End of Period
	(in millions)				
2018	\$17.5	\$ 12.9	\$ (22.1)	\$ (0.2)	\$ 8.1
2017	\$5.7	\$ 36.6	\$ (24.8)	\$—	\$ 17.5
2016	\$—	\$ 9.6	\$ (3.9)	\$—	\$ 5.7

See Note 2 of Notes to Consolidated Financial Statements.

Other Income (Expense), Net

	Year Ended October 31,			\$ Change		% Change	
	2018	2017	2016	2017 to 2018	2016 to 2017		
	(dollars in millions)						
Interest income	\$5.3	\$7.2	\$3.7	\$(1.9)	(26)%	\$3.5	95 %
Interest expense	(15.6)	(7.3)	(3.8)	(8.3)	114 %	(3.5)	92 %
Gain (loss) on assets related to executive deferred compensation plan	4.6	29.6	4.4	(25.0)	(84)%	25.2	573 %
Foreign currency exchange gain (loss)	3.6	3.4	0.2	0.2	6 %	3.2	1,600 %
Other, net	5.4	2.6	7.7	2.8	108 %	(5.1)	(66)%
Total	\$3.3	\$35.5	\$12.2	\$(32.2)	(91)%	\$23.3	191 %

The net decrease in other income (expense) in fiscal 2018 as compared to fiscal 2017 was primarily due to lower gains in the market value of our executive deferred compensation plan assets and higher interest expense due to a higher debt balance.

The net increase in other income (expense) in fiscal 2017 as compared to fiscal 2016 was primarily due to higher gains in the market value of our executive deferred compensation plan assets.

Income Taxes

The Tax Cuts and Jobs Act (Tax Act), enacted on December 22, 2017, lowered the statutory federal corporate income tax rate from 35% to 21% effective on January 1, 2018. Because our fiscal 2018 commenced on November 1, 2017, the annual statutory federal corporate tax rate applicable to fiscal 2018 is a blended rate of 23.4%. Beginning in fiscal 2019, our annual statutory federal corporate tax rate will be 21%.

Our effective tax rate for fiscal 2018 was (19.0%), which included a tax benefit of \$172.0 million relating to the restructuring of our foreign intellectual property rights, a U.S. federal research tax credit of \$35.1 million, a settlement with the Internal Revenue Service (IRS) of \$21.8 million tax benefit for fiscal 2017, and excess tax benefits from stock-based compensation of \$31.0 million. These benefits were partially offset by tax expense of \$63.1 million for a one-time transition tax on foreign earnings, \$51.1 million due to re-measurement of U.S. deferred tax assets as a result of the Tax Act, and tax expense related to the integration of acquired technologies of \$27.9 million.

Our effective tax rate for fiscal 2017 was 64.4%, which included income tax expense of \$166.2 million relating to a repatriation of foreign earnings of \$825 million, \$30.5 million due to an increase in valuation allowance on state

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deferred tax assets, a settlement with the Korean National Tax Service for the audit of fiscal years 2012 to 2016 of \$7.9 million, and tax expense related to the integration of acquired technologies of \$36.4 million. These expenses were partially offset by excess tax benefits from stock-based compensation of \$38.1 million, a U.S. federal research tax credit of \$25.5 million, and a settlement with the Taiwanese tax authorities for fiscal 2014 of \$10.9 million. Our effective tax rate for fiscal 2016 was 19.0%, which included tax benefits from a settlement with the IRS of \$20.7 million for fiscal 2015 and the permanent reinstatement of the U.S. federal research tax credit of approximately \$37.1 million, partially offset by tax expense from the integration of acquired technologies of \$37.5 million, the impact of undistributed foreign earnings of \$9.6 million, and an increase in the valuation allowance on deferred tax assets of \$14.0 million as a result of changes in the expected utilization of state tax credits. The reinstatement of the research tax credit resulted in an additional tax credit for ten months of fiscal 2015 and the full year of fiscal 2016, which was recorded in fiscal 2016.

The integration of acquired technologies represents the income tax effect resulting from the transfer of certain intangible assets among company-controlled entities. The income tax effect is generally recognized over five years. These intangible assets generally result from the acquisition of technology by a company-controlled entity as part of a business or asset acquisition.

During the year, we made provisional estimates of the accounting impacts of certain provisions of the Tax Act. In the fourth quarter, as a result of further analyzes of certain aspects of the Tax Act, we have finalized the following provisional estimates.

As a result of the reduction in the federal corporate tax rate, we remeasured our deferred taxes, resulting in a first-quarter provisional tax expense of \$45.6 million based on the tax rate that will apply when these deferred taxes are settled or realized in future periods. In the fourth quarter, we finalized our calculations resulting in a tax expense for fiscal 2018 of \$51.1 million.

As part of the adoption of a new territorial tax system, the Tax Act required us to pay a one-time transition tax on previously untaxed earnings represented by foreign cash and certain other net current assets, and 8% on the remaining earnings. As of the third quarter of fiscal 2018, we had recorded a provisional transition tax expense of \$73.4 million, as well as a provisional income tax payable of \$17.9 million. In the fourth quarter, we finalized our calculations resulting in a tax expense of \$63.1 million and income tax payable of \$8.9 million. We intend to elect to pay the transition tax over a period of eight years as permitted by the Tax Act.

We continue to obtain, analyze and interpret additional guidance issued related to the Tax Act. The applicability and impact of the following new tax provisions, are dependent in part on forthcoming IRS guidance.

A tax on global intangible low-tax income (GILTI), which is determined annually based on our aggregate foreign subsidiaries' income in excess of certain qualified business asset investment return, will be effective for us in fiscal year 2019. We need additional information to complete our analysis on whether to adopt an accounting policy to account for the tax effects of GILTI in the period that we are subject to such tax, or to provide deferred taxes for book and tax basis differences that upon reversal, may be subject to such tax. Accordingly, we have not recorded any tax or deferred tax assets or liabilities with respect to GILTI in fiscal year 2018. We will make our accounting policy decision and complete the required accounting in the first quarter of fiscal 2019.

A base erosion and anti-abuse tax (BEAT), which functions as a minimum tax that partially disallows deductions for certain related party transactions, that is not effective for us until fiscal year 2019.

A special tax deduction for foreign-derived intangible income (FDII), which, in general, allows a deduction of certain intangible income earned in the U.S. and derived from foreign sources, that is not effective for us until fiscal year 2019.

As part of the adoption of a territorial tax system, the Tax Act also provides an exemption from federal income taxes for distributions from foreign subsidiaries made after December 31, 2017 that were not subject to the one-time transition tax. We have provided for foreign withholding taxes on undistributed earnings of certain of our foreign subsidiaries to the extent such earnings are no longer considered to be indefinitely reinvested in the operations of those subsidiaries.

In the fourth quarter of 2018, we made significant changes to our international tax structure by transferring intangible assets between certain foreign subsidiaries and changing the tax status of these subsidiaries for U.S. tax purposes. As a

result, we recorded a deferred tax benefit of \$172.0 million for the future U.S. tax deduction related

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to these intangible assets. We paid foreign income tax of \$67.7 million associated with the gain recognized on certain of these transactions. The tax liabilities associated with these transfers are treated as prepaid taxes. A portion of these foreign taxes may result in a U.S. foreign tax credit, but the amount expected to be realized cannot be determined at this time. The tax liabilities and benefits are subject to examination by U.S. and foreign tax authorities in future years. In fiscal 2018, we reevaluated our strategy and subsequently withdrew our contest concerning the Hungary tax litigation related to one issue in the audit of fiscal years 2011 through 2013 and recorded a tax expense of \$5.7 million.

For further discussion of the provision for income taxes, impacts related to the Tax Act, the restructuring of our foreign intellectual property rights and the Hungary audit, see Note 11 of Notes to Condensed Consolidated Financial Statement.

Liquidity and Capital Resources

Our sources of cash and cash equivalents are funds generated from our business operations and funds that may be drawn down under our revolving credit and term loan facilities.

As of October 31, 2018, we held an aggregate of \$177.6 million in cash and cash equivalents in the United States and an aggregate of \$545.5 million in our foreign subsidiaries. As a result of the Tax Act, we have recorded a tax liability for the transition tax on foreign earnings, payable over eight years, of \$0.7 million and \$8.2 million reflected as a short-term and long-term liability, respectively. If we decide to repatriate the undistributed earnings of our foreign subsidiaries for use in the U.S. in the future, the earnings that were subject to the transition tax would not be subject to further U.S. tax. In addition, we have provided foreign deferred taxes on our undistributed earnings sufficient to address the incremental tax that would be due on future foreign earnings. During the fourth quarter of fiscal 2018, we completed a restructuring of our foreign intellectual property rights, resulting in a one-time tax payment of \$67.7 million, which is included in current prepaid taxes.

The following sections discuss changes in our consolidated balance sheets and statements of cash flow, and other commitments of our liquidity and capital resources during fiscal 2018.

Cash and Cash Equivalents

		Year Ended October 31,		\$ Change	% Change
2018	2017				

(dollars in millions)

Cash and cash equivalents	\$723.1	\$1,048.4	\$(325.3)	(31)	%
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Cash and cash equivalents decreased primarily due to cash used for business combinations and asset acquisitions, and stock repurchases under our accelerated stock repurchase agreements, partially offset by cash from our operations and net proceeds from our credit facilities.

