
**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 December 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 001-33554



PROS HOLDINGS, INC.

(Exact Name of Registrant as Specified in Its Charter)

Delaware
(State or Other Jurisdiction of
Incorporation or Organization)

76-0168604
(I.R.S. Employer
Identification No.)

3100 Main Street, Suite 900, Houston, Texas
(Address of Principal Executive Offices)

77002
(Zip code)

Registrant's telephone number, including area code: (713) 335-5151

Securities Registered Pursuant to Section 12(b) of the Act:

Title of Each Class
Common Stock, par value \$0.001 per share

Name of Each Exchange on Which Registered
New York Stock Exchange

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 Exchange 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 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 or a smaller reporting company. See definition of "large accelerated filer", "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act.:

Large accelerated Filer	<input checked="" type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated Filer	<input type="checkbox"/>	Smaller reporting company	<input type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

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

The aggregate market value of voting and non-voting common equity held by non-affiliates of the registrant was approximately \$842.5 million as of June 30, 2018 based upon the closing price for the registrant's of the common stock on the New York Stock Exchange. This determination of affiliate status was based on publicly filed documents and is not necessarily a conclusive determination for other purposes.

As of February 11, 2019 , there were outstanding 37,475,474 shares of common stock, par value \$0.001, of the registrant.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's Proxy Statement relating to its 2019 Annual Stockholders Meeting, to be filed within 120 days of the end of the fiscal year ended December 31, 2018 , are incorporated by reference into Part III of this Annual Report on Form 10-K.

PROS Holdings, Inc.
Annual Report on Form 10-K
Table of Contents
For the Year Ended December 31, 2018

Item	Description	Page
	<u>Part I</u>	
1	Business	2
1A.	Risk Factors	8
1B.	Unresolved Staff Comments	20
2	Properties	20
3	Legal Proceedings	20
4	Mine Safety Disclosure	20
	<u>Part II</u>	
5	Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities	21
6	Selected Financial Data	22
7	Management’s Discussion and Analysis of Financial Condition and Results of Operations	23
7A.	Quantitative and Qualitative Disclosures About Market Risk	39
8	Financial Statements and Supplementary Data	39
9	Changes in and Disagreements with Accountants on Accounting and Financial Disclosure	39
9A.	Controls and Procedures	39
9B.	Other Information	40
	<u>Part III</u>	
10	Directors, Executive Officers and Corporate Governance	41
11	Executive Compensation	41
12	Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters	41
13	Certain Relationships, Related Transactions and Director Independence	41
14	Principal Accountant Fees and Services	41
	<u>Part IV</u>	
15	Exhibits and Financial Statement Schedules	42
16	Form 10-K Summary	F-38

SIGNIFICANT RELATIONSHIPS REFERENCED IN THIS ANNUAL REPORT

The terms "PROS," "we," "us," and "our" refer to PROS Holdings, Inc., a Delaware corporation, and all of its subsidiaries that are consolidated in conformity with the generally accepted accounting principles in the United States of America ("GAAP").

CAUTIONARY STATEMENT REGARDING FORWARD LOOKING STATEMENTS

This Annual Report on Form 10-K contains "forward-looking statements" within the meaning of the Section 27A of the Securities Act of 1933, as amended (the "Securities Act"), and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). All statements in this report other than historical facts are forward-looking and are based on current estimates, assumptions, trends, and projections. Statements which include the words "believes," "seeks," "expects," "may," "should," "intends," "likely," "targets," "plans," "anticipates," "estimates," or the negative version of those words and similar expressions are intended to identify forward-looking statements. Numerous important factors, risks and uncertainties affect our operating results, including, without limitation, those contained in this report, and could cause our actual results to differ materially, from the results implied by these or any other forward-looking statements made by us or on our behalf. You should pay particular attention to the important risk factors and cautionary statements described in the section of this report entitled "Risk Factors". You should also carefully review the cautionary statements described in the other documents we file from time to time with the Securities and Exchange Commission ("SEC"), specifically all Quarterly Reports on Form 10-Q and Current Reports on Form 8-K.

You should not rely on forward-looking statements as predictions of future events, as we cannot guarantee that future results, levels of activity, performance or achievements will meet expectations. The forward-looking statements made herein are only made as of the date hereof, and we undertake no obligation to publicly update such forward-looking statements for any reason.

Part I

Item 1. *Business*

Overview

PROS provides artificial intelligence ("AI") solutions that power commerce in the digital economy by providing fast, frictionless and personalized buying experiences. PROS cloud solutions enable dynamic buying experiences for both business-to-business ("B2B") and business-to-consumer ("B2C") companies across industry verticals. Companies can use our dynamic pricing optimization, sales effectiveness, revenue management and commerce solutions to assess their market environments in real time to deliver customized prices and offers. Our solutions enable buyers to move fluidly across our customers' direct sales, online, mobile and partner channels with personalized experiences regardless of which channel buyers choose. Our decades of data science and AI expertise are infused into our solutions and are designed to reduce time and complexity through actionable intelligence. We provide standard configurations of our solutions based on the industries we serve and offer professional services to configure our solutions to meet the specific needs of each customer.

We deliver our cloud-based solutions through the internet as a service on a subscription basis. Our subscription services are designed to achieve high levels of security, scalability, performance and availability. We believe our cloud solutions allow our customers to reduce their initial investment in third-party software, hardware, and administration requirements over traditional enterprise software, and also allow smaller customers or business units to cost-effectively leverage our enterprise class infrastructure, infrastructure management, security and other strategic services. In addition, as we manage all updates and upgrades of software deployed on the PROS cloud on behalf of our customers, we are able to provide our customers with our latest product innovations in a more uniform way. Over time, we believe that this model will require us to support fewer old versions of our software solutions, which would allow our product development team to focus more effort on creating innovative enhancements to our existing products and developing new products.

Before 2015, we primarily offered on-premise license solutions, for which our customers purchased the perpetual right to use our software within a specific license scope. The vast majority of these license customers also purchased software maintenance and support, which includes unspecified software updates and enhancements on a when-and-if-available basis, maintenance releases, and patches released during the term of the support period.

Our Industry

Data-driven decision making is an important driver of business performance in the digital economy. Rapidly changing markets and buyer expectations make it increasingly harder for companies to grow. In response to these pressures, we believe that market forces, including increasingly dynamic and complex business models, the explosion of e-commerce, and the exponential

increase in the volume of enterprise and market data will accelerate the demand for software solutions that enable companies to dynamically price, configure and sell their products and services across all their channels with speed, precision and consistency. We believe the market for solutions that can power commerce using AI and machine learning is a large, growing market that spans most major industries.

Our Solutions

Our cloud-based software solutions provide companies with AI-based predictive and prescriptive guidance on key business decisions that drive growth and profitability, including product mix optimization, price forecasting, price optimization, product configuration recommendations, new sales opportunity recommendations, cross-sell recommendations and proactive attrition detection. These insights are derived from machine learning data science based on historic customer transactions, external market inputs and other data. Our B2B cloud solutions enable a consistent buyer experience across direct, partner and eCommerce channels to support digital selling, and consist of Control (including a Real-Time Pricing Engine), Guidance, Opportunity Detection and Smart CPQ. Our B2C solutions for the travel industry include Revenue Management, Real-Time Dynamic Pricing, Group Sales, Shopping and Merchandising. Our solutions help to increase visibility, business agility and customer engagement by aligning sales and pricing strategy across go-to-market channels. As a result, our solutions make it easier for companies to configure the correct product(s), set the right price and quickly get a quote into the hands of a buyer.

Solutions for Selling Improvement

PROS selling solutions accelerate sales team's performance by automating sales processes with a rich eCommerce experience and infusing AI and machine learning insights to provide the right products and configurations, at the right price to close the deal, consistently across every sales channel:

- *PROS Smart CPQ* automates the quoting process, enabling sales teams, partners and end customers on eCommerce platforms to provide fast, error-free quotes. Infused with AI and machine learning, Smart CPQ provides personalized product and pricing recommendations to deliver targeted offers designed to win competitive business.
- *PROS Opportunity Detection* increases sales productivity, accelerating quota attainment by uncovering sales opportunities in existing accounts for sales teams, and delivers data-driven product recommendations designed to increase average cart size for eCommerce sites. By applying AI and machine learning techniques to historical transactional activity, Opportunity Detection surfaces new opportunities to help proactively increase account penetration with existing customers while preventing customer churn.

Solutions for Pricing

PROS pricing solutions enable enterprises to optimize, personalize, and harmonize pricing across the complexity of their go-to-market channels in the context of dynamic market and competitive conditions. Our pricing solutions include:

- *PROS Control* provides a comprehensive pricing platform that offers a single source of accuracy for price measurement, coordination, and strategy. This platform allows businesses to harmonize pricing across go-to-market channels while simultaneously increasing price discipline and protecting price attainment. Pricing users leverage this solution to deploy formulaic price strategies that can incorporate real-time information or conditional data to ensure that every delivered price is up-to-date with the latest market and competitive conditions. With the performance, power, and scalability of PROS Control's Real-Time Pricing Engine, even B2C organizations can replace price lists across commerce channels with dynamic calculations for price requests, ensuring that every delivered price is cognizant of conditions at the time of request. This engine allows businesses facing volatile price competition to leverage data science to systematically adjust pricing in real time.
- *PROS Guidance* leverages AI to provide market-relevant price guidance across sales channels that is dynamically refined to adapt to changing market conditions and buyer behavior. This prescriptive price guidance provides optimized pricing for each unique buying scenario, which helps businesses recover margin leakage, accelerate quote turnaround times and increase win-rates. PROS Guidance also provides businesses transparency within their pricing model via insight into the market prices behind each price recommendation.

Airline Revenue Optimization

PROS airline revenue optimization solutions enable enterprises in the travel industry, including the airline, hotel and cruise industries, to drive revenue- and profit-maximizing business strategies through the application of advanced forecasting, optimization technologies and decision-support capabilities. These solutions are designed to empower companies to quickly adapt

to changing market conditions, differentiate customers by market and sales channel, monitor pricing and revenue management performance, and increase customer loyalty by providing the right products and services to the right customer at the right time. Our Airline Revenue Optimization suite of products includes:

- *PROS Airline Revenue Management* delivers algorithmic forecasting and network optimization for the travel industry. Companies leverage our demand management and forecasting capabilities to determine overbooking levels and manage fare values as pricing updates become available.
- *PROS Airline Real-Time Dynamic Pricing™* is a scalable solution that offers accurate availability across all channels, while keeping the rules, fares and other data in sync. The solution computes availability in real time and dynamically applies strategies to seat availability so that airlines can maximize revenue and enable offer optimization.
- *PROS Airline Group Sales* is a group revenue optimization solution powered by dynamic pricing science that enables companies to manage group bookings, contracts and policies in one location across users.

Airline eCommerce

Our Airline eCommerce solutions power airlines to become better retailers by increasing their control over how they sell and distribute offers. These solutions provide airlines with shopping and merchandising capabilities to design and distribute offers across individuals and groups. The solutions are powered by proprietary algorithms, compliant with industry pricing and distribution standards and entirely passenger service system-independent. Our Airline eCommerce suite of products includes:

- *PROS Airline Shopping* powers airlines' shopping, pricing and repricing by delivering fast, accurate and comprehensive flight offers to travelers across airlines' sales channels.
- *PROS Airline Merchandising* Increases airlines conversion and revenues per passenger by dynamically selling ancillary services, including extra baggage, legroom and other services. Airlines can upsell with personalized offers at any time in the customer journey using rich content across the airlines' sales channels.

Technology

Our high-performance software architecture supports real-time, high-volume transaction processing and enables us to handle the complex and demanding processing requirements of sophisticated global enterprises, including those who require sub-second response times for their customers. We provide the majority of our cloud services via cloud computing platform partners who offer Infrastructure-as-a-Service, including servers, storage, databases and networking, located in the U.S., Germany, United Kingdom, Australia and other countries. The use of cloud computing platform partners provides us flexibility to service customers at scale and also offer options to comply with in-country data privacy requirements. We also deliver our solutions from infrastructure designed and operated by us but secured within third-party data center facilities. We offer both single-tenant and multi-tenant cloud solutions.

Artificial Intelligence. Our robust machine learning and AI capabilities include forecasting, optimization, neural networks, segmentation and reinforcement learning and allow us to leverage our deep science and research expertise in our solutions. These capabilities are industry-independent and are validated using our proprietary verification and testing processes.

Configuration vs. Custom Coding. Our solutions can be configured to meet each customer's business needs through configuration rather than custom code. The configuration capabilities define both a business layer (including definition of user workflows, executive dashboards, analytics views, calculations, approval processes and alerts), as well as a data layer that permits configuration of data structures, including hierarchical dimensions, pricing levels and measures. We maintain our customers' configurations which allows them to use the latest version of our solutions.

Data Integration. The data needed to execute and power personalized digital buying typically resides in multiple sources, such as a company's enterprise resource planning ("ERP"), supply chain management ("SCM"), customer relationship management ("CRM"), reservations and inventory systems, external market data sources, spreadsheets and/or industry-specific transaction systems. Our data integration capabilities bring data from disparate sources together into a single cohesive database, both in real time and through scheduled batch tasks. We also provide certified content for integration with SAP as well as integration development services using industry standard tools.

Micro-services Architecture. A comprehensive web services interface is at the heart of our architecture. This interface enables extension onto other platforms and the creation of rich integrated solutions.

User Interface. Our technology provides a rich and modern, browser-based interface that supports both local and remote users. This interface supports a wide variety of interactive charts and other data views, and provides a comprehensive security model based on user role and scope of responsibility. We also offer capabilities for multiple mobile devices, tablets, CRM systems and client applications.

Subscription Services

Our subscription services provide customers access to our software via the Internet which, as compared to an on-premise software model, helps reduce their infrastructure, installation and ongoing administration requirements. We also reduce the total cost of ownership of our cloud services over the subscription term by delivering multiple feature releases per year that automatically introduce new features, while preserving previous customizations and integrations that minimize additional customer investment for compatibility. We also offer cloud-based services to allow existing customers who previously purchased licenses to our software to have access to that software within a cloud-based IT environment that we manage.

Sales and Marketing

We sell and market our software solutions primarily through our direct global sales force and indirectly through go-to-market partners, resellers and systems integrators. Our sales force is organized by our target markets, including automotive and industrial, B2B services, cargo, chemicals and energy, consumer goods, insurance, food and beverage, healthcare, high tech and travel. Our marketing activities consist of a variety of programs designed to generate sales leads, accelerate sales opportunities and build awareness of our solutions. We also use digital channels including search and content syndication to reach our target market. We host an annual customer conference, Outperform, where our customers and prospects are invited to learn about best practices from thought leaders, executives and other practitioners in using sales, pricing and revenue management to compete in the digital economy, hear about our latest innovations, and network with peers across industries. We also host other smaller conferences throughout the year, host informational web seminars and participate in and sponsor other industry and trade conferences and organizations.

Professional Services

We provide software-related professional services, including implementation and configuration services, consulting and training services. Our software solution implementations have a standardized and tested implementation process developed through years of experience implementing our software solutions in global enterprises across multiple industries. We also offer change management, process redesign, organizational design, opportunity assessment, performance management consulting, as well as an array of training on all aspects of our software solutions, from introductory on-demand mini-courses to multi-day hands-on deep technical classroom sessions. In addition to our own internal professional services team, we also work with many globally diverse partners who have been certified to implement our software.

Maintenance and Support

Customers maintaining implementations under on-premise licenses may purchase, at their discretion, maintenance and support services. Maintenance enrollment entitles a customer to solicit support through a web-based interface to submit and track issues, access our online knowledge base, and receive unspecified upgrades, maintenance releases and bug fixes during the term of the support period on a when-and-if-available basis. We invest significant resources in providing these services.

Revenue from maintenance and support services has declined as a percentage of our total revenue since we announced our cloud strategy as customers have purchased fewer on-premise licenses to our software. We expect our maintenance revenue to continue to decrease further as more existing customers migrate to our cloud solutions. Revenue from maintenance and support services comprised 33% , 41% , and 45% of our total revenue in 2018 , 2017 and 2016 , respectively.

Customers

We sell our software solutions to customers across many industries, including automotive and industrial, B2B services, cargo, chemicals and energy, consumer goods, insurance, food and beverage, healthcare, high tech and travel. Our customers are generally large global enterprises and medium-sized businesses, although we also have customers that are smaller in scope of operations. In each of 2018 , 2017 and 2016 , we had no single customer that accounted for 10% or more of our revenue. Our customers are also geographically diverse, as approximately 65% , 63% , and 63% of our total revenue came from customers outside the U.S. for the years ended December 31, 2018 , 2017 and 2016 , respectively.

We provide our customers with several service options including a customer success management team to help our customers accelerate the value of their investments in our solutions; a professional services ecosystem of both our professional service teams and certified third party system integrators; 24x7 support; and an online community to facilitate collaboration among our customers and our product development teams.

Competition

The markets for our products and services are competitive, fragmented and rapidly evolving. For example, we have seen consolidation in the quoting software market with large vendors acquiring smaller quoting companies as they attempt to provide end-to-end solutions to drive sales and profit. Today, we are increasingly competing in a sales ecosystem with competitors that all aim to drive effectiveness and efficiency in selling, although we believe we are unmatched in our ability to deliver sales and pricing AI with speed and precision. We face collective competition from a number of larger and smaller companies, including vendors that provide software for specific industries, vendors that compete against a portion of our pricing solutions, vendors that compete against our selling improvement solutions, and vendors that compete against a portion of our revenue management and shopping and merchandising solutions in the airline industry. To a lesser extent, we compete against large enterprise application providers that have developed offerings that include competing functionality and custom solutions developed internally by businesses, which generally include some combination of spreadsheets, manual processes, external consultants, and internally-developed software tools.

The number of companies that we compete with has increased in recent years as we expanded into adjacent technologies. We believe our customers consider the following factors when evaluating our solutions versus competitive solutions:

- product architecture, functionality, performance, reliability and scalability;
- strength of AI embedded in offerings;
- real-time capabilities;
- customer base and references;
- return on investment, total cost of ownership, and time-to-value;
- breadth and depth of product and service offerings;
- depth of expertise in data and pricing science;
- industry domain expertise;
- services and customer support quality;
- size and quality of partner ecosystem;
- existing customer relationships; and
- vendor viability.

We believe that none of our competitors can provide all of the functionality needed to support an organization interested in optimizing sales growth through AI-based omnichannel pricing, selling improvement and revenue management. Our competitors generally compete on price or by bundling their applications with other enterprise applications, and we expect that this will continue in the future. We distinguish ourselves from these vendors through our long history of providing software solutions incorporating AI, data science, and/or machine learning, the breadth and depth of the functionality we offer, the robust integration and configuration capabilities of our solutions, our ability to handle large data volumes at scale, and our proven ability to provide high-value dynamic science-based optimization software to our global customer base across industries. In the future, we believe our competition will continue to increase as more companies move into our market segment and as we expand into adjacent market segments.

Intellectual Property

Our success and ability to compete is dependent in part on our ability to develop and maintain the proprietary aspects of our technology and operate without infringing upon the proprietary rights of others. We protect our intellectual property with a combination of trade secrets, confidentiality procedures, contractual provisions, patents, trademarks, copyrights and other similar measures. We believe that reliance upon trade secrets and unpatented proprietary know-how are generally the most advantageous methods for us to protect our proprietary information.