Cash Flows

	Year Ended October 31,			\$ Change 2017 to 2018	\$ Change 2016 to 2017
	2018	2017	2016		

(dollars in millions)

Cash provided by operating activities	\$424.2	\$634.6	\$586.6	\$(210.4)	\$ 48.0
Cash used in investing activities	(743.5)	(189.3)	(142.7)	(554.2)	(46.6)
Cash provided by (used in) financing activities	5.1	(373.1)	(306.9)	378.2	(66.2)

Cash Provided by Operating Activities

We expect cash from our operating activities to fluctuate as a result of a number of factors, including the timing of our billings and collections, our operating results, and the timing and amount of tax and other liability payments. Cash provided by our operations is dependent primarily upon the payment terms of our license agreements. We generally receive cash from upfront arrangements much sooner than from time-based products revenue, in which the license fee is typically paid either quarterly or annually over the term of the license.

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Fiscal 2018 compared to fiscal 2017. The decrease in cash provided by operating activities was primarily driven by higher vendor disbursements, higher income taxes payment, higher accounts receivable due to timing of customer billings, and higher inventory. Disbursements in fiscal 2018 included certain one-time payments of \$163.3 million for income taxes and \$65.0 million for a litigation settlement.

Fiscal 2017 compared to fiscal 2016. The increase in cash provided by operating activities was primarily driven by higher cash collections, partially offset by higher disbursements for operations, including vendors.

Cash Used in Investing Activities

Fiscal 2018 compared to fiscal 2017. The increase in cash used in investing activities was primarily driven by higher cash paid for acquisitions of \$393.4 million and lower proceeds from sales and maturities of short-term investments, net of purchases, of \$128.1 million.

Fiscal 2017 compared to fiscal 2016. The increase in cash used in investing activities was primarily driven by higher cash paid for acquisitions and intangible assets of \$199.1 million, partially offset by higher proceeds from the sales and maturities of short-term investments of \$139.3 million.

Cash Provided by (Used in) Financing Activities

Fiscal 2018 compared to fiscal 2017. Cash provided by financing activity in fiscal 2018 was higher compared to fiscal 2017 primarily due to higher proceeds of \$300.6 million from drawdowns of our credit facilities and lower debt repayment of \$85.3 million.

Fiscal 2017 compared to fiscal 2016. The increase in cash used in financing activities was primarily due to higher debt repayments of \$195.6 million, partially offset by higher proceeds from the drawdown of our senior unsecured revolving credit facility of \$135.0 million.

Accounts Receivable, net**Year Ended**

October 31,

2018 2017 \$ Change % Change

(dollars in millions)

\$554.2 \$451.1 \$103.1 23%

Changes in our accounts receivable balance are primarily driven by timing of customer billing, collection activities and to a lesser extent, customer receivables acquired through our acquisitions.

Working Capital

Working capital is comprised of current assets less current liabilities, as shown on our consolidated balance sheets:

	Year Ended October 31,			
	2018	2017	\$ Change	% Change
	(dollars in millions)			
Current assets	\$ 1,543.8	\$ 1,682.6	\$(138.8)	(8)%
Current liabilities	2,102.4	1,614.1	488.3	30%
Working capital (deficit)	\$(558.6)	\$ 68.5	\$(627.1)	(915)%

Decreases in our working capital were primarily due to a decrease in cash and cash equivalents of \$325.3 million, an increase in short term debt of \$333.8 million, an increase in deferred revenue of \$88.3 million, and an increase in accounts payable and accrued liabilities of \$78.5 million, partially offset by an increase in accounts receivable of \$103.1 million, an increase in inventory of \$60.5 million, and an increase in income taxes receivable and prepaid taxes of \$28.3 million.

Other

As of October 31, 2018, our cash equivalents consisted of taxable money market mutual funds. We follow an established investment policy and set of guidelines to monitor, manage and limit our exposure to interest rate and credit risk.

We proactively manage our cash equivalents balances and closely monitor our capital and stock repurchase expenditures to ensure ample liquidity. Additionally, we believe the overall credit quality of our portfolio is strong,

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with our global excess cash, and our cash equivalents, invested in banks and securities with a weighted-average credit rating exceeding AA. The majority of our investments are classified as Level 1 or Level 2 investments, as measured under fair value guidance. See Notes 5 and 6 of Notes to Consolidated Financial Statements.

We believe that our current cash and cash equivalents, cash generated from operations, and available credit under our Revolver (defined below) will satisfy our routine business requirements for at least the next 12 months and the foreseeable future.

Other Commitments — Credit and Term Loan Facilities

In July 2018, we entered into a 220.0 million RMB (approximately \$33.0 million) credit agreement with a lender in China to support our facilities expansion. Borrowings bear interest at a floating rate based on the Chinese Central Bank rate plus 10% of such rate. As of October 31, 2018, we had \$5.5 million outstanding under the agreement. On November 28, 2016, we entered into an amended and restated credit agreement with several lenders (the Credit Agreement) providing for (i) a \$650.0 million senior unsecured revolving credit facility (the Revolver) and (ii) a \$150.0 million senior unsecured term loan facility (the Term Loan). The Credit Agreement amended and restated our previous credit agreement dated May 19, 2015 (the 2015 Agreement), in order to increase the size of the revolving credit facility from \$500.0 million to \$650.0 million, provide a new \$150.0 million senior unsecured term loan facility, and extend the termination date of the revolving credit facility from May 19, 2020 to November 28, 2021. Subject to obtaining additional commitments from lenders, the principal amount of the loans provided under the Credit Agreement may be increased by us by up to an additional \$150.0 million. The Credit Agreement contains financial covenants requiring us to operate within a maximum leverage ratio and maintain a minimum interest coverage ratio, as well as other non-financial covenants. As of October 31, 2018, we were in compliance with all financial covenants.

As of October 31, 2018, we had \$133.8 million outstanding balance, net of debt issuance costs, under the Term Loan, of which \$120.0 million was classified as long-term liabilities. Outstanding principal payments under the Term Loan are due as follows:

Fiscal year	(in thousands)
2019	\$ 14,062
2020	17,813
2021	27,187
2022	75,000
Total	\$ 134,062

As of October 31, 2017, we had \$144.0 million outstanding balance, net of debt issuance costs, under the Term loan, of which \$134.1 million was classified as long-term liabilities, and no outstanding balance under the Revolver. The total outstanding balance of the Revolver as of October 31, 2018 was \$330.0 million, which was included in short-term liabilities. We expect the borrowings under the Revolver will fluctuate from quarter to quarter. Borrowings bear interest at a floating rate based on a margin over our choice of market observable base rates as defined in the Credit Agreement. As of October 31, 2018, borrowings under the Term Loan bore interest at LIBOR +1.125% and the applicable interest rate for the Revolver was LIBOR +1.000%. In addition, commitment fees are payable on the Revolver at rates between 0.125% and 0.200% per year based on our leverage ratio on the daily amount of the revolving commitment.

Subsequent to fiscal year 2018, we drew down \$150.0 million under the Revolver. The total outstanding balance of the Revolver as of December 14, 2018 is \$430.0 million, net of repayments.

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Contractual Obligations

The following table summarizes our contractual obligations as of October 31, 2018:

	Total	Fiscal 2019	Fiscal 2020/ Fiscal 2021	Fiscal 2022/ Fiscal 2023	Thereafter	Other
	(in thousands)					
Lease Obligations:						
Operating Leases(1)	\$589,900	\$61,819	\$116,784	\$93,162	\$318,135	\$—
Purchase Obligations(2)	456,823	272,979	183,526	318	—	—
Revolver(3)	335,535	335,535	—	—	—	—
Term Loan(3)	134,062	14,062	45,000	75,000	—	—
Other Long-Term Obligations(4)	2,588	863	1,725	—	—	—
Long term accrued income taxes(5)	50,590	—	1,429	1,429	5,357	42,375
Total	\$1,569,498	\$685,258	\$348,464	\$169,909	\$323,492	\$42,375

(1) See Note 7 of Notes to Consolidated Financial Statements.

Purchase obligations represent an estimate of all open purchase orders and contractual obligations in the ordinary course of business for which we have not received the goods or services as of October 31, 2018. Although open

(2) purchase orders are considered enforceable and legally binding, the terms generally allow us the option to cancel, reschedule and adjust our requirements based on our business needs prior to the delivery of goods or performance of services.

(3) These commitments relate to the principal of the Revolver, the Term Loan, and a credit facility as discussed in Other Commitments above.

(4) These other obligations include fees associated with our Revolver.

Long-term accrued income taxes represent uncertain tax benefits and transition tax liability as of October 31, 2018.

(5) Currently, a reasonably reliable estimate of timing of payments related to uncertain tax benefits in individual years beyond fiscal 2018 cannot be made due to uncertainties in timing of the commencement and settlement of potential tax audits.

The expected timing of payments of the obligations discussed above is estimated based on current information.

Timing of payment and actual amounts paid may be different depending on the time of receipt of goods or services or changes to agreed-upon amounts for some obligations.

Off-Balance Sheet Arrangements

As of October 31, 2018, we did not have any off-balance sheet arrangements, as defined in Item 303(a)(4)(ii) of SEC Regulation S-K.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

Interest Rate Risk. Our exposure to market risk for changes in interest rates relates to our cash, cash equivalents, and outstanding debt. As of October 31, 2018, all of our cash, cash equivalents and debt were at short-term variable and fixed interest rates. While par value generally approximates fair value on variable instruments, rising interest rates over time would increase both our interest income and our interest expense. The primary objective of our investment activities is to preserve the principal while at the same time maximizing yields without significantly increasing the risk. To achieve this objective, we maintain our portfolio of investments in a mix of tax-exempt and taxable instruments that meet high credit quality standards, as specified in our investment policy. None of these investments are held for trading purposes. Our policy also limits the amount of credit exposure to any one issue, issuer and type of instrument.

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The following table presents our cash equivalents and debt by fiscal year of expected maturity and average interest rates:

As of October 31, 2018

	Maturing in Year Ending October 31,					2022 Total	Fair Value
	2019	2020	2021	2021	2022		
	(in thousands)						
Cash & Cash equivalent (variable rate)	\$574,959					\$574,959	\$574,959
Average interest rate	0.93	%					
Short-term debt (variable rate):							
Revolver	\$330,000					\$330,000	\$330,000
Average interest rate	LIBOR +						
	1.000%						
Term Loan	\$14,062	\$17,813	\$27,187	\$75,000		\$134,062	\$134,062
Average interest rate	LIBOR +						
	1.125%						
Credit Facility in China	\$5,535					\$5,535	\$5,535
	Chinese						
	Central						
Average interest rate	Bank rate						
	+ 10% of						
	such rate						

Foreign Currency Risk. We operate internationally and are exposed to potentially adverse movements in currency exchange rates. The functional currency of the majority of our active foreign subsidiaries is the foreign subsidiary's local currency. We enter into hedges in the form of foreign currency forward contracts to reduce our exposure to foreign currency rate changes on non-functional currency denominated forecasted transactions and balance sheet positions including: (1) certain assets and liabilities, (2) shipments forecasted to occur within approximately one month, (3) future billings and revenue on previously shipped orders, and (4) certain future intercompany invoices denominated in foreign currencies. The foreign currency contracts are carried at fair value and denominated in various currencies as listed in the tables below. The duration of forward contracts usually ranges from one month to 21 months. A description of our accounting for foreign currency contracts is included in Note 2 and Note 5 of Notes to Consolidated Financial Statements.

The success of our hedging activities depends upon the accuracy of our estimates of various balances and transactions denominated in non-functional currencies. To the extent our estimates are correct, gains and losses on our foreign currency contracts will be offset by corresponding losses and gains on the underlying transactions. For example, if the Euro were to depreciate by 10% compared to the U.S. dollar prior to the settlement of the Euro forward contracts listed in the table below providing information as of October 31, 2018, the fair value of the contracts would decrease by approximately \$12.4 million, and we would be required to pay approximately \$12.4 million to the counterparty upon contract maturity. At the same time, the U.S. dollar value of our Euro-based expenses would decline, resulting in a gain and positive cash flow of approximately \$12.4 million that would offset the loss and negative cash flow on the maturing forward contracts.

Net unrealized loss of approximately \$23.9 million and gain of \$4.4 million, net of tax, are included in accumulated other comprehensive income (loss) in our consolidated balance sheets as of October 31, 2018 and 2017, respectively. If estimates of our balances and transactions prove inaccurate, we will not be completely hedged, and we will record a gain or loss, depending upon the nature and extent of such inaccuracy.

We do not use foreign currency forward contracts for speculative or trading purposes. We enter into foreign exchange forward contracts with financial institutions and have not experienced nonperformance by counterparties. Further, we anticipate performance by all counterparties to such agreements.

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The following table provides information about the gross notional values of our foreign currency contracts as of October 31, 2018:

	Gross Notional Amount in U.S. Dollars (in thousands)	Average Contract Rate
Forward Contract Values:		
Japanese yen	\$ 291,495	109.506
Hungarian forint	188,192	284.365
Indian rupee	131,679	71.319
Euro	124,091	1.206
Chinese renminbi	113,860	6.756
Taiwanese dollar	85,383	29.476
Canadian dollar	56,496	1.282
Korean won	41,342	1,124.225
Israeli shekel	36,100	3.604
British pound sterling	28,247	1.359
Armenian dram	20,967	475.367
Singapore dollar	9,224	1.368
Swiss franc	8,473	0.953
	\$ 1,135,549	

Equity Risk. We have approximately \$10.9 million and \$7.8 million of non-marketable equity securities in privately held companies as of October 31, 2018 and 2017, respectively. These investments are accounted for under the cost or equity methods. The cost basis of securities sold is based on the specific identification method. The securities of privately held companies are reported at carrying value. Investments are written down to the fair value if there are any events or changes in circumstances that indicate any other than temporary decline in the value. We did not recognize any impairment during fiscal 2018 and recorded \$1.3 million of other-than-temporary impairment during fiscal 2017. None of our investments are held for speculation purposes.

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Item 8. Financial Statements and Supplementary Data
Report of Independent Registered Public Accounting Firm
To the Stockholders and Board of Directors
Synopsis, Inc.:

Opinions on the Consolidated Financial Statements and Internal Control Over Financial Reporting

We have audited the accompanying consolidated balance sheets of Synopsis, Inc. and its subsidiaries (the Company) as of November 3, 2018 and October 28, 2017, the related consolidated statements of operations, comprehensive income, stockholders' equity, and cash flows for each of the years in the three-year period ended November 3, 2018, and the related notes (collectively, the consolidated financial statements). We also have audited the internal control over financial reporting of Synopsis, Inc. as of November 3, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of November 3, 2018 and October 28, 2017, and the results of its operations and its cash flows for each of the years in the three-year period ended November 3, 2018, in conformity with U.S. generally accepted accounting principles. Also in our opinion, Synopsis, Inc. maintained, in all material respects, effective internal control over financial reporting as of November 3, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control Over Financial Reporting appearing under item 9A(b). Our responsibility is to express an opinion on the Company's consolidated financial statements and an opinion on the internal control over financial reporting of Synopsis, Inc. based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB. We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail,

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accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ KPMG LLP

We have served as the Company's auditor since 1992.

Santa Clara, California

December 14, 2018

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SYNOPSISYS, INC.
 CONSOLIDATED BALANCE SHEETS
 (In thousands, except par value amounts)

	October 31,	
	2018	2017
ASSETS		
Current assets:		
Cash and cash equivalents	\$723,115	\$1,048,356
Accounts receivable, net of allowances of \$5,613 and \$5,165, respectively	554,217	451,144
Inventories	122,407	61,884
Income taxes receivable and prepaid taxes	76,525	48,257
Prepaid and other current assets	67,533	72,952
Total current assets	1,543,797	1,682,593
Property and equipment, net	309,310	266,014
Goodwill	3,143,249	2,706,974
Intangible assets, net	360,404	253,843
Long-term prepaid taxes	138,312	20,157
Deferred income taxes	404,166	243,989
Other long-term assets	246,736	222,844
Total assets	\$6,145,974	\$5,396,414
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable and accrued liabilities	\$578,326	\$499,846
Accrued income taxes	27,458	39,811
Deferred revenue	1,152,862	1,064,528
Short-term debt	343,769	9,924
Total current liabilities	2,102,415	1,614,109
Long-term accrued income taxes	50,590	33,239
Long-term deferred revenue	116,859	83,252
Long-term debt	125,535	134,063
Other long-term liabilities	265,560	252,027
Total liabilities	2,660,959	2,116,690
Stockholders' equity:		
Preferred Stock, \$0.01 par value: 2,000 shares authorized; none outstanding	—	—
Common Stock, \$0.01 par value: 400,000 shares authorized; 149,265 and 150,445 shares outstanding, respectively	1,493	1,505
Capital in excess of par value	1,644,830	1,622,429
Retained earnings	2,543,688	2,143,873
Treasury stock, at cost: 7,996 and 6,817 shares, respectively	(597,682)	(426,208)
Accumulated other comprehensive income (loss)	(113,177)	(65,979)
Total Synopsys stockholders' equity	3,479,152	3,275,620
Non-controlling interest	5,863	4,104
Total stockholders' equity	3,485,015	3,279,724
Total liabilities and stockholders' equity	\$6,145,974	\$5,396,414
See accompanying notes to consolidated financial statements.		

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SYNOPSISYS, INC.
 CONSOLIDATED STATEMENTS OF OPERATIONS
 (In thousands, except per share amounts)

	Year Ended October 31,		
	2018	2017	2016
Revenue:			
Time-based products	\$2,303,317	\$2,021,812	\$1,910,902
Upfront products	357,698	338,204	248,137
Maintenance and service	460,043	364,864	263,493
Total revenue	3,121,058	2,724,880	2,422,532
Cost of revenue:			
Products	448,430	413,203	346,825
Maintenance and service	203,434	164,872	94,019
Amortization of intangible assets	84,034	76,109	102,118
Total cost of revenue	735,898	654,184	542,962
Gross margin	2,385,160	2,070,696	1,879,570
Operating expenses:			
Research and development	1,084,822	908,841	856,705
Sales and marketing	622,978	549,248	502,368
General and administrative	262,560	196,844	165,962
Amortization of intangible assets	41,630	31,614	27,507
Restructuring charges	12,945	36,586	9,633
Total operating expenses	2,024,935	1,723,133	1,562,175
Operating income	360,225	347,563	317,395
Other income (expense), net	3,318	35,535	12,153
Income (loss) before provision for income taxes	363,543	383,098	329,548
Provision (benefit) for income taxes	(68,975)) 246,535	62,722
Net income	\$432,518	\$136,563	\$266,826
Net income per share:			
Basic	\$2.90	\$0.91	\$1.76
Diluted	\$2.82	\$0.88	\$1.73
Shares used in computing per share amounts:			
Basic	149,036	150,457	152,017
Diluted	153,393	154,874	154,721

See accompanying notes to consolidated financial statements.