Research and Development

We believe our software innovation is the foundation of our business and accordingly have made, and continue to make, significant investments in research and development for the enhancement of existing products and services and the development of new products and services. We also believe that our long-term investments in AI and machine learning of pricing and revenue management differentiate us from our competitors. We are committed to continuing the further development of these high-value solutions as evidenced by our continued investment in research and development. In fiscal 2018, 2017 and 2016, we incurred expenses of \$55.7 million, \$56.0 million and \$52.8 million, respectively, in research and development, net of capitalized internal-use software cost, to enhance our existing portfolio of solutions and to develop new solutions. Our research and development expenses include costs associated with our product management, product development and science and research groups. We conduct research and development activities predominantly in Bulgaria, France and the U.S., and also utilize third-party contractors in Bolivia, Colombia and India.

We employ data scientists, most of whom are Ph.D.'s, to advance sales, pricing, and revenue management technology and its implementation in our software solutions. These scientists have specialties including, but not limited to, AI, machine learning, operations research, management science, statistics, econometrics and computational methods. Our data scientists regularly interact with our customers, product development, sales, marketing and professional services staff to help keep our science efforts relevant to real-world demands.

Employees

As of December 31, 2018, we had 1,145 full-time personnel, which included 1,011 employees and 134 outsourced personnel. We have not experienced any work stoppages and consider our employee relations to be good.

Corporate Information

We were incorporated in Texas in 1985. We reincorporated as a Delaware corporation in 1998. In 2002, we reorganized as a holding company in Delaware. Our principal executive offices are located at 3100 Main Street, Suite 900, Houston, Texas 77002. We report as one operating segment with our Chief Executive Officer acting as our chief operating decision maker. Our telephone number is (713) 335-5151. Our website is www.pros.com. Our website and the information that can be accessed through our website are not part of this report.

Available Information

We make available, free of charge through our website, our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, including exhibits thereto, and any amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act, as soon as reasonably practicable after the reports are electronically filed with or furnished to the SEC. Our reports that are filed with, or furnished to, the SEC are also available at the SEC's website at www.sec.gov.

Annual CEO Certification

Pursuant to Section 303A.12(a) of the New York Stock Exchange ("NYSE") Listed Company Manual, on May 29, 2018, we submitted to the NYSE an annual certification signed by our Chief Executive Officer certifying that he was not aware of any violation by us of NYSE corporate governance listing standards.

Item 1A. Risk Factors

We operate in a dynamic environment that involves numerous risks and uncertainties. The following section describes some of the risks that may adversely affect our business, financial condition or results of operations, and the trading price of our common stock; these risks are not necessarily listed in terms of their importance or level of risk.

Risks relating to our business and industry

If our security measures are breached and unauthorized access is obtained to a customer's data, our data or our IT systems, our solutions may be perceived as not being secure, customers may limit or stop using our solutions and we may incur significant legal and financial exposure and liabilities.

Our solutions involve the storage, and to a more limited extent, the transmission of our customers' proprietary information, including personal and other sensitive data. We have and expect to continue to incur significant costs to maintain security measures designed to prevent, eliminate or alleviate security vulnerabilities, data theft, computer viruses, malicious software programs, attacks by third parties or similar disruptive problems (each a "Security Incident"), and obtain third-party security attestations regarding those security measures. Despite the implementation of these security measures and third-party security attestations, our systems may still be vulnerable to a Security Incident that could result in someone obtaining unauthorized access to our IT systems, customers' data or our data, including our intellectual property and other confidential business information. Because the techniques used to compromise systems change frequently and may not be recognized until launched, we may be unable to anticipate these techniques or to implement adequate preventative measures. We cannot predict the extent, frequency or impact of these problems on us. Any Security Incident could result in interruptions, delays, cessation of service and loss of existing or potential customers, as well as loss of confidence in the security of our solutions and services, damage to our reputation, negative impact to our future sales, disruption of our business, increases to our information security costs, and could lead to indemnity obligations, legal liability and other costs.

We depend on third-party data centers and other unrelated service providers and any disruption in these operations could impair the delivery of our service and negatively affect our business.

Our cloud products are dependent upon third-party hardware, software and cloud hosting vendors, including Microsoft Azure and IBM Softlayer, all of which must inter-operate for end users to achieve their computing goals. We utilize third-party data center hosting facilities, cloud platform providers, and other service providers to host and deliver our subscription services as well as for our own business operations. We host our cloud products from data centers in a variety of countries, including the United States, Germany and Australia. While we control and generally have exclusive access to our servers and all of the components of our network that are located in our external data centers, we do not control the operation of these facilities and they are vulnerable to damage or interruption from earthquakes, floods, fires, power loss, telecommunications failures and similar events. They may also be subject to Security Incidents, break-ins, sabotage, intentional acts of vandalism and similar misconduct. Despite our failover capabilities, standard protocols and other precautions taken at these facilities, the occurrence of a natural disaster or an act of terrorism, a decision to close the facilities without adequate notice or other unanticipated problems at these facilities could result in lengthy interruptions in our service.

In addition, these providers have no obligation to renew their agreements with us on commercially reasonable terms, or at all. If we are unable to renew these agreements on commercially reasonable terms, or if one of our data center operators is acquired, we may be required to transfer our servers and other infrastructure to new data center facilities, and we may incur significant costs and possible service interruption in connection with doing so. Any interruptions or delays in these hosted services, or security or privacy breaches, could damage our reputation, negatively impact our future sales, disrupt our business, and lead to legal liability and other costs.

Furthermore, certain of our applications are essential to our customers' ability to price, quote and/or sell their products and services. Any interruption in our service may affect the availability, accuracy or timeliness of pricing or other information and as a result could require us to issue service credits to our customers, could damage our reputation, cause our customers to terminate their use of our solutions, require us to indemnify our customers against certain losses, and could prevent us from gaining additional business from current or future customers.

Evolving data privacy, cyber security and data localization laws and regulations could adversely impact our business and expose us to increased liability.

We provide our cloud software solutions globally, including in countries that have stringent laws and regulations relating to data privacy, cyber security and data localization. These laws and regulations may be inconsistent across jurisdictions, and may

be subject to interpretation, particularly in the EU, where the General Data Protection Regulation ("GDPR") imposes substantial requirements regarding the handling of personal data. The GDPR, as well as other data privacy, cyber security and data localization laws and regulations, has changed in recent years and is likely to continue to evolve in the future. Although we have implemented measures designed to comply with the laws and regulations applicable to our business, our ongoing efforts to comply with the GDPR and other changes in laws and regulations (such as the California Consumer Privacy Act that will take effect January 2020) may entail substantial expenses and divert resources from other initiatives. These changes have in the past increased, and may continue to increase, our cost of providing our products and services, could limit us from offering certain solutions in certain jurisdictions, could adversely affect our sales cycles, and could impact our new technology innovation. In addition, our cloud software solutions store data on behalf of our customers, and if our customers fail to comply with contractual obligations or applicable laws and regulations, it could result in litigation or reputational harm to us. Any perceived inability to adequately address privacy, data localization or cyber security compliance or to comply with more complex and numerous laws and regulations, even if unfounded, could result in liability to us, damage our reputation, inhibit sales of our solutions and harm our business, financial condition and results of operations.

If we fail to manage our cloud operations, we may be subject to liabilities and our reputation and operating results may be adversely affected.

Since we shifted to a cloud strategy in 2015, we have experienced substantial growth in the number of customers and data volumes serviced by our cloud infrastructure. While we have designed our cloud infrastructure to meet the current and anticipated future performance and accessibility needs of our customers, we must manage our cloud operations in order to handle changes in hardware and software parameters, spikes in customer usage and new versions of our software. We have experienced, and may in the future experience, system disruptions, outages and other cloud infrastructure performance problems. These problems may be caused by a variety of factors, including infrastructure changes, human or software errors, viruses, security attacks (internal or external), fraud, spikes in customer usage and denial of service issues. In some instances, we may not be able to identify the cause or causes of these performance problems within an acceptable period of time. Our customer agreements typically provide service level commitments on a monthly basis and for certain of our products we also offer response time commitments on a monthly basis. If we are unable to meet the stated service level or response time commitments, or if we suffer extended periods of unavailability for our solutions, we may be contractually obligated to issue service credits or refunds to customers for prepaid and unused subscription services, or customers may choose to terminate contracts. Any extended service outages or other performance problems could also result in damage to our reputation or our customers' businesses, cause our customers to elect not renew or to delay or withhold payment to us, loss of future sales, or lead to customers making other claims against us that could harm our subscription revenues, result in an increase in our provision for doubtful accounts, increase collection cycles for our accounts receivable or lead to the expense and risk of litigation.

We have experienced losses since we transitioned to a cloud strategy in 2015, and may continue to incur losses for longer than we expect.

We expect our expenses to continue to exceed our revenues in the near term as we continue to make investments as part of our cloud strategy, particularly in new product development, sales, marketing, security, privacy and cloud operations. Our ability to return to profitability depends on our ability to: continue to drive subscription sales, enhance our existing products and develop new products, scale our sales and marketing and product development organizations, successfully execute our marketing and sales strategies, renew our subscription agreements with existing customers, and manage our expenses. If we are not able to execute on these actions, our business may not grow as we anticipate, our operating results could be adversely affected and we may continue to incur net losses in the future. Additionally, operating margins on our cloud-only products have been and may continue to be lower than those we have achieved on our more mature products, and our new initiatives may not generate sufficient revenue and cash flows to recoup our investments in them. If any of these events were to occur, it could adversely affect our business, results of operations and financial condition.

Failure to sustain our historical renewal rates and pricing would adversely affect our future revenue and operating results.

Our subscription agreements are typically for an initial term of three years, and maintenance and support agreements are typically for an initial term of two years. Our customers have no obligation to renew their software subscriptions after the expiration of their initial term, and some customers elect not to renew. Historically, maintenance and support revenue has represented a significant portion of our total revenue, including approximately 33% , 41% and 45% of our total revenue for the years ended December 31, 2018 , 2017 and 2016 , respectively. Subscription revenue has represented an increasingly significant portion of our total revenue, including approximately 48% , 36% and 25% of our total revenue for the years ended December 31, 2018 , 2017 and 2016 , respectively.

We may not accurately predict future customer renewal rates, which may decline or fluctuate as a result of a number of factors, including their level of satisfaction with our services, our ability to continue to regularly add functionality, the reliability (including uptime) of our subscription services, the prices of our services, the actual or perceived information security of our systems and services, mergers and acquisitions of our customers, reductions in our customers' spending levels, or declines in customer activity as a result of economic downturns or uncertainty in financial markets. If our customers choose not to renew their subscription, maintenance and support agreements with us on favorable terms or at all, our business, operating results and financial condition could be harmed.

If we fail to migrate customers with on-premise software licenses to our latest cloud software solutions, our future revenue may be limited and our costs to provide support to those customers may increase.

Customers with on-premise licenses for our legacy software may need to migrate to our current cloud solutions to take advantage of our latest features and functionality which are only available via PROS cloud. Although we intend to continue to support our legacy on-premise software customers under perpetual licenses for the foreseeable future, we are focused on migrating such customers to our cloud solutions in 2019 and beyond. Customers who purchased on-premise licenses for our solutions may have invested substantial personnel and financial resources in our legacy software. Therefore, if our migration efforts are not successful, and those legacy customers delay or decline to migrate to our cloud solutions, our internal development and customer support teams could find it increasingly difficult and costly to support both our legacy on-premise software installed by customers and our current cloud solutions. In addition, if our legacy on-premise license customers fail to migrate or delay migration to our cloud solutions, our future revenue may be limited.

Our quarterly results may vary and may not fully reflect the performance of our business.

We generally recognize revenue from customers ratably over the terms of their subscription agreements. As a result, most of the revenue we report in each quarter is the result of agreements entered into during prior quarters. Consequently, a decline in new or renewed subscriptions in any quarter may not be reflected in our revenue for that quarter. However, any such decline will negatively affect our revenue in future quarters. Accordingly, the effect of significant downturns in sales, our failure to achieve our internal sales targets, a decline in the market acceptance of our services or potential decreases in our retention rate may not be fully reflected in our operating results until future periods. Our subscription model also makes it difficult for us to rapidly increase our revenue through additional sales in any period, as revenue from additional sales must be recognized over the applicable subscription term. In addition, we may experience seasonal variations in our cash flows from operating activities, including as a result of the timing of payment of payroll taxes, performance bonuses to our employees and costs associated with annual company-wide events, each of which have historically been highest in our first fiscal quarter. Therefore, the results of any prior quarterly periods should not be relied upon as an indication of our future operating performance.

We are a multinational corporation, which subjects us to increased risks that may adversely affect our operating results.

The majority of our revenues are derived from our customers outside the U.S. For the years ended December 31, 2018, 2017 and 2016, approximately 65%, 63% and 63% of our total revenue, respectively, was derived from outside the U.S. To date, the majority of our sales have been denominated in U.S. dollars, although the majority of our expenses that we incur in our international operations are denominated in local currencies. To date, we have not used risk management techniques or "hedged" the risks associated with fluctuations in foreign currency exchange rates. Consequently, our results of operations and financial condition, including our revenue and operating margins, are subject to losses from fluctuations in foreign currency exchange rates, as well as regulatory, political, social and economic developments or instability in the foreign jurisdictions in which we operate. *For additional financial information about geographic areas, see Note 18 of the Notes to the Consolidated Financial Statements.*

Our operations outside the U.S. are subject to risks inherent in doing business internationally, requiring resources and management attention, and may subject us to new or larger levels of regulatory, economic, foreign currency exchange, tax and political risks. We have customers in over 55 countries internationally, which we service through our operations (via wholly-owned subsidiaries) in the U.S., Australia, Bulgaria, Canada, France, Germany, Ireland, United Arab Emirates and United Kingdom. We expect our international operations to continue to grow. Among the risks we believe are most likely to affect us with respect to our international sales and operations are:

- economic conditions in various parts of the world;
- differing labor and employment regulations, especially in the EU, where labor laws are generally more advantageous to employees as compared to the U.S., including hourly wage and overtime regulations and employee termination restrictions or related costs;

- the difficulty of managing and staffing our international operations and the increased travel, infrastructure and legal compliance costs associated with multiple international locations;
- different and more stringent data protection, privacy and other laws, including data localization requirements;
- unexpected changes in regulatory requirements;
- less favorable intellectual property laws;
- new and different sources of competition;
- costs of compliance and penalties for noncompliance with foreign laws and laws applicable to companies doing business in foreign jurisdictions;
- multiple, conflicting and changing tax laws and regulations that may affect both our international and domestic tax liabilities and result in increased complexity and costs;
- availability of broadband and network connectivity required for certain of our products;
- difficulties in enforcing contracts and collecting accounts receivable, especially in developing countries; and
- tariffs and trade barriers, import and export controls and other regulatory or contractual limitations on our ability to sell or develop our solutions in certain foreign markets.

If we continue to expand our business globally, our success will depend, in large part, on our ability to anticipate and effectively manage these and other risks associated with our international operations. Our failure to manage any of these risks successfully could harm our international operations and reduce our international sales, adversely affecting our business, operating results and financial condition.

As we expand our software product portfolio, we could face increased competition as part of entering new markets.

The market for our products is competitive, and we expect competition to continue to increase in the future as we expand our product portfolio and features. We may not compete successfully against future potential competitors, especially those with significantly greater financial resources or brand name recognition. For example, we compete with sales enablement, configure-price-quote, revenue management, and airline shopping and merchandising software. Large companies in these spaces may have advantages over us because of their greater brand name recognition, larger customer bases, broader product portfolios, larger distribution channels, or greater financial, technical and marketing resources. As a result, they may be able to adapt more quickly to new or emerging technologies and changes in customer requirements.

If our new products and product enhancements do not achieve sufficient market acceptance, our results of operations and competitive position could suffer.

We spend substantial amounts of time and money to enhance our existing products, as well as to research and develop new products. We introduce new products and incorporate additional features, improve functionality or add other enhancements to our existing products in order to meet our customers' demands. Our new products or enhancements could fail to attain sufficient market acceptance for many reasons, including delays in introducing new, enhanced or modified products; defects, errors or failures in any of our products; and disruptions or delays in the availability and delivery of our products. If our new products or enhancements do not achieve adequate acceptance in the market, our competitive position could be impaired, our revenue could be diminished and the effect on our operating results may be particularly acute because of the significant research and development, marketing, sales and other expenses we incurred in connection with the new product.

We focus primarily on selling improvement, pricing and revenue management software, and if the markets for this software develop more slowly than we expect, our business could be harmed.

We derive most of our revenue from providing our solutions for selling improvement, pricing and revenue management, implementation services and ongoing customer support. The selling improvement and pricing market is evolving rapidly, and it is uncertain whether this software will achieve and sustain high levels of demand and market acceptance. Our success depends on the willingness of businesses in our target markets to use selling improvement and pricing software. Some businesses may be reluctant or unwilling to implement such software for a number of reasons, including failure to understand the potential returns of improving their processes and lack of knowledge about the potential benefits that such software may provide. Some businesses may elect to improve their pricing processes through solutions obtained from their existing enterprise software providers, whose solutions are designed principally to address functional areas other than pricing. If businesses do not embrace the benefits of selling

improvement and pricing software, the market for such software may not continue to develop or may develop more slowly than we expect, either of which would significantly and adversely affect our revenue and operating results.

We have historically been subject to lengthy sales cycles, and delays or failures to complete sales may harm our business and cause our revenue and operating income to decline in the future.

While our sales cycle times have improved relative to our prior historical averages since we shifted to a cloud strategy in 2015, our sales cycles may take several months to over a year for larger enterprise customers. A large enterprise customer's decision to use our solutions typically involves a number of internal approvals, and sales to those prospective customers generally require us to provide greater levels of education about the benefits of our solutions. We expend substantial resources during our sales cycles with no assurance that a sale may ultimately result. The length of each individual sales cycle depends on many factors, a number of which we cannot control, including the prospective customer's internal evaluation and approval process requirements, as well as the prospective customer's budget and/or resource constraints. Any unexpected lengthening of the sales cycle or failure to secure anticipated orders could negatively affect our revenue. Any significant failure to generate sales after incurring costs related to our sales process could also have a material adverse effect on our business, financial condition and results of operations.

We might not generate increased business from our customers, which could limit our revenue in the future.

We sell our software solutions to both new customers and existing customers. Many of our existing customers initially purchase our software solutions for a specific business segment or a specific geographic location within their organization and later purchase additional software solutions for the same or other business segments and geographic locations within their organization. These customers might not choose to make additional purchases of our software solutions or to expand their existing software solutions to other business segments. In addition, as we deploy new applications and features for our cloud software solutions or introduce new cloud software solutions, our current customers could choose not to purchase these new offerings. If we fail to generate additional business from our existing customers, our revenue could grow at a slower rate or even decrease.

The markets in which we participate are intensely competitive, and if we do not compete effectively, our operating results could be harmed.

The markets for enterprise software applications for selling improvement, pricing, and revenue management are competitive, fragmented and rapidly evolving. We expect additional competition from other established and emerging companies to the extent the markets in which we compete continue to develop and expand, as well as through industry consolidation, including through a merger or partnership of two or more of our competitors or the acquisition of a competitor by a larger company. Some of our current and potential competitors may have larger installed bases of users, longer operating histories, broader distribution and greater name recognition than we have. In addition, many of these companies have significantly greater resources than we have. As a result, these companies may be able to respond more quickly to new or emerging technologies and changes in customer demands, and devote greater resources to the development, promotion and sale of their products.