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SYNOPSIS, INC.
 CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
 (In thousands)

	Year Ended October 31,		
	2018	2017	2016
Net income	\$432,518	\$136,563	\$266,826
Other comprehensive income (loss):			
Change in foreign currency translation adjustment	(18,882)	14,293	5,808
Change in unrealized gains (losses) on investments, net of tax of \$0, for fiscal years 2017 and 2016	—	(19)	47
Cash flow hedges:			
Deferred gains (losses), net of tax of \$4,675, \$(4,380), and \$4,372 for fiscal years 2018, 2017 and 2016, respectively	(17,428)	20,760	(25,767)
Reclassification adjustment on deferred (gains) losses included in net income, net of tax of \$2,207, \$(168), and \$(6,253) for fiscal years 2018, 2017 and 2016, respectively	(10,888)	3,564	20,710
Other comprehensive income (loss), net of tax effects	(47,198)	38,598	798
Comprehensive income	\$385,320	\$175,161	\$267,624

See accompanying notes to consolidated financial statements.

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SYNOPSISYS, INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(In thousands)

	Common Stock		Capital in Excess of Par Value	Retained Earnings	Treasury Stock	Accumulated Other Comprehensive Income (Loss)	Total Synopsys Stockholders' Equity	Non-controlling Interest	Total Stockholders' Equity
	Shares	Amount							
Balance at October 31, 2015	155,157	\$ 1,552	\$ 1,610,460	\$ 1,725,727	\$(98,375)	\$(105,375)	\$ 3,133,989	\$—	\$ 3,133,989
Net income				266,826			266,826		266,826
Other comprehensive income (loss), net of tax effects						798	798		798
Purchases of treasury stock	(8,506)	(85)	20,085		(420,000)		(400,000)		(400,000)
Common stock issued, net of shares withheld for employee taxes	4,803	48	(80,735)	(44,968)	224,323		98,668		98,668
Stock-based compensation			97,583				97,583		97,583
Other			(2,718)				(2,718)		(2,718)
Balance at October 31, 2016	151,454	\$ 1,515	\$ 1,644,675	\$ 1,947,585	\$(294,052)	\$(104,577)	\$ 3,195,146	\$—	\$ 3,195,146
Net income				136,563			136,563		136,563
Retained earnings adjustment due to adoption of an accounting standard related to stock-based compensation			382	106,107			106,489		106,489
Other comprehensive income (loss), net of tax effects						38,598	38,598		38,598
Purchases of treasury stock	(5,413)	(54)	54		(380,000)		(380,000)		(380,000)
Equity forward contract			(20,000)				(20,000)		(20,000)
	4,404	44	(110,976)	(46,382)	247,844		90,530		90,530

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Common stock issued, net of shares withheld for employee taxes										
Stock-based compensation			108,294				108,294		108,294	
Non-controlling interest in an equity investment							—	4,104	4,104	
Balance at October 31, 2017	150,445	\$ 1,505	\$ 1,622,429	\$ 2,143,873	\$(426,208)	\$(65,979)	\$ 3,275,620	\$ 4,104	\$ 3,279,724	
Net income				432,518			432,518		432,518	
Retained earnings adjustment due to adoption of an accounting standard related to reclassification of certain tax effects from accumulated other comprehensive income				(293)			(293)		(293)	
Other comprehensive income (loss), net of tax effects							(47,198)	(47,198)	(47,198)	
Purchases of treasury stock	(4,688)	(47)	47		(420,000)		(420,000)		(420,000)	
Equity forward contract			20,000				20,000		20,000	
Common stock issued, net of shares withheld for employee taxes	3,508	35	(136,522)	(32,410)	248,526		79,629		79,629	
Stock-based compensation			138,876				138,876		138,876	
Non-controlling interest in an equity investment							—	1,759	1,759	
Balance at October 31,	149,265	\$ 1,493	\$ 1,644,830	\$ 2,543,688	\$(597,682)	\$(113,177)	\$ 3,479,152	\$ 5,863	\$ 3,485,015	

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See accompanying notes to consolidated financial statements.

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SYNOPSISYS, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Year Ended October 31,		
	2018	2017	2016
Cash flow from operating activities:			
Net income	\$432,518	\$136,563	\$266,826
Adjustments to reconcile net income to net cash provided by operating activities:			
Amortization and depreciation	209,207	189,442	207,032
Stock-based compensation	140,032	108,294	97,583
Allowance for doubtful accounts	3,368	2,149	950
(Gain) loss on sale of property and investments	(93)	8	(18)
Write-down of long-term investments	—	1,300	—
Deferred income taxes	(210,310)	123,052	(14,037)
Net changes in operating assets and liabilities, net of acquired assets and liabilities:			
Accounts receivable	(95,785)	2,296	(43,269)
Inventories	(66,509)	(20,137)	(32,072)
Prepaid and other current assets	(12,835)	(8,818)	(5,569)
Other long-term assets	(25,892)	(40,236)	(3,770)
Accounts payable and accrued liabilities	49,043	137,631	18,977
Income taxes	(103,841)	19,665	7,098
Deferred revenue	105,329	(16,644)	86,904
Net cash provided by operating activities	424,232	634,565	586,635
Cash flows from investing activities:			
Proceeds from sales and maturities of short-term investments	12,449	295,633	156,350
Purchases of short-term investments	—	(155,098)	(168,712)
Proceeds from sales of long-term investments	494	839	1,785
Purchases of long-term investments	(3,561)	—	(1,002)
Proceeds from sale of property and equipment	1,662	—	—
Purchases of property and equipment	(98,976)	(70,328)	(66,909)
Cash paid for acquisitions and intangible assets, net of cash acquired	(652,643)	(259,202)	(60,056)
Capitalization of software development costs	(2,950)	(3,226)	(4,131)
Other	—	2,100	—
Net cash used in investing activities	(743,525)	(189,282)	(142,675)
Cash flows from financing activities:			
Proceeds from credit facility	620,635	320,000	185,000
Repayment of debt	(295,313)	(380,625)	(185,000)
Issuances of common stock	123,829	126,337	125,283
Payments for taxes related to net share settlement of equity awards	(45,772)	(36,730)	(26,562)
Purchase of equity forward contract	—	(20,000)	—
Purchases of treasury stock	(400,000)	(380,000)	(400,000)
Other	1,759	(2,102)	(5,658)
Net cash provided by (used in) financing activities	5,138	(373,120)	(306,937)
Effect of exchange rate changes on cash and cash equivalents	(11,086)	(427)	3,409
Net change in cash and cash equivalents	(325,241)	71,736	140,432
Cash and cash equivalents, beginning of year	1,048,356	976,620	836,188
Cash and cash equivalents, end of year	\$723,115	\$1,048,356	\$976,620
Supplemental disclosure of cash flow information:			

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Cash paid for income taxes during the year:	\$252,522	\$103,478	\$69,447
Interest payments during the year:	\$15,307	\$7,095	\$3,708
See accompanying notes to consolidated financial statements.			

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SYNOPSYS, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Note 1. Description of Business

Synopsys, Inc. (Synopsys or the Company) provides products and services used by designers across the entire silicon to software spectrum, from engineers creating advanced semiconductors to software developers seeking to ensure the security and quality of their code. The Company is a global leader in supplying the electronic design automation (EDA) software that engineers use to design and test integrated circuits (ICs), also known as chips. The Company also offers semiconductor intellectual property (IP) products, which are pre-designed circuits that engineers use as components of larger chip designs rather than designing those circuits themselves. The Company provides software and hardware used to validate the electronic systems that incorporate chips and the software that runs on them. To complement these offerings, the Company provides technical services and support to help its customers develop advanced chips and electronic systems. The Company is also a leading provider of software tools and services that improve the security and quality of software code in a wide variety of industries, including electronics, financial services, media, automotive, medicine, energy and industrials.

Note 2. Summary of Significant Accounting Policies

Fiscal Year End. The Company's fiscal year ends on the Saturday nearest to October 31 and consists of 52 weeks, with the exception that approximately every five years, the Company has a 53-week year. Fiscal 2018 was a 53-week year and ended on November 3, 2018. Fiscal 2017 and 2016 were 52-week years ending on October 28, 2017 and October 29, 2016, respectively. For presentation purposes, the consolidated financial statements and accompanying notes refer to the closest calendar month end. Fiscal 2019 will be a 52-week year.

Principles of Consolidation. The consolidated financial statements include the accounts of the Company and all of its subsidiaries. All significant intercompany accounts and transactions have been eliminated.

Use of Estimates. To prepare financial statements in conformity with U.S. generally accepted accounting principles (U.S. GAAP), management must make estimates and assumptions that affect the amounts reported in the consolidated financial statements and accompanying notes. Actual results could differ from these estimates and may result in material effects on the Company's operating results and financial position.

Foreign Currency Translation. The functional currency of the majority of the Company's active foreign subsidiaries is the foreign subsidiary's local currency. Assets and liabilities that are not denominated in the functional currency are remeasured into the functional currency with any related gain or loss recorded in earnings. The Company translates assets and liabilities of its non-U.S. dollar functional currency foreign operations into the U.S. dollar reporting currency at exchange rates in effect at the balance sheet date. The Company translates income and expense items of such foreign operations into the U.S. dollar reporting currency at average exchange rates for the period. Accumulated translation adjustments are reported in stockholders' equity, as a component of accumulated other comprehensive income (loss).

Foreign Currency Contracts. The Company operates internationally and is exposed to potentially adverse movements in currency exchange rates. The Company enters into hedges in the form of foreign currency forward contracts to reduce its exposure to foreign currency rate changes on non-functional currency denominated forecasted transactions and balance sheet positions. The assets or liabilities associated with the forward contracts are recorded at fair value in other current assets or accrued liabilities in the consolidated balance sheet.

The accounting for gains and losses resulting from changes in fair value depends on the use of the foreign currency forward contract and whether it is designated and qualifies for hedge accounting. See Note 5. Financial Assets and Liabilities.

Fair Values of Financial Instruments. The Company's cash equivalents and foreign currency contracts are carried at fair value. The fair value of the Company's accounts receivable and accounts payable approximates the carrying amount due to their short duration. Non-marketable equity securities are carried at cost, net of impairments. The Company performs periodic impairment analysis on these non-marketable equity securities. The carrying amount of the short-term debt approximates the estimated fair value. See Note 6. Fair Value Measures.

Cash and Cash Equivalents. The Company classifies investments with original maturities of three months or less when acquired as cash equivalents.

Concentration of Credit Risk. Financial instruments that potentially subject the Company to significant concentrations of credit risk consist principally of cash equivalents, marketable securities, foreign currency

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SYNOPSISYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

contracts, and accounts receivable from trade customers. The Company maintains cash equivalents primarily in highly rated taxable and tax-exempt money market funds located in the U.S. and in various overseas locations.

The Company sells its products worldwide primarily to customers in the global electronics market. The Company performs on-going credit evaluations of its customers' financial condition and does not require collateral. The Company establishes reserves for potential credit losses and such losses have been within management's expectations and have not been material in any year presented.

Accounts Receivable, Net. The balances consist of accounts receivable billed and unbilled. Unbilled accounts receivable represent amounts recorded as revenue which will be invoiced within one year of the balance sheet date. The following table represents the components of accounts receivable, net:

	October 31,	
	2018	2017
	(in thousands)	
Accounts receivable	\$495,763	\$393,229
Unbilled accounts receivable	64,067	63,080
Total accounts receivable	559,830	456,309
Less allowance for doubtful accounts	(5,613)	(5,165)
Total accounts receivable, net	\$554,217	\$451,144

Allowance for Doubtful Accounts. Trade accounts receivable are recorded at the invoiced amount and do not bear interest. The Company maintains allowances for doubtful accounts to reduce the Company's receivables to their estimated net realizable value. The Company provides a general reserve on all accounts receivable based on a review of customer accounts. The following table presents the changes in the allowance for doubtful accounts:

Fiscal Year	Balance at Beginning of Period (in thousands)	Provisions	Write-offs(1)	Balance at End of Period
2018	\$5,165	\$ 3,368	\$ (2,920)	\$ 5,613
2017	\$3,201	\$ 2,149	\$ (185)	\$ 5,165
2016	\$2,561	\$ 950	\$ (310)	\$ 3,201

(1) Balances written off, net of recoveries.

Inventories. Inventories primarily include components and parts used in emulation and prototyping hardware systems. Inventory cost is computed using standard costs, which approximate actual costs, on a first-in, first-out basis and recorded at lower of cost or net realizable value. A charge is recorded to cost of product when inventory is determined to be in excess of anticipated demand or considered obsolete.

Income Taxes. The Company accounts for income taxes using the asset and liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date.

The Company accounts for uncertainty in income taxes using a two-step approach to recognizing and measuring uncertain tax positions. The first step is to evaluate the tax position for recognition by determining whether it is more likely than not that the position will be sustained on audit, including resolution of related appeals or litigation processes, if any. The second step is to measure the tax benefit as the largest amount which is more than 50% likely of

being realized upon ultimate settlement. An uncertain tax position is considered effectively settled on completion of an examination by a taxing authority if certain other conditions are satisfied.

Property and Equipment. Property and equipment is recorded at cost less accumulated depreciation. Assets, excluding land, are depreciated using the straight-line method over their estimated useful lives. Leasehold

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SYNOPSISYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

improvements are amortized using the straight-line method over the remaining term of the lease or the economic useful life of the asset, whichever is shorter. Depreciation expenses were \$72.8 million, \$82.8 million and \$73.8 million in fiscal 2018, 2017 and 2016, respectively. Repair and maintenance costs are expensed as incurred and such costs were \$45.7 million, \$40.6 million and \$38.8 million in fiscal 2018, 2017 and 2016, respectively.

A summary of property and equipment, at cost less accumulated depreciation and amortization, as of October 31, 2018 and 2017 is as follows:

	October 31,	
	2018	2017
	(in thousands)	
Computer and other equipment	\$604,117	\$540,257
Buildings	68,522	68,877
Furniture and fixtures	61,070	54,882
Land	18,849	20,414
Leasehold improvements	183,430	153,619
	935,988	838,049
Less accumulated depreciation and amortization(1)	(626,678)	(572,035)
Total	\$309,310	\$266,014

(1) Accumulated depreciation and amortization includes write-offs due to retirement of fully amortized fixed assets.

The useful lives of depreciable assets are as follows:

	Useful Life in Years
Computer and other equipment	3-5
Buildings	30
Furniture and fixtures	5
Leasehold improvements (average)	5

Goodwill. Goodwill represents the excess of the aggregate purchase price over the fair value of the net tangible and identifiable intangible assets acquired by the Company. The carrying amount of goodwill is tested for impairment annually as of October 31 or more frequently if facts and circumstances warrant a review. The Company determined that it is a single reporting unit for the purpose of goodwill impairment tests. For purposes of assessing the impairment of goodwill, the Company estimates the value of the reporting unit using its market capitalization as the best evidence of fair value. This fair value is then compared to the carrying value of the reporting unit. During fiscal 2018, 2017 and 2016, there were no indicators of impairment to goodwill.

Intangible Assets. Intangible assets consist of acquired technology, certain contract rights, customer relationships, trademarks and trade names, capitalized software, and in-process research and development. These intangible assets are acquired through business combinations, direct purchases, or internally developed capitalized software. Intangible assets are amortized on a straight-line basis over their estimated useful lives which range from one to ten years, except for in-process research and development (IPR&D) projects not yet completed. IPR&D assets are amortized over their estimated useful lives upon completion or are written off upon abandonment.

The Company continually monitors events and changes in circumstances that could indicate carrying amounts of long-lived assets, including property and equipment and intangible assets, may not be recoverable. When such events or changes in circumstances occur, the Company assesses the recoverability of long-lived assets by determining whether the carrying value of such asset group will be recovered through the undiscounted future cash flow. If the undiscounted future cash flow is less than the carrying amount of the asset group, the Company recognizes an impairment loss based on the excess of the carrying amount over the fair value of the asset group. The Company had no material impairment charges for long-lived assets in fiscal 2018, and none in fiscal 2017 or 2016.

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SYNOPSISYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

Restructuring Charges. During fiscal 2018, the Company recorded \$12.9 million of restructuring charges for severance and benefits due to involuntary employee termination actions. The restructuring actions were undertaken to position the Company for future growth, reallocate resources to priority areas and, to a lesser extent, eliminate operational redundancy. These charges consisted primarily of severance benefits. As of October 31, 2018, there was an \$8.1 million outstanding balance remaining in accounts payable and accrued liabilities in the consolidated balance sheets. The remaining balance will be paid in fiscal 2019.

During fiscal 2017, the Company recorded \$36.6 million of restructuring charges for severance and benefits due to involuntary employee termination actions. The restructuring actions were undertaken to position the Company for future growth, reallocate resources to priority areas, and to a lesser extent, eliminate operational redundancy. These charges consist primarily of severance and retirement benefits. As of October 31, 2017, there was a \$17.5 million outstanding balance remaining in accounts payable and accrued liabilities in the consolidated balance sheets, which was paid in fiscal 2018.

During fiscal 2016, the Company recorded \$9.6 million of restructuring charges for severance and benefits due to involuntary employee terminations, of which \$3.9 million was paid in fiscal 2016. As of October 31, 2016, there was a \$5.7 million outstanding balance remaining in accounts payable and accrued liabilities as payroll and related benefits in the consolidated balance sheets. The remaining balance was paid in fiscal 2017.

Accounts Payable and Accrued Liabilities. The balance consists of:

	October 31,	
	2018	2017
	(in thousands)	
Payroll and related benefits	\$413,307	\$382,773
Other accrued liabilities	79,973	97,119
Accounts payable	85,046	19,954
Total	\$578,326	\$499,846

Other Long-term Liabilities. The balance consists of:

	October 31,	
	2018	2017
	(in thousands)	
Deferred compensation liability (See Note 10)	\$212,165	\$197,542
Other long-term liabilities	53,395	54,485
Total	\$265,560	\$252,027

Other Comprehensive Income (Loss). Other comprehensive income (loss) (OCI) includes all changes in equity during a period, such as accumulated net translation adjustments, unrealized gain (loss) on certain foreign currency forward contracts that qualify as cash flow hedges, reclassification adjustments related to cash flow hedges and unrealized gain (loss) on investments. See Note 8. **Accumulated Other Comprehensive Income (Loss).**

Revenue Recognition. The Company generates revenue from the sale of products that include software licenses and to a lesser extent, hardware products, maintenance and services. Time-based products revenue consists of fees associated with the licensing of the Company's software. Maintenance and service revenue consists of maintenance fees associated with perpetual licenses, hardware products, and professional services fees. Upfront products revenue includes hardware revenue consisting of sales of Field Programmable Gate Array (FPGA)-based emulation and prototyping products and perpetual software licenses.

Most of the Company's customer arrangements are complex, involving hundreds of products and various license rights, bundled with post-contract customer support and additional meaningful rights that provide a complete end-to-end solution to the customer. Throughout the contract, the Company's customers are typically using a myriad of products to complete each phase of a chip design and are concurrently working on multiple chip designs, or

projects, in different phases of the design. During this time, the customer looks to the Company to release state-of-the-art technology as the Company constantly invests to keep up with the rapid change, to address requested

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SYNOPSISYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

enhancements to the Company's tools to meet customer specifications, to provide support at each stage of the customer's design, including the final manufacturing of the chip (the tape out stage), and other important services.