Competition could seriously impede our ability to sell our software solutions and services on terms favorable to us. Our current and potential competitors may develop and market new technologies that render our existing or future solutions obsolete, unmarketable or less competitive. In addition, if these competitors develop solutions with similar or superior functionality to our solutions, or if they offer solutions with similar functionality at a substantially lower price than our solutions, we may need to decrease the prices for our solutions in order to remain competitive. If we are unable to maintain our current pricing due to competitive pressures, our margins could be reduced and our operating results could be adversely affected. If we do not compete successfully against current or future competitors, competitive pressures could materially and adversely affect our business, financial condition and operating results.

Any unauthorized, and potentially improper, actions of our personnel could adversely affect our business, operating results and financial condition.

The recognition of our revenue depends on, among other things, the terms negotiated in our contracts with our customers. Our personnel may act outside of their authority and negotiate additional terms without our knowledge. We have implemented policies to help prevent and discourage such conduct, but there can be no assurance that such policies would be followed. For instance, in the event that our sales personnel negotiate terms that do not appear in the contract and of which we are unaware, whether such additional terms are written or verbal, we could be prevented from recognizing revenue in accordance with our plans. Furthermore, depending on when we learn of unauthorized actions and the size of the transactions involved, we may have to restate revenue for a previously reported period, which could seriously harm our business, operating results and financial condition.

We may enter into acquisitions that may be difficult to integrate, fail to achieve our strategic objectives, disrupt our business, dilute stockholder value or divert management attention.

We have completed three acquisitions since 2013 and in the future we may continue to acquire other businesses, technologies and products that we intend to complement our existing business, solutions, services and technologies. We cannot provide assurance that the acquisitions we have made or may make in the future will provide us with the benefits or achieve the results we anticipated when entering into the transaction(s). Acquisitions are typically accompanied by a number of risks, including:

- difficulties in integrating the operations and personnel of the acquired companies;
- difficulties in maintaining acceptable standards, controls, procedures and policies, including integrating financial reporting and operating systems, particularly with respect to foreign and/or public subsidiaries;
- disruption of ongoing business and distraction of management;
- inability to maintain relationships with customers of the acquired business;
- impairment of relationships with employees and customers as a result of any integration of new management and other personnel;
- difficulties in incorporating acquired technology and rights into our solutions and services;
- unexpected expenses resulting from the acquisition; and
- potential unknown liabilities associated with the acquisition.

In addition, we may incur debt, acquisition-related costs and expenses, restructuring charges and write-offs as a result of acquisitions. Acquisitions may also result in goodwill and other intangible assets that are subject to impairment tests, which could result in future impairment charges.

We may enter into negotiations for acquisitions that are not ultimately consummated. Those negotiations could result in diversion of management time and significant out-of-pocket costs. If we fail to evaluate and execute acquisitions successfully, we may not be able to achieve our anticipated level of growth and our business and operating results could be adversely affected.

If our goodwill or amortizable intangible assets become impaired, then we could be required to record a significant charge to earnings.

Under GAAP, we review our goodwill and amortizable intangible assets for impairment when events or changes in circumstances indicate the carrying value may not be recoverable. GAAP requires us to test for goodwill impairment at least annually. Factors that may be considered a change in circumstances indicating that the carrying value of our goodwill or amortizable intangible assets may not be recoverable include declines in stock price, market capitalization or cash flows and slower growth rates in our industry. We could be required to record a significant charge to earnings in our financial statements during the period in which any impairment of our goodwill or amortizable intangible assets were determined, negatively impacting our results of operations.

Any downturn in sales to our target markets could adversely affect our operating results.

Our success is highly dependent upon our ability to sell our software solutions to customers in our target industries, including automotive and industrial, B2B services, cargo, chemicals and energy, consumer goods, insurance, food and beverage, healthcare, high tech and travel. If we are unable to sell our software solutions effectively to customers in these industries, we may not be able to grow our business. It is uncertain whether our software solutions may achieve and sustain the levels of demand and market acceptance that we anticipate. Such uncertainty is attributable to, among other factors, the following:

- it may be more difficult than we currently anticipate to implement our software solutions in certain sub-verticals within our target industries;
- it may be more difficult than we currently anticipate to increase our customer base in our target industries; and
- our experience implementing our software solutions in certain sub-verticals may be limited within our target industries.

Our revenue growth has historically been derived from customers in many major industries. Our revenue growth is highly dependent upon continued growth of market acceptance in these industries, and there can be no assurance our solutions may

achieve or sustain widespread acceptance among customers in these industries. Failure to expand market acceptance of our solutions or maintain sales in these industries could adversely affect our operating results and financial condition.

Certain of our software solutions require implementation projects that are subject to significant risks and delays, which if any occurred could negatively impact the effectiveness of our software, resulting in harm to our reputation, business and financial performance.

The implementation of certain of our software solutions by our large enterprise customers across their entire business may involve complex, large-scale projects that require substantial support operations, significant resources and reliance on factors that are beyond our control. For example, the success of our implementation projects is dependent upon the quality of data used by our software solutions, and the commitment of customers' resources and personnel to the projects. We may not be able to correct or compensate for weaknesses or problems in data, or any lack of our customers' commitment and investment in personnel and resources. If we are unable to successfully manage the implementation of our software solutions, and as a result those products do not meet customer needs or expectations, we may become involved in disputes with our customers and our business reputation and financial performance may be significantly harmed. If an implementation project for a large customer or a number of customers is substantially delayed or canceled, our ability to recognize the associated revenue and our operating results could be adversely affected.

If our executives and other key personnel are unable to effectively manage our business, or if we fail to attract additional qualified sales, marketing, professional services, product development and other personnel, our revenue and operating results could be adversely affected.

Our future success depends upon the performance and service of our executive officers and other key sales, marketing, development, science and professional services staff. The failure of our executives and key personnel to effectively manage our business or the loss of the services of our executive officers and other key personnel would harm our operations. In addition, our future success could depend in large part on our ability to attract and retain a sufficient number of highly qualified sales, marketing, professional services, product development and other personnel, and there can be no assurance that we may be able to do so. We have continued to add a significant number of new personnel to support our continued growth, and their ability to learn our business and manage it effectively could be important to our continued growth and expansion. In addition, given the highly sophisticated data science included in our solutions, the pool of data scientists and software developers qualified to work on our solutions is limited. The implementation of certain of our software solutions requires highly-qualified personnel, and hiring and retaining such personnel to support our growth may be challenging. Competition for such qualified personnel is intense, and we compete for these individuals with other companies that have greater financial, technical, marketing, service and other resources than we do. If our key personnel are unable to effectively manage our business, or if we fail to attract additional qualified personnel, our operating results could be adversely affected.

If we cannot maintain our corporate culture, we could lose the innovation, teamwork and passion that we believe contribute to our success, and our business may be harmed.

If we cannot maintain our corporate culture, we could lose the innovation, teamwork and passion that we believe contribute to our success, and our business may be harmed. We invest substantial time and resources in building and maintaining our culture. Any failure to preserve our culture could negatively affect our future success, including our ability to retain and recruit personnel and to effectively pursue our strategic objectives.

We incurred indebtedness by issuing the 2019 and 2047 convertible notes, and our debt repayment obligations may adversely affect our financial condition and cash flows from operations in the future.

In June 2017, we issued \$106.3 million principal amount of 2.0% convertible senior notes ("2047 Notes") due June 1, 2047, unless earlier redeemed, purchased or converted in accordance with their terms prior to such date. Each holder of the 2047 Notes has the right to require us to repurchase for cash, such holder's 2047 Notes on June 1, 2022 on the terms set forth in the note indenture. Interest is payable semi-annually in arrears on June 1 and December 1 of each year. In December 2014, we issued \$143.8 million principal amount of 2.0% convertible senior notes ("2019 Notes" and collectively with the 2047 Notes, the "Notes") due December 1, 2019, unless earlier purchased or converted. Interest is payable semi-annually in arrears on June 1 and December 1 of each year.

Our indebtedness could have important consequences because it may impair our ability to obtain additional financing in the future for working capital, capital expenditures, acquisitions and general corporate or other purposes, and a portion of our cash flows from operations may have to be dedicated to repaying the principal beginning in 2019. Our ability to meet our debt obligations will depend on our future performance, which will be affected by financial, business, economic, regulatory and other factors. We

cannot control many of these factors. Our future operations may not generate sufficient cash to enable us to repay our debt. If we fail to make a payment on our debt, we could be in default on such debt. If we are at any time unable to pay our indebtedness when due, we may be required to renegotiate the terms of the indebtedness, seek to refinance all or a portion of the indebtedness or obtain additional financing. There can be no assurance that, in the future, we will be able to successfully renegotiate such terms, that any such refinancing would be possible or that any additional financing could be obtained on terms that are favorable or acceptable to us.

Changes in accounting principles or standards, or in the way they are applied, could result in unfavorable accounting charges or effects and unexpected financial reporting fluctuations, and could adversely affect our reported operating results.

We prepare our consolidated financial statements in conformity with GAAP. These principles are subject to interpretation by the SEC and various bodies formed to interpret and create appropriate accounting principles and guidance. A change in existing principles, standards or guidance, in particular those related to revenue recognition, can have a significant effect on our reported results, may retroactively affect previously reported results, could cause unexpected financial reporting fluctuations, and may require us to make costly changes to our operational processes and accounting systems.

The Financial Accounting Standards Board ("FASB") is currently working with the International Accounting Standards Board ("IASB") to converge certain accounting principles and to facilitate more comparable financial reporting between companies that are required to follow GAAP and those that are required to follow International Financial Reporting Standards ("IFRS"). These projects may result in different accounting principles under GAAP, which may have a material impact on the way in which we report financial results in areas including, but not limited to, principles for recognizing revenue, lease accounting, and financial statement presentation.

In addition, the SEC may make a determination in the future regarding the incorporation of IFRS into the financial reporting system for U.S. companies. Changes in accounting principles from GAAP to IFRS, or to converged accounting principles, may have a material impact on our financial statements and may retroactively affect the accounting treatment of previously reported transactions.

If we fail to develop or acquire new functionality to enhance our existing software solutions, we may not be able to grow our business and it could be harmed.

The markets in which we compete are characterized by:

- rapid technological developments;
- newly emerging and changing customer requirements; and
- frequent solution introductions, updates and functional enhancements.

We must introduce enhancements to our existing software solutions in order to meet our business plan, maintain or improve our competitive position, keep pace with technological developments, satisfy increasing customer requirements and increase awareness of software for sales, pricing, configure-price-quote, revenue management, shopping and merchandising generally and of our modern commerce software solutions in particular. Any new functionality we develop may not be introduced in a timely manner and may not achieve market acceptance sufficient to generate material revenue. Furthermore, certain of our competitors could be heavily investing in research and development, and may develop and market new solutions that may compete with, and may reduce the demand for, our software solutions. We cannot provide assurance that we could be successful in developing or otherwise acquiring, marketing and selling new functionality, or delivering updates and upgrades that meet changing industry standards and customer demands. In addition, we may experience difficulties that could delay or prevent the successful development, marketing and selling of such functionality. If we are unable to develop or acquire new functionality, enhance our existing software solutions or adapt to changing industry requirements to meet market demand, we may not be able to grow our business and our revenue and operating results would be adversely affected.

In addition, because our software solutions are intended to operate on a variety of technology platforms, we must continue to modify and enhance our software solutions to keep pace with changes in these platforms, as well as develop and maintain relationships with platform providers. Any inability of our software solutions to operate effectively with existing or future platforms, or our inability to develop or maintain relationships with significant platform providers, could reduce the demand for our software solutions, result in customer dissatisfaction and limit our revenue.

Defects or errors in our software solutions could harm our reputation, impair our ability to sell our solutions and result in significant costs to us.

Our software solutions are complex and may contain undetected defects or errors. Several of our solutions have recently been developed and may therefore be more likely to contain undetected defects or errors. In addition, we frequently develop enhancements to our software solutions that may contain defects. We have not suffered significant harm from any defects or errors to date. We have in the past issued, and may in the future need to issue, corrective releases of our solutions to correct defects or errors, but we may not be able to detect and correct any such defects or errors before the final implementation of our software solutions. The occurrence of any defects or errors could result in:

- delayed market acceptance and lost sales of our software solutions;
- delays in payment to us by customers;
- damage to our reputation;
- diversion of our resources;
- legal claims, including product liability claims, against us;
- increased maintenance and support expenses; and
- increased insurance costs.

Our agreements with our customers typically contain provisions designed to limit our liability for defects and errors in our software solutions and damages relating to such defects and errors, but these provisions may not be enforced by a court or otherwise effectively protect us from legal claims. Our liability insurance may not be adequate to cover all of the costs resulting from these legal claims. Moreover, we cannot provide assurance that our current liability insurance coverage would continue to be available on acceptable terms. In addition, the insurer may deny coverage on any future claims. The successful assertion against us of one or more large claims that exceeds available insurance coverage, or the occurrence of changes in our insurance policies, including premium increases or the imposition of large deductible or co-insurance requirements, could have a material adverse effect on our business and operating results. Furthermore, even if we prevail in any litigation, we are likely to incur substantial costs and our management's attention may be diverted from our operations.

If we fail to protect our intellectual property adequately, our business may be harmed.

Our success and ability to compete depends in part on our ability to protect our intellectual property. We rely upon a combination of trade secrets, confidentiality policies, nondisclosure and other contractual arrangements, and patent, copyright and trademark laws to protect our intellectual property rights. We cannot, however, be certain that steps we take to protect our intellectual property are adequate.

We may be required to spend significant resources to protect our intellectual property rights. Litigation brought to protect and enforce our intellectual property rights could be costly, time-consuming, and distracting to management and could result in the impairment or loss of portions of our intellectual property. Furthermore, our efforts to enforce our intellectual property rights may be met with defenses, counterclaims, and countersuits attacking the validity and enforceability of our intellectual property rights. The procurement and enforcement of certain intellectual property rights involves complex legal and factual considerations, and the associated legal standards are not always applied predictably or uniformly, can change, and not provide adequate remedies. As a result, we may not be able to obtain or adequately enforce our intellectual property rights, and other companies may be better able to develop products that compete with ours. Our failure to secure, protect, and enforce our intellectual property rights could seriously adversely affect our brand, competitive business position, business prospects, operating results and financial condition.

Intellectual property litigation and infringement claims may cause us to incur significant expense or prevent us from selling our software solutions.

Our industry is characterized by the existence of a large number of patents, trademarks and copyrights, and by frequent litigation based on allegations of infringement or other violations of intellectual property rights. A third-party may assert that our technology violates its intellectual property rights, or we may become the subject of a material intellectual property dispute. Sales, pricing, configure-price-quote, revenue management, shopping and merchandising solutions may become increasingly subject to infringement claims as the number of such commercially available solutions increases and the functionality of these solutions overlaps. In addition, changes in patent laws in the U.S. may affect the scope, strength and enforceability of our patent rights or the nature of proceedings which may be brought by us related to our patent rights. Future litigation may involve patent holding companies or other adverse patent owners who have no relevant product revenue and against whom our own potential patents may

therefore provide little or no deterrence. Regardless of the merit of any particular claim that our technology violates the intellectual property rights of others, responding to such claims may require us to:

- incur substantial expenses and expend significant management efforts to defend such claims;
- pay damages, potentially including treble damages, if we are found to have willfully infringed such parties' patents or copyrights;
- cease making, selling or using products that are alleged to incorporate the intellectual property of others;
- distract management and other key personnel from performing their duties for us;
- enter into potentially unfavorable royalty or license agreements in order to obtain the right to use necessary technologies; and
- expend additional development resources to redesign our solutions.

Any licenses required as a result of litigation under any patent may not be made available on commercially acceptable terms, if at all. In addition, some licenses may be nonexclusive, and therefore our competitors may have access to the same technology licensed to us. If we fail to obtain a required license or are unable to design around a patent, we may be unable to effectively develop or market our solutions, which could limit our ability to generate revenue or maintain profitability.

Contract terms generally obligate us to defend and hold our customers harmless, and to a lesser extent to indemnify our customers for their use of the intellectual property associated with our software or for other third-party products that are incorporated into our solutions and that infringe the intellectual property rights of others. If we are unable to resolve our legal obligations by settling or paying an infringement claim or a related indemnification claim as described above, we may be required to compensate our customers under the contractual arrangement with such customers. Our intellectual property defense and indemnification obligations are generally contractually either capped at a very high amount or not capped at all.

We use open source software in our solutions that may subject our software solutions to general release or require us to re-engineer our solutions, which may cause harm to our business.

We use open source software in our solutions and may use more open source software in the future. From time to time, there have been claims challenging the ownership of open source software against companies that incorporate open source software into their products. As a result, we could be subject to lawsuits by parties claiming ownership of what we believe to be open source software. Some open source licenses contain requirements that we make available source code for modifications or derivative works we create based upon the open source software and that we license such modifications or derivative works under the terms of a particular open source license or other license granting third parties certain rights of further use. If we combine our proprietary software solutions with open source software in a certain manner, we could, under certain of the open source licenses, be required to release the source code of our proprietary software solutions. In addition to risks related to license requirements, usage of open source software can lead to greater risks than use of third-party commercial software, as open source licensors generally do not provide warranties or controls on origin of the software. In addition, open source license terms may be ambiguous and many of the risks associated with usage of open source cannot be eliminated, and could, if not properly addressed, negatively affect our business. If we were found to have inappropriately used open source software, we may be required to seek licenses from third parties in order to continue offering our software, to re-engineer our solutions, to discontinue the sale of our solutions in the event re-engineering cannot be accomplished on a timely basis or take other remedial action that may divert resources away from our development efforts, any of which could adversely affect our business, operating results and financial condition.

We utilize third-party software that we incorporate into our software solutions, and impaired relations with these third parties, defects in third-party software or a third party's inability or failure to enhance their software over time could adversely affect our operating performance and financial condition.

We incorporate and include third-party software into our software solutions. If our relations with any of these third parties are impaired, or if we are unable to obtain or develop a replacement for the software, our business could be harmed. The operation of our solutions could be impaired if errors occur in the third-party software that we utilize. It may be more difficult for us to correct any defects in third-party software because the software is not within our control. Accordingly, our business could be adversely affected in the event of any errors in this software. There can be no assurance that these third parties may continue to invest the appropriate levels of resources in their products and services to maintain and enhance the capabilities of their software.

Catastrophic events may disrupt our operations.

Our headquarters are located in Houston, Texas, and we conduct business in other domestic and international locations. We also rely on our network and third-party infrastructure and enterprise applications for our sales, marketing, development, operational support, and hosted services. Although we have contingency and business continuity plans in effect for natural disasters or other catastrophic events (including terrorist attacks, power loss, telecommunications failure, cyber-attacks and hurricanes), these events could disrupt our operations. Even though we carry business interruption insurance and typically have provisions in our contracts that protect us in certain events, we might suffer losses as a result of business interruptions that exceed the coverage available under our insurance policies or for which we do not have coverage. Any natural disaster or other catastrophic event could create a negative perception in the marketplace, delay our product innovations, or lead to lengthy interruptions in our services, breaches of data security, and losses of critical data, all of which could have an adverse effect on our operating results.

We incur significant costs as a result of operating as a public company, and our management is required to devote substantial time to compliance initiatives.