With respect to software licenses, the Company utilizes primarily two license types:

Technology Subscription Licenses (TSLs). TSLs are time-based licenses for a finite term, and generally provide the customer with limited rights to receive, or to exchange certain quantities of licensed software for, unspecified future technology. The majority of the Company's arrangements are TSLs due to the nature of the business and customer requirements. In addition to the licenses, the arrangements also include: post-contract customer support, which includes providing frequent updates and upgrades to maintain the utility of the software due to rapid changes in technology; other intertwined services such as multiple copies of the tools; assistance to the Company's customers in applying the Company's technology in their development environment; and rights to remix licenses for other licenses.

Perpetual licenses. Perpetual licenses continue as long as the customer renews maintenance plus an additional 20 years. Perpetual licenses do not provide the customer any rights to receive, or to exchange licensed software for, unspecified future technology. Customers purchase maintenance separately for the first year and may renew annually.

For the two software license types, the Company recognizes revenue as follows:

TSLs. The Company typically recognizes revenue from TSL fees ratably over the term of the license period, or as customer installments become due and payable, whichever is later. Revenue attributable to TSLs is reported as "time-based products revenue" in the consolidated statements of operations.

Perpetual licenses. The Company recognizes revenue from perpetual licenses in full upon shipment of the software if payment terms require the customer to pay at least 75% of the license fee and 100% of the maintenance fee within one year from shipment and all other revenue recognition criteria are met. Revenue attributable to these perpetual licenses is reported as "upfront products revenue" in the consolidated statements of operations. For perpetual licenses in which less than 75% of the license fee and 100% of the maintenance fee is payable within one year from shipment, the Company recognizes revenue as customer installments become due and payable. Such revenue is reported as "time-based products revenue" in the consolidated statements of operations.

The Company's maintenance and service revenue primarily consists of maintenance fees associated with perpetual licenses and hardware products, and professional services fees. The Company recognizes revenue from maintenance arrangements ratably over the maintenance period to the extent cash has been received or fees become due and payable, and recognizes revenue from professional services and training fees as such services are performed and accepted by the customers as needed. Revenue attributable to maintenance, professional services and training is reported as "maintenance and service revenue" in the consolidated statements of operations.

Hardware revenue consists of sales of FPGA-based emulation and prototyping products. The Company recognizes revenue from sales of hardware products in full upon shipment if all other revenue recognition criteria are met. Revenue attributable to these sales is reported as "upfront products revenue" in the consolidated statements of operations.

Infrequently, the Company enters into certain license arrangements wherein licenses are provided for a finite term without any other services or rights, including rights to receive, or to exchange licensed software for, unspecified future technology. The Company recognizes revenue from these term licenses in full upon shipment of the software and when all other revenue recognition criteria are met.

The Company also enters into arrangements in which portions of revenue are contingent upon the occurrence of uncertain future events, such as royalty arrangements. The Company refers to this revenue as "contingent revenue." Contingent revenue is recognized if and when the event that removes the contingency occurs. Such revenue is reported as "time-based products revenue" in the consolidated statements of operations. These arrangements are not material to the Company's total revenue.

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SYNOPSISYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

The Company infrequently enters into multiple-element arrangements that contain both software and non-software deliverables such as hardware. The Company has determined that the software and non-software deliverables in the Company's contracts are separate units of accounting. The Company recognizes revenue for the separate units of accounting when all revenue recognition criteria are met. Revenue allocated to hardware units of accounting is recognized upon shipment when all other revenue recognition criteria are met. Revenue allocated to software units of accounting is recognized depending on the software license type (TSL or perpetual license). Such arrangements have not had a material effect on the Company's consolidated financial statements and are not expected to have a material effect in future periods.

The Company also enters into arrangements to deliver software products, either alone or together with other products or services, that require significant modification or customization of the software. The Company accounts for such arrangements using the percentage of completion method as the Company has the ability to make reasonably dependable estimates that relate to the extent of progress toward completion, contract revenues and costs. The Company measures the progress towards completion using the labor hours incurred to complete the project. Revenue attributable to these arrangements is reported as "maintenance and service revenue" in the consolidated statements of operations.

The Company determines the fair value of each element in multiple element software arrangements that only contain software and software-related deliverables based on vendor-specific objective evidence (VSOE). The Company limits assessment of VSOE of fair value for each element to the price charged when such element is sold separately. The Company has analyzed all of the elements included in multiple-element software arrangements and has determined that the Company has sufficient VSOE to allocate revenue to the maintenance components of the Company's perpetual license products and to professional services. Accordingly, assuming all other revenue recognition criteria are met, the Company recognizes license revenue from perpetual licenses upon delivery using the residual method, recognizes revenue from maintenance ratably over the maintenance term, and recognizes revenue from professional services as services are performed and accepted by the customer. With respect to TSL arrangements, due to the complexity of the tools, the complexity of the arrangement terms and intertwined services, the license, maintenance and other services are not separable and are considered as a combined unit. Additionally, the Company does not have sufficient VSOE of fair value to allocate the fee between these services. Therefore, the Company recognizes revenue from TSLs ratably over the term of the license, assuming all other revenue recognition criteria are met.

Revenue recognition involves certain judgments. Specifically, in connection with each transaction involving the Company's products, the Company must evaluate whether: (1) persuasive evidence of an arrangement exists, (2) delivery of software or services has occurred, (3) the fee for such software or services is fixed or determinable, and (4) collectability is probable. All four of these criteria must be met in order for the Company to recognize revenue with respect to a particular arrangement. The Company applies these revenue recognition criteria as follows:

Persuasive Evidence of an Arrangement Exists. Prior to recognizing revenue on an arrangement, the Company's customary policy is to have a written contract, signed by both the customer and by the Company or a purchase order from those customers that have previously negotiated a standard end-user license arrangement or purchase agreement.

Delivery Has Occurred. The Company delivers its products to its customers electronically or physically. For electronic deliveries, delivery occurs when the Company provides access to its customers to take immediate possession of the software through downloading it to the customer's hardware. For physical deliveries, the standard transfer terms are typically Freight on Board (FOB) shipping point. The Company generally ships its products or license keys promptly after acceptance of customer orders. However, a number of factors can affect the timing of product shipments and, as a result, timing of revenue recognition, including the delivery dates requested by customers and the Company's operational capacity to fulfill product orders at the end of a fiscal quarter.

The Fee is Fixed or Determinable. The Company's determination that an arrangement fee is fixed or determinable depends principally on the arrangement's payment terms. The Company's standard payment terms for perpetual

licenses require 75% or more of the license fee and 100% of the maintenance fee to be paid within one year. If the arrangement includes these terms, the Company regards the fee as fixed or determinable, and recognizes all license revenue under the arrangement in full upon delivery (assuming all other revenue recognition criteria are met). If the arrangement does

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SYNOPSYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

not include these terms, the Company does not consider the fee to be fixed or determinable and generally recognizes revenue when customer installments are due and payable. In the case of a TSL, because of the right to exchange products or receive unspecified future technology and because VSOE for maintenance services does not exist for a TSL, the Company recognizes revenue ratably over the term of the license, but not in advance of when customers' installments become due and payable.

Collectability is Probable. The Company judges collectability of the arrangement fees on a customer-by-customer basis pursuant to its credit review policy. The Company typically sells to customers with whom it has a history of successful collection. For a new customer, or when an existing customer substantially expands its commitments, the Company evaluates the customer's financial position and ability to pay and typically assigns a credit limit based on that review. The Company increases the credit limit only after it has established a successful collection history with the customer. If the Company determines at any time that collectability is not probable under a particular arrangement based upon its credit review process or the customer's payment history, the Company recognizes revenue under that arrangement as customer payments are actually received.

Warranties and Indemnities. The Company generally warrants its products to be free from defects in media and to substantially conform to material specifications for a period of 90 days for software products and for up to six months for hardware systems. In certain cases, the Company also provides its customers with limited indemnification with respect to claims that their use of the Company's software products infringes on United States patents, copyrights, trademarks or trade secrets. The Company is unable to estimate the potential impact of these commitments on the future results of operations. To date, the Company has not been required to pay any material warranty claims.

Net Income Per Share. The Company computes basic income per share by dividing net income available to common shareholders by the weighted average number of common shares outstanding during the period. Diluted net income per share reflects the dilution from potential common shares outstanding such as stock options and unvested restricted stock units and awards during the period using the treasury stock method.

The table below reconciles the weighted average common shares used to calculate basic net income per share with the weighted average common shares used to calculate diluted net income per share:

	Year Ended October 31,		
	2018	2017	2016
	(in thousands, except per share amounts)		
Numerator:			
Net income	\$432,518	\$136,563	\$266,826
Denominator:			
Weighted average common shares for basic net income per share	149,036	150,457	152,017
Dilutive effect of common share equivalents from equity-based compensation	4,357	4,417	2,704
Weighted average common shares for diluted net income per share	153,393	154,874	154,721
Net income per share:			
Basic	\$2.90	\$0.91	\$1.76
Diluted	\$2.82	\$0.88	\$1.73
Anti-dilutive employee stock-based awards excluded(1)	850	345	1,971

These stock options and unvested restricted stock units were anti-dilutive for the respective periods and are (1) excluded in calculating diluted net income per share. While such awards were anti-dilutive for the respective periods, they could be dilutive in the future.

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SYNOPSISYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

Note 3. Business Combinations

Fiscal 2018 Acquisitions

During fiscal 2018, the Company completed several acquisitions with aggregate cash consideration of \$637.0 million, net of cash, cash equivalents and short-term investments acquired. The Company does not consider these acquisitions to be material, individually or in the aggregate, to the Company's consolidated statements of operations. The Company funded these acquisitions with cash.

Acquisition of Black Duck Software (Black Duck)

On December 11, 2017, the Company acquired 100% of the outstanding shares of Black Duck, a privately-held leader in automated solutions for securing and managing open source software, for \$565.1 million total purchase consideration.

As of October 31, 2018, the total purchase consideration and the purchase allocation was as follows:

	(in thousands)
Cash paid	\$ 563,500
Fair value of assumed equity awards allocated to purchase consideration	1,588
Total purchase consideration	\$ 565,088
Goodwill	\$ 395,395
Identifiable intangibles assets acquired	178,000
Cash, cash equivalents and short-term investments	19,491
Other tangible liabilities acquired, net	(12,298)
Deferred revenue	(15,500)
Total purchase allocation	\$ 565,088

Goodwill of \$395.4 million is primarily attributable to the assembled workforce and expectation of sales growth due to the Company's new technology offerings in the security, quality and compliance testing space. The goodwill is not deductible for tax purposes. The acquired identifiable intangible assets of \$178.0 million were valued using the income or cost methods. The intangible assets, except for in-process research and development project not yet completed, are being amortized over their respective useful lives ranging from one to ten years. The acquisition-related costs directly attributable to the business combination of \$15.5 million, including compensation expenses, professional fees and other direct expenses, were expensed as incurred in the consolidated statement of operations during fiscal year 2018. The Company funded the acquisition with cash of \$544.0 million, net of acquired cash, cash equivalents and short-term investments.

The Company also assumed unvested restricted stock units (RSUs) and stock options with a fair value of \$15.6 million. The Black-Scholes option-pricing model was used to determine the fair value of these stock options, whereas the fair value of the RSUs was based on the market price on the grant date of the instruments. Of the total fair value of the RSU and stock options assumed, \$1.6 million was allocated to the purchase consideration and \$14.0 million was allocated to future services to be expensed over their remaining service periods on a straight-line basis.

Other Fiscal 2018 Acquisitions

During fiscal 2018, the Company completed other acquisitions for a total purchase consideration of \$93.0 million, net of cash acquired. The Company does not consider these acquisitions to be material to the Company's consolidated financial statements. The preliminary purchase allocations resulted in \$47.6 million of goodwill, which is not deductible for tax purposes, and \$51.9 million of acquired identifiable intangible assets valued using the income or cost methods. The intangible assets, except for in-process research and development projects not yet completed, are being amortized over their respective useful lives ranging from one to seven years. The acquisition-related costs for these acquisitions, totaling \$3.8 million, were expensed as incurred in the consolidated statement of operations.

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SYNOPSIS, INC.

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Note 4. Goodwill and Intangible Assets

Goodwill:

	(in thousands)
Balance at October 31, 2016	\$ 2,518,245
Additions	178,545
Effect of foreign currency translation	10,184
Balance at October 31, 2017	\$ 2,706,974
Additions	443,007
Effect of foreign currency translation	(6,732)
Balance at October 31, 2018(1)	\$ 3,143,249

(1) There is no impairment of goodwill for periods presented.

Intangible assets as of October 31, 2018 consist of the following:

	Gross Assets	Accumulated Amortization	Net Assets
	(in thousands)		
Core/developed technology	\$773,147	\$ 598,956	\$ 174,191
Customer relationships	358,524	204,382	154,142
Contract rights intangible	183,953	177,191	6,762
Trademarks and trade names	42,929	21,944	20,985
In-process research and development (IPR&D)(2)	1,200	—	1,200
Capitalized software development costs	35,818	32,694	3,124
Total	\$1,395,571	\$ 1,035,167	\$ 360,404

(2) IPR&D is reclassified to core/developed technology upon completion or is written off upon abandonment.

Intangible assets as of October 31, 2017 consist of the following:

	Gross Assets	Accumulated Amortization	Net Assets
	(in thousands)		
Core/developed technology	\$647,975	\$ 526,796	\$ 121,179
Customer relationships	278,811	166,886	111,925
Contract rights intangible	174,615	172,178	2,437
Trademarks and trade names	25,329	17,401	7,928
In-process research and development (IPR&D)(2)	6,600	—	6,600
Capitalized software development costs	32,868	29,094	3,774
Total	\$1,166,198	\$ 912,355	\$ 253,843

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SYNOPSIS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

Amortization expense related to intangible assets consisted of the following:

	Year Ended October 31,		
	2018	2017	2016
	(in thousands)		
Core/developed technology	\$78,820	\$65,916	\$85,331
Customer relationships	37,395	27,340	24,594
Contract rights intangible	4,906	10,886	16,543
Trademarks and trade names	4,543	3,580	3,156
Capitalized software development costs ⁽³⁾	3,599	3,986	3,697
Total	\$129,263	\$111,708	\$133,321

⁽³⁾ Amortization of capitalized software development costs is included in cost of products revenue in the consolidated statements of operations.

The following table presents the estimated future amortization of intangible assets:

Fiscal Year	(in thousands)
2019	\$ 102,605
2020	78,074
2021	55,850
2022	44,009
2023	29,219
2024 and thereafter	49,447
IPR&D ⁽⁴⁾	1,200
Total	\$ 360,404

⁽⁴⁾ IPR&D assets are amortized over their useful lives upon completion or are written off upon abandonment.

Note 5. Financial Assets and Liabilities

Cash equivalents. The Company classifies time deposits and other investments with original maturities less than three months as cash equivalents.

As of October 31, 2018, the balances of the Company's cash equivalents and non-marketable equity securities investments were:

	Cost	Gross Unrealized Gains	Gross	Gross	Estimated Fair Value ⁽¹⁾
			Unrealized Losses Less Than 12 Continuous Months	Unrealized Losses 12 Continuous Months or Longer	
(in thousands)					
Cash equivalents:					
Money market funds	\$ 165,296	\$ —	\$ —	\$ —	\$ 165,296
Total:	\$ 165,296	\$ —	\$ —	\$ —	\$ 165,296
Other long-term assets:					
Non-marketable equity securities	\$ 10,892	\$ —	\$ —	\$ —	\$ 10,892
Total:	\$ 10,892	\$ —	\$ —	\$ —	\$ 10,892

⁽¹⁾ See Note 6. Fair Value Measures for further discussion on fair values of cash equivalents.

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SYNOPSISYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

As of October 31, 2017, the balances of our cash equivalents and non-marketable equity securities investments were:

	Cost	Gross Unrealized Gains	Gross Unrealized Losses Less Than 12 Continuous Months	Gross Unrealized Losses 12 Months or Longer	Estimated Fair Value(1)
	(in thousands)				
Cash equivalents:					
Money market funds	\$ 560,594	\$ —	\$ —	\$ —	\$ 560,594
Total:	\$ 560,594	\$ —	\$ —	\$ —	\$ 560,594
Other long-term assets:					
Non-marketable equity securities	\$ 7,826	\$ —	\$ —	\$ —	\$ 7,826
Total:	\$ 7,826	\$ —	\$ —	\$ —	\$ 7,826

(1) See Note 6. Fair Value Measures for further discussion on fair values of cash equivalents.

Non-marketable equity securities. The Company's strategic investment portfolio consists of non-marketable equity securities in privately held companies. The securities accounted for as cost method investments are reported at cost, net of impairment losses. Securities accounted for as equity method investments are recorded at cost plus the proportional share of the issuers' income or loss, which is recorded in the Company's other income (expense), net. The cost basis of securities sold is based on the specific identification method. Refer to Note 6. Fair Value Measures.

Derivatives. The Company recognizes derivative instruments as either assets or liabilities in the consolidated financial statements at fair value and provides qualitative and quantitative disclosures about such derivatives. The Company operates internationally and is exposed to potentially adverse movements in foreign currency exchange rates. The Company enters into hedges in the form of foreign currency forward contracts to reduce its exposure to foreign currency rate changes on non-functional currency denominated forecasted transactions and balance sheet positions including: (1) certain assets and liabilities, (2) shipments forecasted to occur within approximately one month, (3) future billings and revenue on previously shipped orders, and (4) certain future intercompany invoices denominated in foreign currencies.

The duration of forward contracts ranges from approximately one month to 21 months, the majority of which are short-term. The Company does not use foreign currency forward contracts for speculative or trading purposes. The Company enters into foreign exchange forward contracts with high credit quality financial institutions that are rated 'A' or above and to date has not experienced nonperformance by counterparties. Further, the Company anticipates continued performance by all counterparties to such agreements.

The assets or liabilities associated with the forward contracts are recorded at fair value in other current assets or accrued liabilities in the consolidated balance sheets. The accounting for gains and losses resulting from changes in fair value depends on the use of the foreign currency forward contract and whether it is designated and qualifies for hedge accounting.

Cash Flow Hedging Activities

Certain foreign exchange forward contracts are designated and qualify as cash flow hedges. These contracts have durations of approximately 21 months or less. Certain forward contracts are rolled over periodically to capture the full length of exposure to the Company's foreign currency risk, which can be up to three years. To receive hedge accounting treatment, all hedging relationships are formally documented at the inception of the hedge, and the hedges must be highly effective in offsetting changes to future cash flows on the hedged transactions. The effective portion of gains or losses resulting from changes in fair value of these hedges is initially reported, net of tax, as a

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SYNOPSIS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

component of other comprehensive income (loss) (OCI), in stockholders' equity and reclassified into revenue or operating expenses, as appropriate, at the time the hedged transactions affect earnings. The Company expects a majority of the hedge balance in OCI to be reclassified to the statements of operations within the next twelve months. Hedging effectiveness is evaluated monthly using spot rates, with any gain or loss caused by hedging ineffectiveness recorded in other income (expense), net. The premium/discount component of the forward contracts is recorded to other income (expense), net, and is not included in evaluating hedging effectiveness.