As a public company, we incur significant legal, accounting and other expenses. The Sarbanes-Oxley Act of 2002 ("Sarbanes-Oxley") and the Dodd-Frank Wall Street Reform and Consumer Protection Act, and rules currently proposed or subsequently implemented by the SEC and NYSE impose heightened requirements on public companies. Our management and other personnel devote a substantial amount of time to these compliance initiatives. We may also need to hire additional personnel to support our compliance requirements. Moreover, these rules and regulations increase our legal and financial costs and make some activities more time-consuming.

If we fail to continue to maintain internal controls over financial reporting in accordance with Section 404 of the Sarbanes-Oxley Act, our market price may be adversely affected.

Section 404 of Sarbanes-Oxley requires our management to assess the effectiveness of our internal control over financial reporting and to provide a report by our registered independent public accounting firm addressing the effectiveness of our internal control over financial reporting. If we are unable to continue to assert that our internal controls over financial reporting are effective, or if a material weakness is identified in our internal controls over financial reporting, or if we are unable to implement internal controls over financial reporting for our acquisitions, our financial results may be adversely affected and we could lose investor confidence in the reliability of our financial statements. Accordingly failure to maintain effective controls over financial reporting may have an adverse effect on the market price of our common stock.

Risks relating to ownership of our common stock, the 2019 Notes and 2047 Notes

Market volatility may affect our stock price and the value of your investment.

The market price for our common stock, and the software industry generally, has been and is likely to continue to be volatile. Volatility could make it difficult to trade shares of our common stock at predictable prices or times. Many factors could cause the market price of our common stock to be volatile, including the following:

- variations in our quarterly or annual operating results;
- decreases in market valuations of comparable companies;
- fluctuations in stock market prices and volumes;
- decreases in financial estimates by equity research analysts;
- announcements by our competitors of significant contracts, new solutions or enhancements, acquisitions, distribution partnerships, joint ventures or capital commitments;
- departure of key personnel;
- changes in governmental regulations and standards affecting the software industry and our software solutions;
- sales of common stock or other securities by us in the future;
- damages, settlements, legal fees and other costs related to litigation, claims and other contingencies;
- deterioration of the general U.S. and global economic condition; and
- other risks described elsewhere in this section.

In the past, securities class action litigation often has been initiated against a company following a period of volatility in the market price of the company's securities. If class action litigation is initiated against us, we may incur substantial costs and our management's attention could be diverted from our operations. All of these factors could cause the market price of our stock to decline, and you may lose some or all of your investment.

Historically, shares of our common stock have been relatively illiquid and trading of our shares could adversely affect the market price of our common stock.

Our common stock has historically been thinly traded, and we have a relatively small public float. Our common stock may be less liquid than the stock of companies with a broader public ownership. In addition, sales of a large volume of our common stock by us or our current or future stockholders, or the perception that sales could occur, may also have a significant impact on its trading price.

Our directors, executive officers, and certain significant stockholders hold a significant portion of our outstanding shares.

Our directors and executive officers collectively control approximately 13% of our issued and outstanding common shares, and together with certain significant stockholders, including investment funds associated with Brown Capital Management, PRIMECAP Management Company, D.F. Dent, Conestoga Capital Advisors, BlackRock and Riverbridge Partners, control approximately 62% of our issued and outstanding common shares. In the event that these stockholders each independently decided to vote for or against matters requiring stockholder approval, they could influence such matters in ways that may not align with your specific interests as a stockholder, including the election of directors and approval of significant corporate transactions. This concentration of ownership could affect the market price of our shares if there is a sale by this group of stockholders, and could also have the effect of delaying or preventing a change in control of us even if such change of control could be beneficial to you as a stockholder.

If equity research analysts cease to publish research or reports about us or if they issue inaccurate or unfavorable commentary or downgrade our common stock, the price and trading volume of our common stock could decline.

The trading market for our common stock relies in part on the research and reports that equity research analysts publish about us and our business. The price of our stock could decline if one or more equity research analysts downgrade our stock or if those analysts issue other inaccurate or unfavorable commentary or cease publishing reports about our business. If one or more of these analysts cease coverage of us or fail to publish reports on us regularly, demand for our securities could decrease, which might cause the price and trading volume of our securities to decline.

Anti-takeover provisions in our Certificate of Incorporation and Bylaws and under Delaware law could make an acquisition of us more difficult and may prevent attempts by our stockholders to replace or remove our current management.

Our Certificate of Incorporation and Bylaws and Section 203 of the Delaware General Corporation Law contain provisions that might enable our management to resist a takeover of our company. These provisions include the following:

- the division of our board of directors into three classes to be elected on a staggered basis, one class each year;
- a prohibition on actions by written consent of our stockholders;
- the elimination of the right of stockholders to call a special meeting of stockholders;
- a requirement that stockholders provide advance notice of any stockholder nominations of directors or any proposal of new business to be considered at any meeting of stockholders;
- a requirement that a supermajority vote be obtained to amend or repeal certain provisions of our certificate of incorporation; and
- the ability of our board of directors to issue preferred stock without stockholder approval.

In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which limits the ability of stockholders owning in excess of 15% of our outstanding voting stock to merge or combine with us. Although we believe these provisions collectively provide for an opportunity to obtain higher bids by requiring potential acquirors to negotiate with our board of directors, they would apply even if an offer were considered beneficial by some stockholders. In addition, these provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors, which is responsible for appointing the members of our management.

We do not intend to pay dividends for the foreseeable future.

We do not currently anticipate paying any cash dividends on our common stock in the foreseeable future. We currently anticipate that we will retain all of our available cash, if any, for use as working capital, repayment of debt and for other general corporate purposes. Consequently, stockholders must rely on sales of their common stock after price appreciation as the only way to realize any future gains on their investment.

The accounting method for convertible debt securities that may be settled in cash, such as the 2019 Notes and 2047 Notes, could have a material effect on our reported financial results.

In May 2008, FASB, issued FASB Staff Position No. APB 14-1, Accounting for Convertible Debt Instruments That May Be Settled in Cash Upon Conversion (Including Partial Cash Settlement), which has subsequently been codified as Accounting Standards Codification 470-20, Debt with Conversion and Other Options, which we refer to as ASC 470-20. Under ASC 470-20, an entity must separately account for the liability and equity components of the convertible debt instruments (such as the Notes) that may be settled entirely or partially in cash upon conversion in a manner that reflects the issuer's economic interest cost. The effect of ASC 470-20 on the accounting for the Notes is that the equity component is required to be included in the additional paid-in capital section of stockholders' equity on our consolidated balance sheet and the value of the equity component would be treated as original issue discount for purposes of accounting for the debt component of the Notes. As a result, we will be required to record a greater amount of non-cash interest expense in current periods presented as a result of the amortization of the discounted carrying value of the Notes to their face amount over the term of the Notes. We will report lower net income in our financial results because ASC 470-20 will require interest to include both the current period's amortization of the debt discount and the instrument's coupon interest, which could adversely affect our reported or future financial results, the trading price of our common stock and the trading price of the Notes. In addition, under certain circumstances, convertible debt instruments (such as the Notes) that may be settled entirely or partly in cash are currently accounted for utilizing the treasury stock method, the effect of which is that any shares issuable upon conversion of the Notes are not included in the calculation of diluted earnings per share except to the extent that the conversion value of the Notes exceeds their principal amount. Under the treasury stock method, for diluted earnings per share purposes, the transaction is accounted for as if the number of shares of common stock that would be necessary to settle such excess, if we elected to settle such excess in shares, are issued. We cannot be sure that the accounting standards in the future will continue to permit the use of the treasury stock method. If we are unable to use the treasury stock method in accounting for the shares issuable upon conversion of the Notes, then our diluted earnings per share would be adversely affected.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Our headquarters are located in Houston, Texas, where we lease approximately 98,000 square feet of office space. In November 2018, we entered into a new lease for approximately 118,000 square feet of office space and we plan to relocate our headquarters to this new location in Houston, Texas. We also lease a number of smaller regional offices, including, but not limited to London, England; Toulouse, France; Sofia, Bulgaria; and San Francisco, California, which range from 3,000 to 23,000 square feet. We believe our existing facilities are sufficient for our current needs. We may add new facilities and expand our existing facilities as we add employees, and we believe that suitable additional or substitute space will be available as needed to accommodate any such expansion of our operations.

Item 3. Legal Proceedings

In the ordinary course of our business, we may be involved in various legal proceedings and claims. The outcomes of these matters are inherently unpredictable. We are not currently involved in any outstanding litigation that we believe, individually or in the aggregate, will have a material adverse effect on our business, results of operations or financial condition.

Item 4. Mine Safety Disclosures

Not applicable.

Part II

Item 5. Market for Registrant’s Common Equity, Related Stockholders Matters and Issuer Purchases of Equity Securities

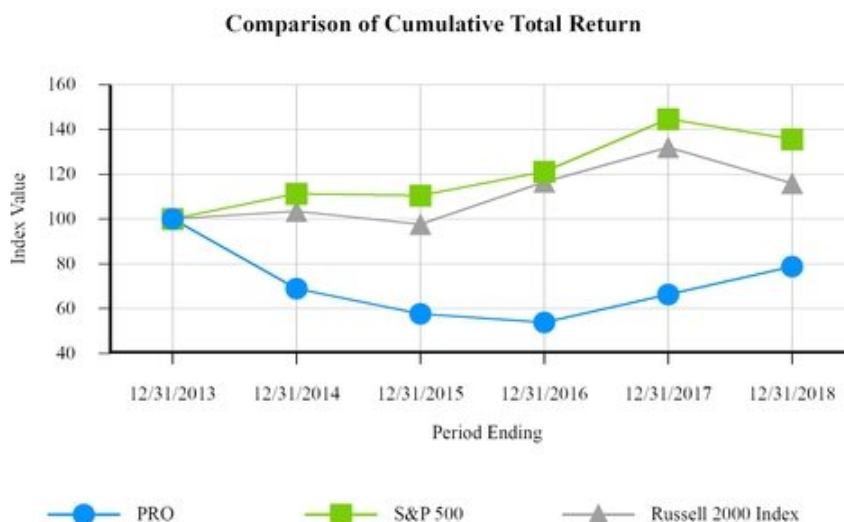
Market Information, Holders and Dividends

Our common stock is listed on the NYSE under the symbol "PRO". On February 11, 2019 there were 53 stockholders of record of our common stock. Since 2007, we have not declared or paid any dividends on our common stock. We currently expect to retain all remaining available funds and any future earnings for use in the operation and development of our business. Accordingly, we do not anticipate declaring or paying cash dividends on our common stock in the foreseeable future.

Performance Graph

The following shall not be deemed "soliciting material" or "filed" with the SEC, or incorporated by reference into any future filing under the Securities Act or Exchange Act, except to the extent that we specifically incorporate it by reference into such filing.

The graph below presents a five-year comparison of the relative investment performance of our common stock, the Standard & Poor’s 500 Stock Index ("S&P 500"), and the Russell 2000 Index for the period commencing on December 31, 2013, and ending December 31, 2018 . The graph is not meant to be an indication of our future performance.



(1) The graph assumes that \$100 was invested on December 31, 2013 in our common stock, the S&P 500 and the Russell 2000 Index and further assumes all dividends were reinvested. No cash dividends have been paid on our common stock for the periods presented above.

Company/Index	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018
PRO	\$ 100.00	\$ 68.87	\$ 57.74	\$ 53.93	\$ 66.29	\$ 78.70
S&P 500	\$ 100.00	\$ 111.39	\$ 110.58	\$ 121.13	\$ 144.65	\$ 135.63
Russell 2000 Index	\$ 100.00	\$ 103.53	\$ 97.62	\$ 116.63	\$ 131.96	\$ 115.89

Issuer Purchase of Equity Securities

On August 25, 2008, we announced that the Board of Directors authorized a stock repurchase program for the purchase of up to \$15.0 million of our common stock. Under the board-approved repurchase program, share purchases may be made from time to time in the open market or through privately negotiated transactions depending on market conditions, share price, trading volume and other factors, and such purchases, if any, will be made in accordance with applicable insider trading and other securities laws and regulations. These repurchases may be commenced or suspended at any time or from time to time without prior notice.

During 2018 , we did not make any purchases of our common stock under this program. As of December 31, 2018 , \$10.0 million remains available under the stock repurchase program.

Recent Sales of Unregistered Securities

There were no unregistered sales of equity securities for the year ended December 31, 2018 .

Item 6. Selected Financial Data

The following selected consolidated financial data presented under the captions "Selected consolidated statement of operations data" and "Selected consolidated balance sheet data" are derived from our Consolidated Financial Statements. The selected consolidated financial data set forth below should be read in conjunction with, and is qualified by reference to, "Management's Discussion and Analysis of Financial Condition and Result of Operations" and our Consolidated Financial Statements and the related notes included elsewhere in this report. As presented in the table, amounts are in thousands (except per share data).

	Year Ended December 31,				
	2018	2017	2016	2015	2014
Selected consolidated statement of operations data:					
Total revenue	\$ 197,024	\$ 168,816	\$ 153,276	\$ 168,246	\$ 185,829
Gross profit	119,845	100,250	89,923	106,836	127,743
Loss from operations	(49,215)	(64,943)	(65,398)	(55,497)	(22,407)
Net loss	(64,246)	(77,926)	(75,225)	(65,811)	(37,551)
Net loss attributable to common stockholders	\$ (64,246)	\$ (77,926)	\$ (75,225)	\$ (65,811)	\$ (36,644)
Net loss attributable to common stockholders per share:					
Basic and diluted	(1.86)	(2.46)	(2.47)	(2.23)	(1.27)
Weighted average number of shares:					
Basic and diluted	34,465	31,627	30,395	29,578	28,915
Selected consolidated balance sheet data:					
Cash and cash equivalents, unrestricted	\$ 295,476	\$ 160,505	\$ 118,039	\$ 161,770	\$ 161,019
Working capital	71,393	100,031	76,936	124,571	151,903
Total assets	436,967	288,683	227,654	263,211	300,125
Long-term obligations	107,318	233,637	134,327	121,443	112,740
Total stockholders' equity	\$ 54,899	\$ (46,979)	\$ (3,394)	\$ 55,414	\$ 98,999

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

Overview

PROS provides AI solutions that power commerce in the digital economy by providing fast, frictionless and personalized buying experiences. PROS solutions enable dynamic buying experiences for both B2B and B2C companies across industry verticals. Companies can use our dynamic pricing optimization, sales effectiveness, revenue management and commerce solutions to assess their market environments in real time to deliver customized prices and offers. Our solutions enable buyers to move fluidly across our customers' direct sales, online, mobile and partner channels with personalized experiences regardless of which channel those customers choose. Our decades of data science and AI expertise are infused into our solutions and are designed to reduce time and complexity through actionable intelligence. We provide standard configurations of our software based on the industries we serve and offer professional services to configure these solutions to meet the specific needs of each customer.

Executive Summary

In 2018, we continued to achieve important milestones in our cloud transformation efforts which began in 2015, while continuing to enable our customers to leverage our AI-driven solutions to help them compete in modern commerce. In 2018, we surpassed our pre-cloud transition total revenue and approached free cash flow breakeven. Other notable items for the year included:

- Subscription revenue increased by 57% in 2018 over 2017, and accounted for 48%, 36% and 25% of total revenue for the years ended December 31, 2018, 2017 and 2016, respectively;
- Recurring revenue, which consists of maintenance and subscription revenue, accounted for 81% of our total revenue and grew by 23% in 2018 over 2017;
- Annual recurring revenue ("ARR") was \$190.5 million on a constant currency basis (\$189.3 on an as reported basis) as of December 31, 2018, up 19% (18% as reported) year-over-year; and
- Completed a follow-on public offering of 4,370,000 primary shares of common stock generating \$142.0 million in net proceeds.

ARR is one of our key performance metrics to assess the health and trajectory of our overall business. ARR, a non-GAAP financial measure, is defined, as of a specific date, as contracted recurring revenue, including contracts with a future start date, together with annualized overage fees incurred above contracted minimum transactions, and excluding perpetual and term license agreements recognized as license revenue in accordance with GAAP. ARR should be viewed independently of revenue, deferred revenue and other GAAP measures, and is not intended to be combined with any of these items. We adjust our reported ARR on an annual basis to reflect any material exchange rate changes. Our constant currency ARR is based on currency rates set at the start of the year and held constant throughout the year. Total ARR on a constant currency basis as of December 31, 2018 was \$190.5 million, up from \$160.6 million as of December 31, 2017, an increase of 19%. Total ARR on an as reported basis as of December 31, 2018 was \$189.3 million, or approximately \$1.2 million lower than our constant currency ARR.

Cash provided by operating activities was \$5.7 million for the year ended December 31, 2018, as compared to cash used in operating activities of \$25.3 million for the year ended December 31, 2017. The improvement in net cash provided by operating activities was primarily due to the net impact of working capital changes and an improvement in our operating results. The change in the working capital was mainly attributable to higher recurring deferred revenue driven by our sales of subscription services.

Free cash flow is another key metric to assess the strength of our business. We define free cash flow, a non-GAAP financial measure, as net cash provided by (used in) operating activities minus capital expenditures (excluding expenditures for PROS new headquarters), purchases of other (non-acquisition-related) intangible assets and capitalized internal-use software development costs. We believe free cash flow may be useful to investors and other users of our financial information in evaluating the amount of cash generated by our business operations. Free cash flow used for the year ended December 31, 2018 was \$0.5 million, compared to \$29.5 million for the year ended December 31, 2017. The improvement was primarily attributable to a \$31.0 million increase in net cash provided by operating activities primarily due to the net impact of working capital changes and an improvement in our operating results. The following is a reconciliation of free cash flow to the most comparable GAAP measure, net cash provided by (used in) operating activities:

	Year Ended December 31,	
	2018	2017
Net cash provided by (used in) operating activities	\$ 5,703	\$ (25,313)
Purchase of property and equipment	(1,475)	(1,286)
Purchase of intangible asset	(125)	(125)
Capitalized internal-use software development costs	(4,613)	(2,797)
Free cash flow	\$ (510)	\$ (29,521)

Financial Performance Summary

Recurring revenue, which is comprised of our subscription and maintenance revenue, accounted for 81% of our total revenue for the year ended December 31, 2018 . Total recurring revenue was \$160.0 million for the year ended December 31, 2018 as compared to \$129.9 million for the year ended December 31, 2017 , an increase of approximately \$30.0 million , or 23% . This increase in recurring revenue was primarily attributable to a 57% increase in subscription revenue from new and existing customers.

Total revenue for the year ended December 31, 2018 , increased approximately \$28.2 million to \$197.0 million from \$168.8 million for the year ended December 31, 2017 , representing a 17% increase. This increase in total revenue was primarily attributable to an increase of 57% in subscription revenue.

Total deferred revenue was \$117.2 million as of December 31, 2018 , as compared to \$95.2 million as of December 31, 2017 , an increase of \$22.0 million , or 23% , primarily due to an increase in our subscription deferred revenue. Recurring deferred revenue, which includes both subscription and maintenance deferred revenue, was \$100.0 million as of December 31, 2018 and increased 25% as compared to December 31, 2017 .

Revenue by Geography

The following geographic information is presented for the years ended December 31, 2018 , 2017 and 2016 . PROS categorizes geographic revenues based on the location of our customers' headquarters.

	Year Ended December 31,					
	2018		2017		2016	
	Revenue	Percent	Revenue	Percent	Revenue	Percent
United States of America	\$ 68,482	35%	\$ 63,097	37%	\$ 56,774	37%
Europe	60,947	31%	51,273	30%	44,655	29%
The rest of the world	67,595	34%	54,446	32%	51,847	34%
Total revenue	\$ 197,024	100%	\$ 168,816	100%	\$ 153,276	100%

Secondary Offering

In August 2018, we completed a follow-on public offering of 3,800,000 shares of our common stock at an offering price of \$34 per share (the "Secondary Offering"). Additionally, as part of the Secondary Offering the underwriters exercised, in full, their over-allotment option to purchase an additional 570,000 shares of our common stock at the offering price of \$34 per share. The aggregate gross proceeds from the Secondary Offering, including the exercise of the over-allotment, were \$148.6 million , and net proceeds received after underwriting fees and offering expenses were approximately \$142.0 million .

Acquisitions

Acquisitions are an element of our long-term corporate strategy. On August 3, 2017, we acquired Vayant, a privately held company based in Sofia, Bulgaria, for total cash consideration, net of cash acquired, of approximately \$34.1 million . We believe future acquisitions could strengthen our competitive position, enhance the products and services that we can offer to customers, expand our customer base, grow our revenues and increase our overall value.

Backlog

We have aligned our backlog definition with the concepts and requirements of Accounting Standards Update No. 2014-09, " *Revenue from Contracts with Customers (Topic 606)* ". See Note 10 of our Notes to Consolidated Financial Statements for additional information regarding our performance obligations.

Factors Affecting Our Performance

Key factors and trends that have affected and we believe will continue to affect our operating results include:

- ***Buying Preferences Driving Technology Adoption*** . Buyers are increasingly demanding the same type of digital buying experience that they enjoy as consumers. For example, buyers increasingly prefer to buy online when they have already decided what to buy, and often prefer not to interact with a sales representative as their primary source of research. In response, we believe that businesses are increasingly looking to modernize their sales process to compete in digital commerce by adopting technologies which provide fast, frictionless, and personalized buying experiences across sales channels. We believe we are uniquely positioned to help power these buying experiences with our AI-powered solutions that enable buyers to move fluidly across our customers' direct sales, online, mobile and partner channels and have personalized experiences however they choose to buy.
- ***Continued Investments*** . We are focused on creating awareness for our solutions, expanding our customer base and growing our recurring revenues. While we incurred losses in 2018, we believe our market is large and underpenetrated and therefore we intend to continue investing to expand our ability to sell our and renew subscription offerings globally through investments in sales, marketing, customer success, cloud support, security, privacy, infrastructure and other long-term initiatives. We also plan to continue to invest in product development to enhance our existing technologies and develop new applications and technologies.
- ***Cloud Transition*** . In 2015, we began our transition to a cloud business to help accelerate adoption of our solutions and drive recurring revenue. Our cloud strategy has resulted in more sales of subscription-based solutions and very few on-premise license sales since we began our transition in 2015, and we expect this trend to continue. This increase in the sales of subscription-based solutions has resulted in an increase in our subscription revenue.
- ***Cloud Migrations*** . We expect that over time, additional sales of our cloud-based solutions will result in a decrease in our maintenance and support revenue, particularly as existing customers continue to migrate from our licensed solutions to our cloud solutions.
- ***Sales Mix Impacts Subscription Revenue Recognition Timing*** . The mix of subscription services and professional services can create revenue variability in given periods based on the nature and scope of services sold together. Professional services that are deemed to be distinct from the subscription services are accounted for as a separate performance obligation and revenue is recognized as the services are performed. If determined that the professional services are not considered distinct, the professional services and the subscription services are determined to be a single performance obligation and all revenue is recognized over the contractual term of the subscription beginning on the date that subscription services are made available to the customer, resulting in a deferral of revenue and revenue recognized over a shorter period of time, which would have a negative near-term financial impact.

Description of Key Components of our Operating Results

Revenue

We derive our revenues primarily from recurring revenue, which includes subscription and maintenance and support services. Recurring revenues accounted for 81% of our total revenue in 2018 .

Subscription services. Subscription services revenue primarily consists of fees that give customers access to one or more of our cloud applications with routine customer support. Subscription services revenue is generally recognized ratably over the contractual term of the arrangement beginning on the date that our service is made available to the customer. Our subscription contracts do not provide customers with the right to take possession of the software supporting the applications and, as a result, are accounted for as service contracts. Our subscription contracts are generally two to five years in length, billed annually in advance, and are generally non-cancelable.

Maintenance and support. Maintenance and support revenue includes post-implementation customer support for our on-premise software and the right to unspecified software updates and enhancements. We recognize revenue from maintenance arrangements ratably over the period in which the services are provided. Our maintenance and support contracts are generally one year in length, billed annually in advance, and non-cancelable.

License. Licenses for on-premise software provide the customer with a right to use the software as it exists when made available to the customer. License revenue from distinct on-premises licenses is recognized at the point in time when the software is made available to the customer. For customer contracts that contain license and professional services that are not considered distinct, the license and professional services are determined to be a single performance obligation and recognized over time based upon our efforts to satisfy the performance obligation.

Professional services. Professional services revenue primarily consists of fees for deployment and configuration services, as well as training. Professional services revenues are generally recognized as the services are rendered for time and material contracts, or on a proportional performance basis for fixed price contracts. The majority of our professional services contracts are on a fixed fee basis. Training revenues are recognized as the services are rendered.

Significant judgments are required in determining whether professional services that are contained in customer subscription services contracts are considered distinct, including whether the professional services are capable of being distinct and whether they are separately identifiable in the customer contract. Professional services that are deemed to be distinct are accounted for as a separate performance obligation and revenue is recognized as the services are performed. If determined that the professional services are not considered distinct, the professional services and the subscription services are determined to be a single performance obligation and revenue is recognized over the contractual term of the subscription beginning on the date that subscription services are made available to the customer.

Cost of Revenue

Cost of subscription. Cost of subscription includes those costs related to supporting our subscription services, principally (a) personnel costs, which include our employees and employee benefits, third-party contractors and noncash share-based compensation expense, (b) expenses related to operating our cloud infrastructure, (c) amortization of capitalized software for internal use, and (d) an allocation of depreciation, amortization of intangibles, facilities and information technology ("IT") support costs, including data center costs, and other costs incurred in providing subscription services to our customers.

Cost of maintenance and support. Cost of maintenance and support consists largely of personnel related expenses and an allocation of depreciation, amortization of intangibles, facilities and IT support costs and other costs incurred in providing maintenance and support services to our customers.

Cost of license. Cost of license consists of third-party fees for our licensed software and an allocation of the amortization of intangibles.

Cost of services. Cost of services includes those costs related to professional services and implementation of our solutions, principally (a) personnel costs, which include our employees and employee benefits, third-party contractors and noncash share-based compensation expense, (b) billable and non-billable travel, (c) amortization of capitalized software for internal use, and (d) an allocation of depreciation, facilities and IT support costs and other costs incurred in providing professional services to our customers. Cost of providing professional services may vary from quarter to quarter depending on a number of factors, including the amount of professional services required to implement and configure our solutions.

Operating Expenses

Selling and marketing. Selling and marketing expenses principally consist of (a) personnel costs, which include our employees and employee benefits, third-party contractors, sales commissions related to selling and marketing personnel and noncash share-based compensation expense, (b) sales and marketing programs such as lead generation programs, company awareness programs, our annual Outperform conference, hosting and participation in industry trade shows, and other sales and marketing programs, (c) travel and other out-of-pocket expenses, (d) amortization expenses associated with acquired intangible assets, and (e) an allocation of depreciation, facilities and IT support costs and other costs.

General and administrative. General and administrative expenses consist primarily of expenditures for executive, accounting and finance, legal, IT and human resources support functions. General and administrative expenses principally consist of (a) personnel costs, which include our employees and employee benefits, third-party contractors and noncash share-based compensation expense, (b) travel and other out-of-pocket expenses, (c) accounting, legal and other professional fees, and (d) an allocation of depreciation, facilities and IT support costs and other costs.

Research and development. Research and development expenses principally consist of (a) personnel costs, which include our employees and employee benefits and third-party contractors, that are comprised of software developers, scientists and product

managers working on enhancements of existing solutions, the development of new solutions, scientific research, quality assurance and testing and noncash share-based compensation expense, net of capitalized internal-use software cost and associated amortization, and (b) an allocation of depreciation, facilities and IT support costs and other costs.

Results of Operations

Comparison of year ended December 31, 2018 with year ended December 31, 2017

Revenue:

(Dollars in thousands)	For the Year Ended December 31,					
	2018		2017		Variance \$	Variance %
	Amount	Percentage of total revenue	Amount	Percentage of total revenue		
Subscription	\$ 95,192	48%	\$ 60,539	36%	\$ 34,653	57 %
Maintenance and support	64,760	33%	69,408	41%	(4,648)	(7)%
Total subscription, maintenance and support	159,952	81%	129,947	77%	30,005	23 %
License	3,516	2%	5,562	3%	(2,046)	(37)%
Services	33,556	17%	33,307	20%	249	1 %
Total revenue	\$ 197,024	100%	\$ 168,816	100%	\$ 28,208	17 %

Subscription revenue. Subscription revenue increased primarily due to an increase in the number of subscriptions purchased by new and existing customers for the year ended December 31, 2018. The increase in subscription revenue also included an increase of \$6.2 million from our acquisition of Vayant for the year ended December 31, 2018, as compared to the same period in 2017. We continued to invest in customer programs and initiatives which helped keep our customer attrition rate fairly consistent as compared to the prior year. Our ability to maintain consistent customer attrition rates will play a role in our ability to continue to grow our subscription revenue.

Maintenance and support revenue. The decrease in maintenance and support revenue was principally a result of customer maintenance churn and converting existing maintenance contracts to the cloud during the year ended December 31, 2018. The decrease in 2018 was also impacted by the timing of certain cash collections from maintenance contracts that we only recognize on a cash basis during the same period in 2017. We expect maintenance revenue to continue to decline over time as we sell fewer licenses and related maintenance and support, sell more subscription services and migrate existing maintenance customers to our cloud solutions.

License revenue. License revenue decreased primarily due to a smaller number of customers licensing our software as a result of our strategy to sell fewer licenses and more subscription services and due to the completion of several large perpetual license projects related to agreements executed prior to our cloud transition, which were recognized over time based upon our efforts to satisfy the performance obligation.

Services revenue. Services revenue remained relatively consistent during the year ended December 31, 2018 as compared to the same period in 2017. Services revenue varies from period to period depending on different factors, including the level of professional services required to implement our solutions, the timing of services revenue recognition on certain subscription contracts and any additional professional services requested by our customers during a particular period.

Cost of revenue and gross profit.

(Dollars in thousands)	For the Year Ended December 31,					
	2018		2017		Variance \$	Variance %
	Amount	Percentage of total revenue	Amount	Percentage of total revenue		
Cost of subscription	\$ 35,368	18%	\$ 27,858	17%	\$ 7,510	27 %
Cost of maintenance and support	11,602	6%	11,693	7%	(91)	(1)%
Total cost of subscription, maintenance and support	46,970	24%	39,551	23%	7,419	19 %
Cost of license	251	—%	282	—%	(31)	(11)%
Cost of services	29,958	15%	28,733	17%	1,225	4 %
Total cost of revenue	\$ 77,179	39%	\$ 68,566	41%	\$ 8,613	13 %
Gross profit	\$ 119,845	61%	\$ 100,250	59%	\$ 19,595	20 %

Cost of subscription. Cost of subscription increased primarily as a result of an increase in infrastructure cost to support our current and anticipated subscription customer base, which included \$4.3 million related to the acquisition of Vayant. Our subscription gross profit percentage was 63% and 54% , respectively, for the years ended December 31, 2018 and 2017 .

Cost of maintenance and support. The cost of maintenance and support declined primarily due to a decrease in personnel cost mainly due to efficiencies in employee related costs. Maintenance and support gross profit percentages for the years ended December 31, 2018 and 2017 , were 82% and 83% , respectively.

Cost of license. Cost of license consists of third-party fees for licensed software and remained relatively consistent year-over-year. License gross profit percentages for the years ended December 31, 2018 and 2017 , were 93% and 95% , respectively.

Cost of services. The increase in cost of services was primarily attributable to a \$1.5 million increase in personnel cost to staff our customer implementation engagements, partially offset by a \$0.3 million decrease in travel, facility, IT-related and other costs. Services gross profit percentages for the years ended December 31, 2018 and 2017 , were 11% and 14% , respectively. Services gross profit percentages vary period to period depending on different factors, including the level of professional services required to implement our solutions, our effective man-day rates and the utilization of our professional services personnel. We plan to add additional employees in our professional services organization to support our anticipated growth in the number of customers purchasing our subscription services.

Gross profit. The increase in overall gross profit for the year ended December 31, 2018 was principally attributable to an increase of 17% in total revenue as compared to the same period in 2017 mainly due to an increase in our subscription revenue.

Operating expenses :

(Dollars in thousands)	For the Year Ended December 31,					
	2018		2017		Variance \$	Variance %
	Amount	Percentage of total revenue	Amount	Percentage of total revenue		
Selling and marketing	\$ 72,006	37%	\$ 68,116	40%	\$ 3,890	6 %
General and administrative	41,302	21%	40,336	24%	966	2 %
Research and development	55,657	28%	56,021	33%	(364)	(1)%
Acquisition-related	95	—%	720	—%	(625)	(87)%
Total operating expenses	\$ 169,060	86%	\$ 165,193	98%	\$ 3,867	2 %

Selling and marketing. The increase was primarily attributable to a \$3.1 million increase in personnel cost mainly due to our continued investments in sales and marketing as we focus on adding new customers and increasing penetration within our existing customer base. In addition, there was an increase of \$0.8 million in non-personnel cost, which included \$0.9 million intangible amortization related to our acquisition of Vayant and an increase of \$0.6 million for sales and marketing events, partially offset by a decrease of \$0.7 million in travel expenses.

General and administrative expenses. The increase in general and administrative expenses was primarily attributable to a \$0.5 million increase associated with the acquisition of Vayant, a \$0.3 million increase in other personnel cost and a \$0.2 million increase in bad debt expense.

Research and development expenses. The decrease in research and development expenses was mainly attributable to an increase in capitalized internal-use software cost of \$2.1 million and a decrease of share-based compensation cost of \$0.7 million. The decrease was partially offset by an increase of \$2.0 million in personnel cost primarily due to higher headcount associated with the Vayant acquisition and a \$0.4 million increase in facility and other non-personnel cost.

Acquisition-related expenses. Acquisition-related expenses were \$0.1 million and \$0.7 million, respectively, for the years ended December 31, 2018 and 2017, consisting primarily of advisory, legal, accounting and other professional fees, and retention bonuses related to our acquisition and integration of Vayant.

Other income, net:

(Dollars in thousands)	For the Year Ended December 31,					
	2018		2017		Variance \$	Variance %
	Amount	Percentage of total revenue	Amount	Percentage of total revenue		
Convertible debt interest and amortization	\$ (16,986)	(9)%	\$ (13,218)	(8)%	\$ (3,768)	29%
Other income, net	\$ 2,155	1 %	\$ 384	— %	\$ 1,771	461%

Convertible debt interest and amortization. Convertible debt interest and amortization expense for each of the years ended December 31, 2018 and 2017 relates to coupon interest and amortization of debt discount and issuance costs attributable to our 2019 Notes and our 2047 Notes. The increase in convertible debt interest and amortization primarily relates to our 2047 Notes issued in June 2017.

Other income, net. The increase in other income, net during the year ended December 31, 2018, was primarily due to an increase in interest income partially offset by foreign currency exchange rate fluctuations during the periods.

Income tax provision:

(Dollars in thousands)	For the Year Ended December 31,			
	2018	2017	Variance \$	Variance %
Effective tax rate	— %	— %	n/a	— %
Income tax provision	\$ 200	\$ 149	\$ 51	34%

Our tax provision for the year ended December 31, 2018 primarily consisted of foreign taxes and state taxes not based on income offset by additional release of the valuation allowance related to the Vayant acquisition.

Our 2018 and 2017 effective tax rates had an unusual relationship to pretax loss from operations due to a valuation allowance on our net deferred tax assets. Our income tax provisions in 2018 and 2017 only included foreign taxes and state taxes not based on pre-tax income, resulting in an effective tax rate of 0% for both periods. The difference between the effective tax rates and the federal statutory rate of 34% for the years ended December 31, 2018 and 2017 was primarily due to the increase in our valuation allowance of \$20.4 million and \$5.9 million, respectively.

As of December 31, 2018 and 2017, we had a valuation allowance on our net deferred tax assets of \$94.2 million and \$74.2 million, respectively. The increase in the valuation allowance was principally attributable to an additional valuation allowance recorded on our current year's tax loss and our non-deductible interest of \$17.0 million.

Comparison of year ended December 31, 2017 with year ended December 31, 2016

Revenue:

(Dollars in thousands)	For the Year Ended December 31,					
	2017		2016		Variance \$	Variance %
	Amount	Percentage of total revenue	Amount	Percentage of total revenue		
Subscription	\$ 60,539	36%	\$ 38,158	25%	\$ 22,381	59 %
Maintenance and support	69,408	41%	68,565	45%	843	1 %
Total subscription, maintenance and support	129,947	77%	106,723	70%	23,224	22 %
License	5,562	3%	11,814	8%	(6,252)	(53)%
Services	33,307	20%	34,739	23%	(1,432)	(4)%
Total revenue	\$ 168,816	100%	\$ 153,276	100%	\$ 15,540	10 %

Subscription revenue. Subscription revenue increased primarily due to an increase in the number of subscriptions purchased by new and existing customers for the year ended December 31, 2017. The increase in subscription revenue also included \$3.3 million from our acquisition of Vayant.

Maintenance and support. The modest increase in maintenance and support revenue was principally a result of the timing of certain cash collections.

License revenue. License revenue decreased primarily due to the completion of several large perpetual license projects related to agreements executed prior to our cloud transition, and our strategy to sell fewer licenses and more subscription services.

Services revenue. Services revenue declined primarily as a result of large customer implementations completed in 2016 and fewer similar large implementations completed in 2017. The decrease was also due to lower levels of professional services required on our new subscription sales as well as on certain subscription contracts where subscription and services revenue is deferred until the customer commences use of the subscription because the professional services were deemed to not have stand-alone value.

Cost of revenue and gross profit:

(Dollars in thousands)	For the Year Ended December 31,					
	2017		2016		Variance \$	Variance %
	Amount	Percentage of total revenue	Amount	Percentage of total revenue		
Cost of subscription	\$ 27,858	17%	\$ 17,379	11%	\$ 10,479	60 %
Cost of maintenance and support	11,693	7%	13,681	9%	(1,988)	(15)%
Total cost of subscription, maintenance and support	39,551	23%	31,060	20%	8,491	27 %
Cost of license	282	—%	246	—%	36	15 %
Cost of services	28,733	17%	32,047	21%	(3,314)	(10)%
Total cost of revenue	\$ 68,566	41%	\$ 63,353	41%	\$ 5,213	8 %
Gross profit	\$ 100,250	59%	\$ 89,923	59%	\$ 10,327	11 %

Cost of subscription. Cost of subscription increased primarily as a result of a \$9.7 million increase in infrastructure cost to support our current and anticipated subscription customer base, and includes \$2.5 million related to the acquisition of Vayant. The remaining increase of \$0.8 million was related to personnel cost to support our subscription customer base, which included \$0.2 million related to the Vayant acquisition. Our subscription gross profit percentage was 54% for each of the years ended December 31, 2017 and 2016.

Cost of maintenance and support. The cost of maintenance and support declined primarily due to a decrease in personnel cost mainly due to efficiencies in employee related costs. Maintenance and support gross profit percentages for the years ended December 31, 2017 and 2016, were 83% and 80%, respectively.

Cost of license. Cost of license consists of third-party fees for licensed software and remained relatively consistent year-over-year. License gross profit percentages for the years ended December 31, 2017 and 2016, were 95% and 98%, respectively.

Cost of services. The decrease in cost of services was generally commensurate with our decline in services revenue, and was primarily attributable to decreases in both personnel cost for our software implementations of \$2.7 million, and in overhead expenses of \$0.6 million. Services gross profit percentages for the years ended December 31, 2017 and 2016, were 14% and 8%, respectively.

Gross profit. The increase in overall gross profit for the year ended December 31, 2017 was principally attributable to an increase of 10% in total revenue as compared to the same period in 2016.

Operating expenses:

(Dollars in thousands)	For the Year Ended December 31,					
	2017		2016		Variance \$	Variance %
	Amount	Percentage of total revenue	Amount	Percentage of total revenue		
Selling and marketing	\$ 68,116	40%	\$ 63,980	42%	\$ 4,136	6%
General and administrative	40,336	24%	38,537	25%	1,799	5%
Research and development	56,021	33%	52,804	34%	3,217	6%
Acquisition-related	720	—%	—	—%	720	—%
Total operating expenses	\$ 165,193	98%	\$ 155,321	101%	\$ 9,872	6%

Selling and marketing expenses. Our personnel cost increased by \$2.1 million primarily due to our continued investments in sales and marketing as we focus on adding new customers and increasing penetration within our existing customer base. This was partially offset by a decrease of \$1.2 million in severance expense associated with the change in employment status of our former Chief Operating Officer in July 2016. In addition, there was an increase of \$3.2 million in non-personnel cost, which included \$1.1 million intangible amortization related to our acquisition of Vayant, an increase of \$0.8 million for sales and marketing events, an increase of \$0.7 million in travel expenses, an increase of \$0.5 million of recruiting expense, and an increase of \$0.1 million for facility and other overhead expense.

General and administrative expenses. The increase in general and administrative expenses was primarily attributable to an increase of \$2.1 million in noncash share-based compensation expense and \$0.7 million of personnel and other general and administrative costs related to our acquisition of Vayant. This increase was partially offset by a decrease of \$0.4 million in our use of contract labor, a decrease of \$0.4 million in other overhead expenses, and a decrease of \$0.2 million in bad debt expense.

Research and development expenses. Personnel cost increased \$3.4 million, which included \$1.0 million related to our acquisition of Vayant. Personnel cost increased primarily due to our continued investment in headcount to develop new and improve existing technologies, partially offset by an \$1.5 million increase in capitalized internal-use software development costs. The remaining increase of \$1.3 million was attributable to non-personnel cost and related overhead expenses associated with higher personnel cost.

Acquisition-related expenses. Acquisition-related expenses were \$0.7 million for the year ended December 31, 2017 consisting primarily of advisory, legal, accounting and other professional fees, and retention bonuses related to our acquisition and integration of Vayant.

Other income (expense), net:

(Dollars in thousands)	For the Year Ended December 31,					
	2017		2016		Variance \$	Variance %
	Amount	Percentage of total revenue	Amount	Percentage of total revenue		
Convertible debt interest and amortization	\$ (13,218)	(8)%	\$ (9,319)	(6)%	\$ (3,899)	42 %
Other income (expense), net	\$ 384	—%	\$ (38)	—%	\$ 422	(1,111)%

Convertible debt interest and amortization. Convertible debt interest and amortization expense for each of the years ended December 31, 2017 and 2016 relates to coupon interest and amortization of debt discount and issuance costs attributable to our 2019 Notes and our 2047 Notes. The increase in convertible debt interest and amortization primarily relates to our 2047 Notes issued in June 2017.

Other income (expense), net. Other income (expense), net increased during the year ended December 31, 2017, primarily due to the higher impact of movements in foreign currency exchange rates during the period.

Income tax provision:

(Dollars in thousands)	For the Year Ended December 31,		Variance \$	Variance %
	2017	2016		
Effective tax rate	— %	(1)%	n/a	1 %
Income tax provision	\$ 149	\$ 470	\$ (321)	(68)%

Income tax provision. Our tax provision for the year ended December 31, 2017 primarily consisted of foreign taxes and state taxes not based on income.

Our 2017 and 2016 effective tax rates had an unusual relationship to pretax loss from operations as a result of the presence of a valuation allowance on our net deferred tax assets. Our income tax provisions in 2017 and 2016 only included foreign taxes and state taxes not based on pre-tax income, resulting in an effective tax rate of 0% and (1)%, respectively. The difference between the effective tax rates and the federal statutory rate of 34% for the years ended December 31, 2017 and 2016 was primarily due to the increase in our valuation allowance of \$5.9 million and \$26.6 million, respectively.

On December 22, 2017, the U.S. enacted the Tax Cuts and Jobs Act. The Act significantly changes U.S. corporate income tax laws by, among other things, reducing the U.S. corporate income tax rate to 21% effective January 1, 2018 and creating a territorial tax system with a one-time mandatory repatriation tax on previously deferred foreign earnings of U.S. subsidiaries. *See Note 14 of our Notes to Consolidated Financial Statements for additional information.*

As of December 31, 2017 and 2016, we had a valuation allowance on our net deferred tax assets of \$74.2 million and \$69.0 million, respectively. The increase was principally attributed to an additional valuation allowance recorded on our current year's tax loss and increases in our noncash share-based compensation of \$39.9 million partially offset by a downward adjustment to our valuation allowance related to global tax reform of \$34.0 million.

Liquidity and Capital Resources

At December 31, 2018, we had \$295.5 million of cash and cash equivalents and \$71.4 million of working capital as compared to \$160.5 million of cash and cash equivalents and \$100.0 million of working capital at December 31, 2017.

Our principal sources of liquidity are our cash and cash equivalents, cash flows generated from operations and potential borrowings under our secured Credit Agreement ("Revolver") with the lenders party thereto and Wells Fargo Bank, National Association as agent for the lenders party thereto. We issued the 2019 Notes in December 2014, the 2047 Notes in June 2017 and completed our Secondary Offering in August 2018 to supplement our overall liquidity position. Our material drivers or variants of operating cash flow are net income (loss), noncash expenses (principally share-based compensation, intangible amortization and amortization of debt discount and issuance costs) and the timing of periodic invoicing and cash collections related to licenses, subscriptions and support for our software and related services. Our operating cash flows are also impacted by the timing of payments to our vendors and the payments of our other liabilities. We generally pay our vendors and service providers in accordance with the invoice terms and conditions.

We believe our existing cash and cash equivalents, including funds provided by the issuance of our Notes and our Secondary Offering, funds available under our Revolver and our current estimates of future operating cash flows, will provide adequate liquidity and capital resources to meet our operational requirements, anticipated capital expenditures and principal and coupon payments for our Notes for the next twelve months. Our future working capital requirements will depend on many factors, including the operations of our existing business, potential growth of our subscription services, future acquisitions we might undertake, and expansion into complementary businesses. If such need arises, we may raise additional funds through equity or debt financings.

The following table presents key components of our Consolidated Statements of Cash Flows for the years ended December 31, 2018, 2017 and 2016 :

(Dollars in thousands)	For the Year Ended December 31,		
	2018	2017	2016
Net cash provided by (used in) operating activities	\$ 5,703	\$ (25,313)	\$ (14,345)
Net cash used in investing activities	(6,258)	(22,346)	(25,404)
Net cash provided by (used in) financing activities	135,352	90,654	(3,684)
Cash and cash equivalents (beginning of period)	160,505	118,039	161,770
Cash and cash equivalents (end of period)	\$ 295,476	\$ 160,505	\$ 118,039

Operating Activities

Cash provided by operating activities in 2018 was \$5.7 million . The \$31.0 million increase as compared to 2017 was primarily attributable to a \$13.1 million increase in working capital and a \$13.7 million improvement in our operating results. The working capital change was primarily attributable to higher recurring deferred revenue driven by our sales of subscription services.

Cash used in operating activities for 2017 was \$25.3 million . The increase in the cash used in operating activities was primarily due to a \$13.8 million decrease in working capital as a result of a decrease in accrued payroll and other employee benefits, and an increase in our prepaid assets for advance payments on our cloud infrastructure.

Cash used in operating activities for 2016 was \$14.3 million . The increase in the cash used in operating activities was primarily due to the decrease in our operating results as a result of our transition to the cloud, as on-premise software sales were replaced with subscription services, and the net impact of working capital changes, primarily driven by reduced cash generated from accounts receivable, partially offset by an increase in cash associated with deferred revenue.

Investing Activities

Cash used in investing activities for 2018 was \$6.3 million , which was primarily related to cash outflow of \$4.6 million related to capitalized internal-use software development costs on our subscription service solutions, capital expenditures of \$1.5 million and \$0.1 million for an intangible (non-acquisition) asset.

Cash used in investing activities for 2017 was \$22.3 million , which was primarily related to our acquisition of Vayant, partially offset by the cash inflow from the maturities of short-term investments. In addition, we incurred capitalized internal-use software development costs on our subscription service solutions of \$2.8 million, capital expenditures of \$1.3 million and we paid \$0.1 million for an intangible (non-acquisition) asset.

Cash used in investing activities for 2016 was \$25.4 million , which was primarily the result of the timing of purchases and maturities of short-term investments and capital expenditures of \$7.2 million . During 2016, we also paid \$2.0 million for a cost method investment, paid \$1.6 million for an intangible (non-acquisition) asset and incurred capitalized internal-use software development costs on our subscription service solutions of \$1.0 million.

Financing Activities

Cash provided by financing activities for 2018 was \$135.4 million , which was attributable to the proceeds of \$142.0 million from our Secondary Offering, proceeds from the exercise of employee stock plans and stock options of \$1.7 million and \$1.1 million , respectively, partially offset by a payment of \$9.4 million for tax withholdings on vesting of employee share-based awards and a \$0.1 million payment of notes payable.

Cash provided by financing activities for 2017 was \$90.7 million , which was attributable to the proceeds of \$93.5 million from the issuance of our 2047 Notes, proceeds from the exercise of stock options and employee stock plans of \$6.3 million and \$1.5 million , respectively, partially offset by a payment of \$7.4 million for tax withholdings on vesting of employee share-based awards, a \$3.0 million payment of debt issuance cost on our 2047 Notes, a payment of \$0.2 million in debt issuance costs on the Revolver renewal and a payment of notes payable of \$0.2 million .

Cash used in financing activities for 2016 was \$3.7 million, which was attributable to tax withholdings on vesting of employee share-based awards of \$5.5 million and a payment of notes payable of \$0.2 million, partially offset by the proceeds from employee stock plans and the exercises of stock options of \$2.0 million.

Stock Repurchases

In August 2008, our Board of Directors authorized a stock repurchase program for the purchase of up to \$15.0 million of our common stock. No shares were repurchased during the years ended December 31, 2018, 2017 and 2016, respectively. As of December 31, 2018, \$10.0 million remained available in the stock repurchase program. The repurchase of stock, if continued, will be funded primarily with existing cash balances. The timing of any repurchases will depend upon various factors including, but not limited to, market conditions, the market price of our common stock and management's assessment of our liquidity and cash flow needs. *For additional information on the stock repurchase program see "Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities."*

Off-Balance Sheet Arrangements and Contractual Obligations

We do not have any relationships with unconsolidated entities or financial partnerships, such as variable interest entities, which would have been established for the purpose of facilitating off-balance sheet arrangements or other contractually narrow or limited purposes. Our principal commitments as of December 31, 2018 consist of obligations under operating leases and various service agreements. *See Note 17 of our Notes to Consolidated Financial Statements for additional information regarding our contractual commitments.*

Contractual Obligations

The following table sets forth our contractual obligations as of December 31, 2018 :

(Dollars in thousands)	Payment due by period				
	Total	Less than 1 year	1-3 years	3-5 years	More than 5 years
Notes, including interest	\$ 260,318	\$ 148,750	\$ 4,250	\$ 1,068	\$ 106,250
Operating leases	80,153	4,164	6,764	11,860	57,365
Purchase and contractual commitments	21,250	10,598	9,797	855	—
Total contractual obligations	\$ 361,721	\$ 163,512	\$ 20,811	\$ 13,783	\$ 163,615

Notes

As of December 31, 2018, our outstanding notes consist of the 2019 Notes and the 2047 Notes. Interest on these notes is payable semi-annually, in arrears on June 1 and December 1 of each year. At December 31, 2018, our maximum commitment for interest payments under the Notes was \$10.3 million for the remaining duration of the Notes.

Covenants

Our credit facility contains affirmative and negative covenants, including covenants which restrict our ability to, among other things, create liens, incur additional indebtedness and engage in certain other transactions, in each case subject to certain exclusions. In addition, our credit facility contains certain financial covenants which become effective in the event our liquidity falls below \$50 million or upon the occurrence of an event of default. As of December 31, 2018, we were in compliance with all financial covenants in the credit facility.

Critical Accounting Policies and Estimates

Our consolidated financial statements are prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of these consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenues, costs and expenses, and related disclosures. On an ongoing basis, we evaluate our estimates and assumptions. Actual results could differ from those estimates.

We believe the critical accounting policies listed below affect significant judgment and estimates used in the preparation of our Consolidated Financial Statements.

Revenue Recognition

We derive our revenues primarily from subscription services, professional services, the perpetual licensing of our software products and associated software maintenance and support services.

We determine revenue recognition through the following steps:

- Identification of the contract, or contracts, with a customer
- Identification of the performance obligations in the customer contract(s)
- Determination of the transaction price
- Allocation of the transaction price to each performance obligation in the customer contract(s)
- Recognition of revenue when, or as, we satisfy a performance obligation

Subscription services revenue

Subscription services primarily include a customer's access to one or more of our cloud applications and associated customer support. Subscription services revenue is generally recognized ratably over the contractual subscription term, beginning on the date that our subscription service is made available to the customer. Our subscription contracts do not provide customers with the right to take possession of the software supporting the service and, as a result, are accounted for as service contracts. Our subscription contracts are generally two to five years in length, billed annually in advance, and non-cancelable.

Maintenance and support revenue

Maintenance and support revenue includes post-implementation customer support for on-premise licenses and the right to unspecified software updates and enhancements. We recognize revenue from maintenance and support arrangements ratably over the period in which the services are provided. Our maintenance and support contracts are generally one year in length, billed annually in advance, and non-cancelable.

License revenue

Licenses to on-premise software provide the customer with a right to use, in the customer's environment, our software as it exists when made available to the customer. License revenue from customer contracts with distinct on-premises licenses is recognized at the point in time when the software is made available to the customer. For customer contracts that contain license and professional services that are not considered distinct, both the license and professional services are determined to be a single performance obligation and the revenue is recognized over time based upon our efforts to satisfy the performance obligation.

Professional services revenue

Professional services revenue primarily consists of fees for deployment and configuration services, as well as training services. Professional services revenues are generally recognized as the services are rendered for time and material contracts, or on a proportional performance basis for fixed fee contracts. The majority of our professional services contracts are on a fixed fee basis. Training revenues are recognized as the services are rendered.

Significant judgment is required in determining whether professional services contained in a customer subscription services contract are capable of being distinct and are separately identifiable in the customer contract. Professional services determined to be distinct are accounted for as a separate performance obligation and revenue is recognized as the services are performed. If the professional services are not determined to be distinct, the professional services and the subscription services are accounted for as a single performance obligation and revenue is recognized over the contractual term of the subscription beginning on the date that subscription services are made available to the customer.

Customer contracts with multiple performance obligations

A portion of our customer contracts contain multiple performance obligations. Significant judgment is required in determining whether multiple performance obligations contained in a single customer contract are capable of being distinct and are separately identifiable. An obligation determined to be distinct is accounted for as a separate performance obligation and revenue for that separate performance obligation is recognized when, or as, we satisfy the performance obligation. If obligations

are not determined to be distinct, those obligations are accounted for as a single, combined performance obligation. The transaction price is allocated to each performance obligation on a relative standalone selling price basis.

Allowance for Doubtful Accounts

In addition to our initial credit evaluations upon entering into a new customer contract, we regularly assess our ability to collect outstanding customer invoices. To do so, we make estimates of the collectability of accounts receivable. We provide an allowance for doubtful accounts when we determine that the collection of an outstanding customer receivable is not probable. We also analyze accounts receivable and historical bad debt experience, customer creditworthiness, changes in customer payment history and industry concentration on an aggregate basis. If any of these factors change, our estimates may also change, which could affect the level of our future provision for doubtful accounts.

Deferred Costs

Sales commissions earned by our sales representatives are considered incremental and recoverable costs of obtaining a customer contract. Sales commissions are deferred and amortized on a straight-line basis over the period of benefit, which we have determined to be five to eight years. We determined the period of benefit by taking into consideration our customer contracts, expected renewals of those customer contracts (as we currently do not pay an incremental sales commission), the our technology and other factors. We also defer amounts earned by employees other than sales representatives who earn incentive payments under compensation plans that are also tied to the value of customer contracts acquired.

Deferred Implementation Costs

We capitalize certain contract fulfillment costs, including personnel and other costs (such as hosting, employee salaries, benefits and payroll taxes), that are associated with arrangements where professional services are not distinct from other undelivered obligations in our customer contracts. We analyze implementation costs and capitalize those costs that are directly related to customer contracts, that are expected to be recoverable and that enhance the resources which will be used to satisfy the undelivered performance obligations in those contracts. Deferred implementation costs are amortized ratably over the remaining contract term once the revenue recognition criteria for the respective performance obligation has been met and revenue recognition commences.

Deferred Revenue

Deferred revenue primarily consists of customer invoicing in advance of revenues being recognized. We generally invoice our customers annually in advance for subscription services and maintenance and support services. Deferred revenue that is anticipated to be recognized during the next twelve-month period is recorded as current deferred revenue and the remaining portion is recorded as noncurrent.

Noncash Share-Based Compensation

We have two noncash share-based compensation plans, the 2007 equity incentive plan and the 2017 equity incentive plan which authorize the discretionary granting of various types of stock awards to key employees, officers, directors and consultants. Our 2007 equity incentive plan expired in March 2017, and in May 2017, we adopted our 2017 equity incentive plan which serves as the successor to our 2007 equity incentive plan. Under the 2017 equity incentive plan, we may provide noncash share-based compensation through the grant of: (i) restricted stock awards; (ii) restricted stock unit awards - time and market-based ("RSUs"); (iii) stock options; (iv) stock appreciation rights ("SARs"); (v) phantom stock; and (vi) performance awards, such as market stock units ("MSUs"). As of December 31, 2018, we have granted stock options, SARs, RSUs and MSUs.

Noncash share-based compensation expense is measured at the grant date based on the fair value of the award and is recognized as expense on a straight-line basis over the requisite service period, which is generally the vesting period.

The fair value of the RSUs (time-based) is based on the closing price of our stock on the date of grant. The fair value and the derived service period of the market-based RSUs is estimated on the date of grant using a Monte Carlo simulation model. The model requires the use of a number of assumptions including the expected volatility of our stock, our risk-free interest rate and expected dividends. Our expected volatility at the date of grant is based on our historical volatility over the performance period.

We estimate the fair value of stock options and SARs using the Black-Scholes option pricing model, which requires us to use significant judgment to make estimates regarding the expected life of the award, volatility of our stock price, the risk-free interest rate and the dividend yield of our stock over the life of the award. The expected life of the award is a historical weighted average of the expected lives of similar securities of comparable public companies. We estimate volatility using our historical

volatility. The risk-free interest rate assumption is based on observed interest rates appropriate for the terms of our awards. The dividend yield assumption is based on our expectation of paying no dividends.

As we issue stock options and SARs, we evaluate the assumptions used to value our stock option awards and SARs. If factors change and we employ different assumptions, noncash share-based compensation expense may differ significantly from what we have recorded in the past. If there are any modifications or cancellations of the underlying unvested securities, we may be required to accelerate, increase or cancel any remaining unearned noncash share-based compensation expense. Future noncash share-based compensation expense and unearned noncash share-based compensation will increase to the extent that we grant additional equity awards to employees.

We estimate the number of awards that will be forfeited and recognize expense only for those awards that ultimately are expected to vest. Significant judgment is required in determining the adjustment to noncash share-based compensation expense for estimated forfeitures. Noncash share-based compensation expense in a period could be impacted, favorably or unfavorably, by differences between forfeiture estimates and actual forfeitures.

MSUs are performance-based awards that cliff vest based on our shareholder return relative to the total shareholder return of the Russell 2000 Index ("Index") over the three year periods ending December 31, 2017, March 2, 2018, February 28, 2019, February 28, 2020, October 9, 2020 and December 31, 2020 ("Performance Period"), respectively. The MSUs vested on January 1, 2018 and March 3, 2018, and are scheduled to vest on March 1, 2019, March 1, 2020, October 9, 2020 and January 10, 2021, respectively. The maximum number of shares issuable upon vesting is 200% of the MSUs initially granted based on the average price of our common stock relative to the Index during the Performance Period. We estimate the fair value of MSUs on the date of grant using a Monte Carlo simulation model. The determination of fair value of the MSUs is affected by our stock price and a number of assumptions including the expected volatilities of our stock and the Index, the risk-free interest rate and expected dividends. Our expected volatility at the date of grant was based on the historical volatilities of our stock and the Index over the Performance Period.

We record deferred tax assets for share-based compensation awards that will result in future deductions on our income tax returns, based on the amount of share-based compensation recognized at the statutory tax rate in the jurisdiction in which we will receive a tax deduction. Because the deferred tax assets we record are based upon the share-based compensation expenses in a particular jurisdiction, the aforementioned inputs that affect the fair values of our stock awards may also indirectly affect our income tax expense. In addition, differences between the deferred tax assets recognized for financial reporting purposes and the actual tax deduction reported on our income tax returns are recorded in our income tax (expense) income.

At December 31, 2018, we had \$33.3 million of total unrecognized compensation costs related to noncash share-based compensation arrangements for stock options, SARs, RSUs and MSUs granted. These costs will be recognized over a weighted-average period of 2.4 years.

Accounting for Income Taxes

We estimate our income taxes based on the various jurisdictions where we conduct business and we use estimates in determining our provision for income taxes. We estimate separately our deferred tax assets, related valuation allowances, current tax liabilities and deferred tax liabilities. The calculation of our tax liabilities involves dealing with uncertainties in the application of complex tax rules and the potential for future adjustment of our uncertain tax positions by the U.S. Internal Revenue Service or other taxing jurisdictions. We estimate our current tax liability and assess temporary differences that result from differing treatments of certain items for tax and accounting purposes. These differences result in deferred tax assets and liabilities, which we show on our balance sheet. At December 31, 2018, our deferred tax assets consisted primarily of temporary differences related to noncash share-based compensation, R&E tax credit carryforwards and net operating losses.

We review the realizability of our deferred tax asset on a quarterly basis, or whenever events or changes in circumstances indicate that a review is required. In determining the requirement for a valuation allowance, the historical and projected financial results of the legal entity or consolidated group recording the net deferred tax asset are considered, along with any other positive or negative evidence. Since future financial results may differ from previous estimates, periodic adjustments to our valuation allowances may be necessary. We continually perform an analysis related to the realizability of our deferred tax assets. As a result, and after considering tax planning initiatives and other positive and negative evidence, we determine that it is more likely than not that our net deferred tax assets will not be realized. During 2018, there was not sufficient positive evidence to outweigh the current and historic negative evidence to determine that it was more likely than not that our net deferred tax assets would not be realized. Therefore, we continue to have a valuation allowance against net deferred tax assets as of December 31, 2018.

We account for uncertain income tax positions recognized in our financial statements in accordance with the Income Tax Topic of the Accounting Standards Codification ("ASC"), issued by the FASB. This interpretation requires companies to use a prescribed model for assessing the financial recognition and measurement of all tax positions taken or expected to be taken in their tax returns. This guidance provides clarification on recognition, classification, interest and penalties, accounting in interim periods, disclosures and transition. *Please see Note 14 to the Consolidated Financial Statements for more information.*

Business Combinations

We record tangible and intangible assets acquired and liabilities assumed in business combinations under the purchase method of accounting. Amounts paid for each acquisition are allocated to the assets acquired and liabilities assumed based on their fair values at the date of acquisition. We then allocate the purchase price in excess of net tangible assets acquired to identifiable intangible assets based on detailed valuations that use information and assumptions provided by management. We allocate any excess purchase price over the fair value of the net tangible and intangible assets acquired and liabilities assumed to goodwill. If the fair value of the assets acquired exceeds our purchase price, the excess is recognized as a gain.

Significant management judgments and assumptions are required in determining the fair value of acquired assets and liabilities, particularly acquired intangible assets. The valuation of purchased intangible assets is based upon estimates of the future performance and cash flows from the acquired business. Each asset is measured at fair value from the perspective of a market participant.

If different assumptions are used, it could materially impact the purchase price allocation and adversely affect our results of operations, financial condition and cash flows.

Intangible Assets, Goodwill and Long-Lived Assets

When we acquire a business, a portion of the purchase consideration is typically allocated to acquired technology and other identifiable intangible assets, such as customer relationships. The excess of the purchase consideration over the net of the acquisition-date fair value of identifiable assets acquired and liabilities assumed is recorded as goodwill. We estimate fair value primarily utilizing the market approach, which calculates fair value based on the market values of comparable companies or comparable transactions. The amounts allocated to acquired technology and other intangible assets represent our estimates of their fair values at the acquisition date. We amortize our intangible assets that have finite lives using either the straight-line method or, if reliably determinable, the pattern in which the economic benefit of the asset is expected to be consumed utilizing expected undiscounted future cash flows. Amortization is recorded over the estimated useful lives ranging from two to eight years.

We review our intangible assets subject to amortization to determine if any adverse conditions exist or a change in circumstances has occurred that would indicate impairment or a change in the remaining useful life. If the carrying value of an asset exceeds its undiscounted cash flows, we will write down the carrying value of the intangible asset to its fair value in the period identified. In assessing recoverability, we must make assumptions regarding estimated future cash flows and discount rates. If these estimates or related assumptions change in the future, we may be required to record impairment charges. If the estimate of an intangible asset's remaining useful life is changed, we will amortize the remaining carrying value of the intangible asset prospectively over the revised remaining useful life.

We assess goodwill for impairment as of November 30 of each fiscal year, or more frequently if events or changes in circumstances indicate that the fair value of our reporting unit has been reduced below its carrying value. When conducting our annual goodwill impairment assessment, we use a three step process. The first step is to perform an optional qualitative evaluation as to whether it is more likely than not that the fair value of our reporting unit is less than its carrying value, using an assessment of relevant events and circumstances. In performing this assessment, we are required to make assumptions and judgments including but not limited to an evaluation of macroeconomic conditions as they relate to our business, industry and market trends, as well as the overall future financial performance of our reporting unit and future opportunities in the markets in which it operates. If we determine that it is not more likely than not that the fair value of our reporting unit is less than its carrying value, we are not required to perform any additional tests in assessing goodwill for impairment. However, if we conclude otherwise or elect not to perform the qualitative assessment, we perform a second step for our reporting unit, consisting of a quantitative assessment of goodwill impairment. This quantitative assessment requires us to estimate the fair value of our reporting unit and compare the estimated fair value to its respective carrying value (including goodwill) as of the date of the impairment test. The third step, employed for our reporting unit if it fails the second step, is used to measure the amount of any potential impairment and compares the implied fair value of our reporting unit with the carrying amount of goodwill.

Recent Accounting Pronouncements

See Note 2 - Summary of Significant Accounting Policies to the Consolidated Financial Statements included in this report, regarding the impact of certain recent accounting pronouncements on our Consolidated Financial Statements.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

Foreign Currency Exchange Risk

Our contracts are predominately denominated in U.S. dollars; however, we have contracts denominated in foreign currencies and therefore a portion of our revenue is subject to foreign currency risks. The primary market risk we face is from foreign currency exchange rate fluctuations. Our cash flows are subject to fluctuations due to changes in foreign currency exchange rates. The effect of an immediate 10% adverse change in exchange rates on foreign denominated receivables as of December 31, 2018, would have resulted in a \$0.3 million loss. We are also exposed to foreign currency risk due to our operating subsidiaries in France, United Kingdom, Canada, Germany, Ireland, Australia, Bulgaria and United Arab Emirates. A hypothetical 10% adverse change in the value of the U.S. dollar in relation to the Euro, which is our single most significant foreign currency exposure, would have changed revenue for the year ended December 31, 2018 by approximately \$0.9 million. However, due to the relatively low volume of payments made and received through our foreign subsidiaries, we do not believe that we have significant exposure to foreign currency exchange risks. Fluctuations in foreign currency exchange rates could harm our financial results in the future.

We currently do not use derivative financial instruments to mitigate foreign currency exchange risks. We continue to review this issue and may consider hedging certain foreign exchange risks through the use of currency futures or options in future years.

Exposure to Interest Rates

Our exposure to market risk for changes in interest rates relates to the variable interest rate on borrowings under our Revolver. As of December 31, 2018, we had no borrowings under the Revolver.

As of December 31, 2018, we had an outstanding principal amount of \$143.8 million and \$106.3 million, respectively, of 2019 Notes and 2047 Notes, which are fixed rate instruments. Therefore, our results of operations are not subject to fluctuations in interest rates. The fair value of the Notes may change when the market price of our stock fluctuates.

We believe that we do not have any material exposure to changes in the fair value as a result of changes in interest rates due to the short term nature of our cash equivalents.

Item 8. Financial Statements and Supplementary Data

The consolidated financial statements required to be filed are indexed on page F-1 and are incorporated herein by reference. See Item 15(a)(1) and (2).

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

As of the end of the period covered by this report, we carried out an evaluation, under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, of the effectiveness of our disclosure controls and procedures as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act. Based on that evaluation as of the period covered by this Annual Report on Form 10-K, our Chief Executive Officer and Chief Financial Officer have concluded that our disclosure controls and procedures were effective to ensure that information we are required to disclose in reports that we file or submit under the Exchange Act (i) is recorded, processed, summarized and reported within the time periods specified in SEC rules and forms, and (ii) is accumulated and communicated to our management, including our Chief Executive Officer and our Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There have been no changes in our internal control over financial reporting that occurred during the most recent fiscal quarter that materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Management's Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act). 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 GAAP. Our internal control over financial reporting is a framework that includes policies and procedures that: (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of our assets; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with GAAP, and that our receipts and expenditures are being made only in accordance with authorizations of our management and directors; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of our assets that could have a material effect on the financial statements.

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, has assessed the effectiveness of our internal control over financial reporting as of December 31, 2018, based on the criteria in Internal Control — Integrated Framework (2013) issued by COSO. Based on this evaluation, management concluded that our internal control over financial reporting was effective as of December 31, 2018 based upon the COSO criteria.

The effectiveness of our internal control over financial reporting as of December 31, 2018 has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report, which is included herein.

Item 9B. Other Information

None.

Part III

Item 10. *Directors, Executive Officers and Corporate Governance*

The information required by this item is incorporated by reference from our proxy statement in connection with our 2019 Annual Meeting of Stockholders, which proxy statement will be filed with the SEC not later than 120 days after the close of our fiscal year ended December 31, 2018 .

Item 11. *Executive Compensation*

The information required by this item is incorporated by reference from our proxy statement in connection with our 2019 Annual Meeting of Stockholders, which proxy statement will be filed with the SEC not later than 120 days after the close of our fiscal year ended December 31, 2018 .

Item 12. *Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters*

The information required by this item is incorporated by reference from our proxy statement in connection with our 2019 Annual Meeting of Stockholders, which proxy statement will be filed with the SEC not later than 120 days after the close of our fiscal year ended December 31, 2018 .

Item 13. *Certain Relationships, Related Transactions and Director Independence*

The information required by this item is incorporated by reference from our proxy statement in connection with our 2019 Annual Meeting of Stockholders, which proxy statement will be filed with the SEC not later than 120 days after the close of our fiscal year ended December 31, 2018 .

Item 14. *Principal Accountant Fees and Services*

The information required by this item is incorporated by reference from our proxy statement in connection with our 2019 Annual Meeting of Stockholders, which proxy statement will be filed with the SEC not later than 120 days after the close of our fiscal year ended December 31, 2018 .

Part IV

Item 15. Exhibits and Financial Statements Schedules

(a)(1) Financial Statements

Reference is made to the Index to Financial Statements in the section entitled "Financial Statements and Supplementary Data" in Part II, Item 8 of this Annual Report on Form 10-K.

(a)(2) Financial Statement Schedules

Reference is made to Schedule II, Valuation and Qualifying Accounts, as indexed on page F-37.

Schedules not listed above have been omitted because they are not applicable or are not required or the information required to be set forth therein is included in the Consolidated Financial Statements or Notes thereto.

(a)(3) Exhibits

Exhibits are as set forth in the section entitled "Exhibit Index" which follows the section entitled "Signatures" in this Annual Report on Form 10-K. Exhibits which are incorporated herein by reference can be inspected and copied at the public reference rooms maintained by the SEC in Washington, D.C., New York, New York, and Chicago, Illinois, and are also available to the public from commercial document retrieval services and at the website maintained by the SEC at <http://www.sec.gov>.

PROS Holdings, Inc.
Index to the Consolidated Financial Statements

	Page
Report of independent registered public accounting firm	F-2
Consolidated balance sheets at December 31, 2018 and 2017	F-4
Consolidated statements of comprehensive income (loss) for the years ended December 31, 2018, 2017 and 2016	F-5
Consolidated statements of cash flows for the years ended December 31, 2018, 2017 and 2016	F-6
Consolidated statements of stockholders' equity for the years ended December 31, 2018, 2017 and 2016	F-8
Notes to the consolidated financial statements	F-9
Schedule II – valuation and qualifying accounts for the years ended December 31, 2018, 2017 and 2016	F-37

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of PROS Holdings, Inc.:

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of PROS Holdings, Inc. and its subsidiaries as of December 31, 2018 and 2017, and the related consolidated statements of comprehensive income (loss), cash flows, and stockholders' equity for each of the three years in the period ended December 31, 2018, including the related notes and financial statement schedule listed in the accompanying index (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company changed the manner in which it accounts for revenues from contracts with customers in 2018.

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 Management's Report on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting 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 (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) 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 (iii) provide reasonable

[Table of Contents](#)

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/ PricewaterhouseCoopers LLP

San Jose, California
February 15, 2019

We have served as the Company's auditor since 2002.

PROS Holdings, Inc.
Consolidated Balance Sheets
(In thousands, except share and per share amounts)

	December 31,	
	2018	2017
Assets:		
Current assets:		
Cash and cash equivalents	\$ 295,476	\$ 160,505
Trade and other receivables, net of allowance of \$978 and \$760, respectively	41,822	32,484
Deferred costs	4,089	3,137
Prepaid and other current assets	4,756	5,930
Total current assets	346,143	202,056
Property and equipment, net	14,676	14,007
Deferred costs, noncurrent	13,373	3,194
Intangibles, net	19,354	26,929
Goodwill	38,231	38,458
Other assets, noncurrent	5,190	4,039
Total assets	\$ 436,967	\$ 288,683
Liabilities and Stockholders' Equity:		
Current liabilities:		
Accounts payable and other liabilities	\$ 6,934	\$ 2,976
Accrued liabilities	9,506	6,733
Accrued payroll and other employee benefits	22,519	16,712
Deferred revenue	99,262	75,604
Current portion of convertible debt, net	136,529	—
Total current liabilities	274,750	102,025
Deferred revenue, noncurrent	17,903	19,591
Convertible debt, net, noncurrent	88,661	213,203
Other liabilities, noncurrent	754	843
Total liabilities	382,068	335,662
Commitments and contingencies (Note 17)		
Stockholders' equity:		
Preferred stock, \$0.001 par value, 5,000,000 shares authorized none issued	—	—
Common stock, \$0.001 par value, 75,000,000 shares authorized; 41,573,491 and 36,356,760 shares issued, respectively; 37,155,906 and 31,939,175 shares outstanding, respectively	42	36
Additional paid-in capital	364,877	207,924
Treasury stock, 4,417,585 common shares, at cost	(13,938)	(13,938)
Accumulated deficit	(292,708)	(238,185)
Accumulated other comprehensive loss	(3,374)	(2,816)
Total stockholders' equity	54,899	(46,979)
Total liabilities and stockholders' equity	\$ 436,967	\$ 288,683

The accompanying notes are an integral part of these consolidated financial statements.

PROS Holdings, Inc.
Consolidated Statements of Comprehensive Income (Loss)
(In thousands, except per share data)

	For the Year Ended December 31,		
	2018	2017	2016
Revenue:			
Subscription	\$ 95,192	\$ 60,539	\$ 38,158
Maintenance and support	64,760	69,408	68,565
Total subscription, maintenance and support	159,952	129,947	106,723
License	3,516	5,562	11,814
Services	33,556	33,307	34,739
Total revenue	197,024	168,816	153,276
Cost of revenue:			
Subscription	35,368	27,858	17,379
Maintenance and support	11,602	11,693	13,681
Total cost of subscription, maintenance and support	46,970	39,551	31,060
License	251	282	246
Services	29,958	28,733	32,047
Total cost of revenue	77,179	68,566	63,353
Gross profit	119,845	100,250	89,923
Operating expenses:			
Selling and marketing	72,006	68,116	63,980
General and administrative	41,302	40,336	38,537
Research and development	55,657	56,021	52,804
Acquisition-related	95	720	—
Loss from operations	(49,215)	(64,943)	(65,398)
Convertible debt interest and amortization	(16,986)	(13,218)	(9,319)
Other income (expense), net	2,155	384	(38)
Loss before income tax provision	(64,046)	(77,777)	(74,755)
Income tax provision	200	149	470
Net loss	(64,246)	(77,926)	(75,225)
Net loss per share:			
Basic and diluted	(1.86)	(2.46)	(2.47)
Weighted average number of shares:			
Basic and diluted	34,465	31,627	30,395
Other comprehensive (loss) income, net of tax:			
Foreign currency translation adjustment	(558)	2,107	(594)
Unrealized gain on short-term investments	—	(13)	6
Other comprehensive loss, net of tax	(558)	2,094	(588)
Comprehensive (loss) income	(64,804)	(75,832)	(75,813)

The accompanying notes are an integral part of these consolidated financial statements.

PROS Holdings, Inc.
Consolidated Statements of Cash Flows
(In thousands)

	Year Ended December 31,		
	2018	2017	2016
Operating activities:			
Net loss	\$ (64,246)	\$ (77,926)	\$ (75,225)
Adjustments to reconcile net loss to net cash provided by operating activities:			
Depreciation and amortization	13,055	10,531	9,507
Amortization of debt discount and issuance costs	12,027	9,264	6,439
Share-based compensation	21,453	22,796	20,466
Deferred income tax, net	(463)	(520)	40
Provision for doubtful accounts	212	—	174
Loss on disposal of assets	37	59	19
Changes in operating assets and liabilities:			
Accounts and unbilled receivables	(9,550)	2,022	5,671
Deferred costs	(4,086)	—	—
Prepaid expenses and other assets	87	(3,715)	(915)
Accounts payable and other liabilities	3,931	700	(2,905)
Accrued liabilities	2,764	(1,055)	2,801
Accrued payroll and other employee benefits	5,830	(2,344)	5,195
Deferred revenue	24,652	14,875	14,388
Net cash provided by (used in) operating activities	5,703	(25,313)	(14,345)
Investing activities:			
Purchase of property and equipment	(1,475)	(1,286)	(7,241)
Purchase of equity securities	(45)	—	(2,000)
Acquisition of Vayant, net of cash acquired	—	(34,130)	—
Capitalized internal-use software development costs	(4,613)	(2,797)	(1,048)
Purchase of intangible asset	(125)	(125)	(1,625)
Purchases in short-term investment	—	—	(154,990)
Proceeds from maturities of short-term investments	—	15,992	141,500
Net cash used in investing activities	(6,258)	(22,346)	(25,404)
Financing activities:			
Exercise of stock options	1,142	6,331	889
Proceeds from employee stock plans	1,720	1,535	1,090
Tax withholding related to net share settlement of stock awards	(9,410)	(7,375)	(5,467)
Proceeds from Secondary Offering, net	141,954	—	—
Payments of notes payable	(54)	(209)	(196)
Proceeds from issuance of convertible debt, net	—	93,500	—
Debt issuance costs related to convertible debt	—	(2,978)	—
Debt issuance costs related to revolver	—	(150)	—
Net cash provided by (used in) financing activities	135,352	90,654	(3,684)
Effect of foreign currency rates on cash	174	(529)	(298)
Net increase (decrease) in cash and cash equivalents	134,971	42,466	(43,731)
Cash and cash equivalents:			
Beginning of period	160,505	118,039	161,770
End of period	\$ 295,476	\$ 160,505	\$ 118,039

PROS Holdings, Inc.
Consolidated Statements of Cash Flows
(In thousands)

Supplemental disclosure of cash flow information:

Cash (paid) refund during period for:						
Taxes	\$	(262)	\$	(271)	\$	968
Interest	\$	(5,252)	\$	(4,013)	\$	(3,182)
Noncash investing activities:						
Purchase of property and equipment accrued but not paid	\$	247	\$	38	\$	378

The accompanying notes are an integral part of these consolidated financial statements.

PROS Holdings, Inc.
Consolidated Statements of Stockholders' Equity
(In thousands, except share data)

	Common Stock			Treasury Stock		Accumulated (Deficit) Retained Earnings	Accumulated other comprehensive loss	Total Stockholders' Equity
	Shares	Amount	Additional Paid-In Capital	Shares	Amount			
Balance at December 31, 2015	29,738,976	\$ 34	\$ 158,674	4,417,585	\$ (13,938)	\$ (85,034)	\$ (4,322)	\$ 55,414
Exercise of stock options	96,870	—	889	—	—	—	—	889
Restricted and market stock net settlement	682,112	1	(5,467)	—	—	—	—	(5,466)
Proceeds from employee stock plans	65,693	—	1,090	—	—	—	—	1,090
Noncash share-based compensation	—	—	20,492	—	—	—	—	20,492
Other comprehensive loss	—	—	—	—	—	—	(588)	(588)
Net loss	—	—	—	—	—	(75,225)	—	(75,225)
Balance at December 31, 2016	30,583,651	\$ 35	\$ 175,678	4,417,585	\$ (13,938)	\$ (160,259)	\$ (4,910)	\$ (3,394)
Exercise of stock options	651,607	1	6,330	—	—	—	—	6,331
Restricted and market stock net settlement	611,708	—	(7,375)	—	—	—	—	(7,375)
Proceeds from employee stock plans	92,209	—	1,535	—	—	—	—	1,535
Equity component of the convertible notes issuance, net	—	—	8,846	—	—	—	—	8,846
Noncash share-based compensation	—	—	22,910	—	—	—	—	22,910
Other comprehensive loss	—	—	—	—	—	—	2,094	2,094
Net loss	—	—	—	—	—	(77,926)	—	(77,926)
Balance at December 31, 2017	31,939,175	\$ 36	\$ 207,924	4,417,585	\$ (13,938)	\$ (238,185)	\$ (2,816)	\$ (46,979)
Exercise of stock options	161,997	1	1,141	—	—	—	—	1,142
Restricted and market stock net settlement	609,188	1	(9,411)	—	—	—	—	(9,410)
Proceeds from employee stock plans	75,546	—	1,720	—	—	—	—	1,720
Proceeds from Secondary Offering, net	4,370,000	4	141,950	—	—	—	—	141,954
Noncash share-based compensation	—	—	21,553	—	—	—	—	21,553
Cumulative effect of adoption of section 606	—	—	—	—	—	9,723	—	9,723
Other comprehensive loss	—	—	—	—	—	—	(558)	(558)
Net loss	—	—	—	—	—	(64,246)	—	(64,246)
Balance at December 31, 2018	37,155,906	\$ 42	\$ 364,877	4,417,585	\$ (13,938)	\$ (292,708)	\$ (3,374)	\$ 54,899

The accompanying notes are an integral part of these consolidated financial statements.

PROS Holdings, Inc.
Notes to Consolidated Financial Statements

1. Organization and Nature of Operations

PROS Holdings, Inc., a Delaware corporation, through its operating subsidiaries (collectively, the "Company"), provides artificial intelligence ("AI") solutions that power commerce in the digital economy by providing fast, frictionless and personalized buying experiences. PROS solutions enable dynamic buying experiences for both business-to-business ("B2B") and business-to-consumer ("B2C") companies across industry verticals. Companies can use the Company's dynamic pricing optimization, sales effectiveness, revenue management and commerce solutions to assess their market environments in real time to deliver customized prices and offers. The Company's solutions enable buyers to move fluidly across its customers' direct sales, online, mobile and partner channels with personalized experiences regardless of which channel those customers choose. The Company's decades of data science and AI expertise are infused into its solutions and are designed to reduce time and complexity through actionable intelligence. The Company provides standard configurations of its software based on the industries it serves and offers professional services to configure these solutions to meet the specific needs of each customer.

2. Summary of Significant Accounting Policies

Principles of Consolidation and Basis of Presentation

These Consolidated Financial Statements include the accounts of the Company and its wholly-owned subsidiaries. All significant intercompany transactions and balances have been eliminated in consolidation. The Consolidated Financial Statements have been prepared in accordance with generally accepted accounting principles in the United States of America ("GAAP").

Changes in Accounting Policies

The Company has consistently applied the accounting policies described in this Note 2 to all periods presented in these Consolidated Financial Statements, except for the Company's adoption of certain accounting standards described in more detail under "*Recently adopted accounting pronouncements*" in this Note 2 below.

Dollar Amounts

The dollar amounts presented in the tabular data within these footnote disclosures are stated in thousands of dollars, except per share amounts, or as noted within the context of each footnote disclosure.

Use of Estimates

The preparation of these Consolidated Financial Statements in conformity with GAAP requires the Company to make certain estimates, judgments and assumptions that affect the reported amounts of assets, liabilities, revenues, costs and expenses during the reporting period. These estimates include, but are not limited to, unbilled receivables and deferred revenue, the determination of the period of benefit for deferred commissions, receivables, allowance for doubtful accounts, useful lives of assets, depreciation and amortization, the fair value of assets acquired and liabilities assumed for business combinations, income taxes and deferred tax asset valuation, valuation of stock options, other current liabilities and accrued liabilities. Actual results could differ from those estimates and such differences could be material to the Company's consolidated financial position and results of operations.

Cash and Cash Equivalents

The Company considers all highly liquid investments with an original maturity of three months or less at the time of purchase, or the ability to be settled in cash within a period of three months, to be cash equivalents, except for commercial paper which is classified as short-term investments, if any. The Company has a cash management program that provides for the investment of excess cash balances, primarily in short-term money market instruments.

Trade and Other Receivables

Trade and other receivables are primarily comprised of trade receivables, net of allowance for doubtful accounts, contract assets and unbilled receivables. The Company's standard billing terms require payment within thirty to sixty days from the date

of invoice. The carrying value of such receivables, net of the allowance for doubtful accounts, represents their estimated net realizable value. The Company estimates its allowance for doubtful accounts for specific trade receivable balances based on historical collection trends, the age of outstanding trade receivables, existing economic conditions, and any financial security associated with the receivables.

Contract assets represent conditional rights to consideration that have been recognized as revenue in advance of billing the customer. Unbilled receivables represent unconditional rights to consideration arising from contingent revenue, that have been recognized as revenue in advance of billing the customer.

Equity Investments

Investments in equity securities of privately held companies without readily determinable fair value, where the Company does not exercise significant influence over the investee, are recorded at cost, less impairment and adjusted for subsequent observable price changes obtained from orderly transactions for identical or similar investments issued by the same investee. Adjustments resulting from impairment, fair value, or observable price changes are accounted for in the Consolidated Statements of Comprehensive Income (Loss).

Financial Instruments

The carrying amount of the Company's financial instruments, which include cash equivalents, receivables and accounts payable, and cost method investment approximates their fair values at December 31, 2018 and 2017. *For additional information on the Company's fair value measurements, see Note 9 to the Consolidated Financial Statements.*

Prepaid Expenses and Other Assets

Prepaid expenses and other assets consist primarily of prepaid third-party cloud infrastructure costs and license fees, deferred project costs and prepaid income taxes.

Property and Equipment, Net

Property and equipment are recorded at cost, less accumulated depreciation. Maintenance, repairs and minor replacements are charged to expense as incurred. Significant renewals and betterments are capitalized. Depreciation on property and equipment, with the exception of leasehold improvements, is recorded using the straight-line method over the estimated useful lives of the assets. Depreciation on leasehold improvements is recorded using the shorter of the lease term or useful life. When property is retired or disposed of, the cost and related accumulated depreciation are removed from the accounts and any resulting gains or losses are reflected in the Consolidated Statements of Comprehensive Income (Loss) in the period of disposal.

Internal-Use Software

Costs incurred to develop internal-use software during the application development stage are capitalized, stated at cost, and depreciated using the straight-line method over the estimated useful lives of the assets. Application development stage costs generally include salaries and personnel costs and third-party contractor expenses associated with internal-use software development, configuration and coding. Capitalization of such costs begins when the preliminary project stage is complete and ceases at the point in which the project is substantially complete and is ready for its intended purpose. Capitalized internal-use software is included in property and equipment, net in the Consolidated Balance Sheets.

Deferred Costs

Sales commissions earned by the Company's sales representatives are considered incremental and recoverable costs of obtaining a customer contract. Sales commissions are deferred and amortized on a straight-line basis over the period of benefit, which the Company has determined to be five to eight years. The Company determined the period of benefit by taking into consideration its customer contracts, expected renewals of those customer contracts (as the Company currently does not pay an incremental sales commission), the Company's technology and other factors. The Company also defers amounts earned by employees other than sales representatives who earn incentive payments under compensation plans that are also tied to the value of customer contracts acquired.

Deferred Implementation Costs

The Company capitalizes certain contract fulfillment costs, including personnel and other costs (such as hosting, employee salaries, benefits and payroll taxes), that are associated with arrangements where professional services are not distinct from other undelivered obligations in its customer contracts. The Company analyzes implementation costs and capitalizes those costs that are directly related to customer contracts, that are expected to be recoverable, and that enhance the resources which will be used to satisfy the undelivered performance obligations in those contracts. Deferred implementation costs are amortized ratably over the remaining contract term once the revenue recognition criteria for the respective performance obligation has been met and revenue recognition commences. Deferred implementation costs are included in prepaid and other current assets and other assets, noncurrent in the Consolidated Balance Sheets. Amortization of deferred implementation costs is included in cost of subscription and cost of services revenues in the Consolidated Statements of Comprehensive Income (Loss).

Deferred Revenue

Deferred revenue primarily consists of customer invoicing in advance of revenues being recognized. The Company generally invoices its customers annually in advance for subscription services and maintenance and support services. Deferred revenue that is anticipated to be recognized during the next twelve-month period is recorded as current deferred revenue and the remaining portion is recorded as noncurrent deferred revenue.

Impairment of Long-Lived Assets

Long-lived assets are reviewed for impairment whenever an event or change in circumstances indicates that the carrying amount of an asset or group of assets may not be recoverable. The impairment review includes comparison of future cash flows expected to be generated by the asset or group of assets with the associated assets' carrying value. If the carrying value of the asset or group of assets exceeds its expected future cash flows (undiscounted and without interest charges), an impairment loss is recognized to the extent that the carrying amount of the asset exceeds its fair value. The Company recorded no impairment charges in the year ended December 31, 2018, 2017 and 2016.

Intangible Assets and Goodwill

Intangible assets that have finite lives are amortized over their useful lives and are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. During this review, the Company reevaluates the significant assumptions used in determining the original cost and estimated lives of long-lived assets. Although the assumptions may vary from asset to asset, they generally include operating results, changes in the use of the asset, cash flows and other indicators of value. Management then determines whether the remaining useful life continues to be appropriate or whether there has been an impairment of long-lived assets based primarily upon whether expected future undiscounted cash flows are sufficient to support the assets' recovery. If impairment exists, the Company would adjust the carrying value of the asset to fair value, generally determined by a discounted cash flow analysis.

Goodwill represents the excess of the purchase consideration over the net of the acquisition-date fair value of identifiable assets acquired, including identifiable intangible assets, and liabilities assumed in connection with business combinations. Goodwill is not amortized, but is assessed for impairment as of November 30 of each fiscal year, or more frequently if events or changes in circumstances indicate that the fair value of the Company's sole reporting unit has been reduced below its carrying value. When conducting the annual goodwill impairment assessment, a three step process is used. The first step is to perform an optional qualitative evaluation as to whether it is more likely than not that the fair value of the Company's sole reporting unit is less than its carrying value, using an assessment of relevant events and circumstances. In performing this assessment, the Company is required to make assumptions and judgments including but not limited to an evaluation of macroeconomic conditions as they relate to the business, industry and market trends, as well as the overall future financial performance of the reporting unit and future opportunities in the markets in which it operates. If it is determined that it is not more likely than not that the fair value of the reporting unit is less than its carrying value, no additional tests are required to be performed in assessing goodwill for impairment. However, if the Company concludes otherwise or elects not to perform the qualitative assessment, the Company performs a second step, consisting of a quantitative assessment of goodwill impairment. This quantitative assessment requires us to estimate the fair value of the reporting unit and compare the estimated fair value to its respective carrying value (including goodwill) as of the date of the impairment test. The third step, employed for the reporting unit failing the second step, is used to measure the amount of any potential impairment and compares the implied fair value of the reporting unit with the carrying amount of goodwill. Based on the results of the qualitative review of goodwill performed as of November 30, 2018, the Company did not identify any indicators of impairment. As such, the second and third steps described above were not necessary.

Research and Development

Research and development costs for software sold to customers are expensed as incurred. These costs include salaries and personnel costs, including employee benefits, third-party contractor expenses, software development tools, an allocation of facilities and depreciation expenses and other expenses in developing new solutions and upgrading and enhancing existing solutions.

Software Development Costs

Capitalization of software development costs for software to be sold, leased, or otherwise marketed begins upon the establishment of technological feasibility, which is generally the completion of a working prototype that has been certified as having no critical bugs and is a release candidate. Amortization begins once the software is ready for its intended use, generally based on the pattern in which the economic benefits will be consumed. To date, software development costs incurred between completion of a working prototype and general availability of the related product have not been material.

Treasury Stock

The Company is authorized to make treasury stock purchases in the open market pursuant to the share repurchase program, which was approved by its Board of Directors on August 28, 2008. The Company accounts for the purchase of treasury stock under the cost method. *For additional information on the Company's stock repurchase program, see Note 11 to the Consolidated Financial Statements.* There were no treasury stock repurchases for the years ended December 31, 2018, 2017 and 2016.

Revenue Recognition

The Company derives its revenues primarily from subscription services, professional services, perpetual licensing of its software products and associated software maintenance and support services.

The Company determines revenue recognition through the following steps:

- Identification of the contract, or contracts, with a customer;
- Identification of the performance obligations in the customer contract(s);
- Determination of the transaction price;
- Allocation of the transaction price to each performance obligation in the customer contract(s); and
- Recognition of revenue when, or as, the Company satisfies a performance obligation.

Subscription services revenue

Subscription services primarily include customer access to one or more of the Company's cloud applications and associated customer support. Subscription services revenue is generally recognized ratably over the contractual subscription term, beginning on the date that the Company's subscription service is made available to the customer. The Company's subscription contracts do not provide customers with the right to take possession of the software supporting the service and, as a result, are accounted for as service contracts. The Company's subscription contracts are generally two to five years in length, billed annually in advance, and non-cancelable.

Maintenance and support revenue

Maintenance and support revenue includes post-implementation customer support for on-premise licenses and the right to unspecified software updates and enhancements. The Company recognizes revenue from maintenance and support arrangements ratably over the period in which the services are provided. The Company's maintenance and support contracts are generally one to three years in length, billed annually in advance, and non-cancelable.

License revenue

Licenses to on-premise software provide the customer with a right to use, in the customer's environment, the Company's software as it exists when made available to the customer. License revenue from customer contracts with distinct on-premises licenses is recognized at the point in time when the software is made available to the customer. For customer contracts that contain license and professional services that are not considered distinct, both the license and professional services are determined to be

a single performance obligation and the revenue is recognized over time based upon the Company's efforts to satisfy the performance obligation.

Professional services revenue

Professional services revenue primarily consists of fees for deployment and configuration services, as well as training services. Professional services revenues are generally recognized as the services are rendered for time and material contracts, or on a proportional performance basis for fixed fee contracts. The majority of the Company's professional services contracts are on a fixed fee basis. Training revenues are recognized as the services are rendered.

Significant judgment is required in determining whether professional services contained in a customer subscription services contract are capable of being distinct and are separately identifiable in the customer contract. Professional services determined to be distinct are accounted for as a separate performance obligation and revenue is recognized as the services are performed. If the professional services are not determined to be distinct, the professional services and the subscription services are accounted for as a single performance obligation and revenue is recognized over the contractual term of the subscription beginning on the date that subscription services are made available to the customer.

Customer contracts with multiple performance obligations

A portion of the Company's customer contracts contain multiple performance obligations. Significant judgment is required in determining whether multiple performance obligations contained in a single customer contract are capable of being distinct and are separately identifiable. An obligation determined to be distinct is accounted for as a separate performance obligation and revenue for that separate performance obligation is recognized when, or as, the Company satisfies the performance obligation. If obligations are not determined to be distinct, those obligations are accounted for as a single, combined performance obligation. The transaction price is allocated to each performance obligation on a relative standalone selling price basis.

Disaggregation of revenue

The Company categorizes revenue from external customers by geographic area based on the location of the customer's headquarters. *For additional information regarding the Company's revenue by geography, see Note 18 to the