Non-designated Hedging Activities

The Company's foreign exchange forward contracts that are used to hedge non-functional currency denominated balance sheet assets and liabilities are not designated as hedging instruments. Accordingly, any gains or losses from changes in the fair value of the forward contracts are recorded in other income (expense), net. The gains and losses on these forward contracts generally offset the gains and losses associated with the underlying assets and liabilities, which are also recorded in other income (expense), net. The duration of the forward contracts for hedging the Company's balance sheet exposure is approximately one month.

The Company also has certain foreign exchange forward contracts for hedging certain international revenues and expenses that are not designated as hedging instruments. Accordingly, any gains or losses from changes in the fair value of the forward contracts are recorded in other income (expense), net. The gains and losses on these forward contracts generally offset the gains and losses associated with the foreign currency in operating income. The duration of these forward contracts is usually less than one year. The overall goal of the Company's hedging program is to minimize the impact of currency fluctuations on its net income over its fiscal year.

The effects of the changes in the fair values of non-designated forward contracts for fiscal years 2018, 2017, and 2016 are summarized as follows:

	October 31,		
	2018	2017	2016
	(in thousands)		

Gain (loss) recorded in other income (expense), net	\$3,361	\$1,359	\$(4,533)
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The notional amounts in the table below for derivative instruments provide one measure of the transaction volume outstanding:

	As of October 31, 2018 (in thousands)	As of October 31, 2017
Total gross notional amount	\$1,135,549	\$955,139
Net fair value	\$(18,120)	\$14,052

The notional amounts for derivative instruments do not represent the amount of the Company's exposure to market gain or loss. The Company's exposure to market gain or loss will vary over time as a function of currency exchange rates. The amounts ultimately realized upon settlement of these financial instruments, together with the gains and losses on the underlying exposures, will depend on actual market conditions during the remaining life of the instruments.

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SYNOPSISYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

The following represents the balance sheet location and amount of derivative instrument fair values segregated between designated and non-designated hedge instruments:

	Fair Values of derivative instruments designated as hedging instruments (in thousands)	Fair Values of derivative instruments not designated as hedging instruments (in thousands)
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As of October 31, 2018

Other current assets	\$ 4,771	\$ 131
Accrued liabilities	\$ 22,890	\$ 132

As of October 31, 2017

Other current assets	\$ 16,582	\$ 15
Accrued liabilities	\$ 2,485	\$ 59

The following table represents the income statement location and amount of gains and losses on derivative instrument fair values for designated hedge instruments, net of tax:

	Location of gain (loss) recognized in OCI on derivatives	Amount of gain (loss) recognized in OCI on derivatives (effective portion)	Location of gain (loss) reclassified from OCI	Amount of gain (loss) reclassified from OCI (effective portion)
(in thousands)				
Fiscal year ended October 31, 2018				
Foreign exchange contracts	Revenue	\$ 693	Revenue	\$ 1,103
Foreign exchange contracts	Operating expenses	(18,121)	Operating expenses	9,785
Total		\$ (17,428)		\$ 10,888
Fiscal year ended October 31, 2017				
Foreign exchange contracts	Revenue	\$ 7,582	Revenue	\$(2,759)
Foreign exchange contracts	Operating expenses	13,346	Operating expenses	(805)
Total		\$ 20,928		\$(3,564)
Fiscal year ended October 31, 2016				
Foreign exchange contracts	Revenue	\$ (14,580)	Revenue	\$(8,585)
Foreign exchange contracts	Operating expenses	(11,259)	Operating expenses	(12,125)
Total		\$ (25,839)		\$(20,710)

The following table represents the ineffective portions and portions excluded from effectiveness testing of the hedge gains (losses) for derivative instruments designated as hedging instruments, which are recorded in other income (expense) income, net:

	Amount of gain (loss) recognized in income statement on derivatives (ineffective portion)(1)	Amount of gain (loss) recognized in income statement on derivatives (excluded from effectiveness testing)(2)
Foreign exchange contracts		

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(in thousands)

Fiscal year ended October 31, 2018	\$ 467	\$ 2,848
Fiscal year ended October 31, 2017	\$ 311	\$ 3,018
Fiscal year ended October 31, 2016	\$ 1,468	\$ 6,058

(1) The ineffective portion includes forecast inaccuracies.

(2) The portion excluded from effectiveness testing includes the discount earned or premium paid for the contracts.

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SYNOPSISYS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

Other Commitments - Credit and Term Loan Facilities

In July 2018, the Company entered into a 220.0 million RMB (approximately \$33.0 million) credit agreement with a lender in China to support its facilities expansion. Borrowings bear interest at a floating rate based on the Chinese Central Bank rate plus 10% of such rate. As of October 31, 2018, the Company had \$5.5 million outstanding under the agreement.

On November 28, 2016, the Company entered into an amended and restated credit agreement with several lenders (the Credit Agreement) providing for (i) a \$650.0 million senior unsecured revolving credit facility (the Revolver) and (ii) a \$150.0 million senior unsecured term loan facility (the Term Loan). The Credit Agreement amended and restated the Company's previous credit agreement dated May 19, 2015 (the 2015 Agreement), in order to increase the size of the revolving credit facility from \$500.0 million to \$650.0 million, provide a new \$150.0 million senior unsecured term loan facility, and to extend the termination date of the revolving credit facility from May 19, 2020 to November 28, 2021. Subject to obtaining additional commitments from lenders, the principal amount of the loans provided under the Credit Agreement may be increased by the Company by up to an additional \$150.0 million. The Credit Agreement contains financial covenants requiring the Company to operate within a maximum leverage ratio and maintain a minimum interest coverage ratio, as well as other non-financial covenants. As of October 31, 2018, the Company was in compliance with all financial covenants.

As of October 31, 2018, the Company had \$133.8 million outstanding balance, net of debt issuance costs, under the Term Loan, of which \$120.0 million was classified as long-term liabilities. Outstanding principal payments under the Term Loan are due as follows:

Fiscal year	(in thousands)
2019	\$ 14,062
2020	17,813
2021	27,187
2022	75,000
Total	\$ 134,062

As of October 31, 2017, the Company had \$144.0 million outstanding balance, net of debt issuance costs, under the Term Loan, of which \$134.1 million was classified as long-term liabilities, and no outstanding balance under the Revolver.

The total outstanding balance of the Revolver as of October 31, 2018 was \$330.0 million, which was included in short-term liabilities. The Company expects its borrowings under the Revolver will fluctuate from quarter to quarter. Borrowings bear interest at a floating rate based on a margin over the Company's choice of market observable base rates as defined in the Credit Agreement. As of October 31, 2018, borrowings under the Term Loan bore interest at LIBOR +1.125% and the applicable interest rate for the Revolver was LIBOR +1.000%. In addition, commitment fees are payable on the Revolver at rates between 0.125% and 0.200% per year based on the Company's leverage ratio on the daily amount of the revolving commitment.

Subsequent to fiscal year 2018, the Company drew down \$150.0 million under the Revolver. The total outstanding balance of the Revolver as of December 14, 2018 is \$430.0 million, net of repayments.

The carrying amount of the short-term and long-term debt approximates the estimated fair value. These borrowings under the Credit Agreement have a variable interest rate structure and are classified within Level 2 of the fair value hierarchy.

Note 6. Fair Value Measures

Accounting Standards Codification (ASC) 820-10, Fair Value Measurements and Disclosures, defines fair value, establishes guidelines and enhances disclosure requirements for fair value measurements. The accounting guidance requires an entity to maximize the use of observable inputs and minimize the use of unobservable inputs when measuring fair value. The accounting guidance also establishes a fair value hierarchy based on the independence of the source and objective evidence of the inputs used. There are three fair value hierarchies based upon the level of inputs that are significant to fair value measurement:

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SYNOPSIS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS—Continued

Level 1—Observable inputs that reflect quoted prices (unadjusted) for identical instruments in active markets;

Level 2—Observable inputs other than quoted prices included in Level 1 for similar instruments in active markets, quoted prices for identical or similar instruments in markets that are not active, and model-driven valuations in which all significant inputs and significant value drivers are observable in active markets; and

Level 3—Unobservable inputs to the valuation derived from fair valuation techniques in which one or more significant inputs or significant value drivers are unobservable.

On a recurring basis, the Company measures the fair value of certain of its assets and liabilities, which include cash equivalents, non-qualified deferred compensation plan assets, and foreign currency derivative contracts.

The Company's cash equivalents are classified within Level 1 or Level 2 because they are valued using quoted market prices in an active market or alternative independent pricing sources and models utilizing market observable inputs.

The Company's non-qualified deferred compensation plan assets consist of money market and mutual funds invested in domestic and international marketable securities that are directly observable in active markets and are therefore classified within Level 1.

The Company's foreign currency derivative contracts are classified within Level 2 because these contracts are not actively traded and the valuation inputs are based on quoted prices and market observable data of similar instruments.

The Company's borrowings under its credit and term loan facilities are classified within Level 2 because these borrowings are not actively traded and have a variable interest rate structure based upon market rates currently available to the Company for debt with similar terms and maturities. Refer to Note 5. Financial Assets and Liabilities.

Assets/Liabilities Measured at Fair Value on a Recurring Basis

Assets and liabilities measured at fair value on a recurring basis are summarized below as of October 31, 2018: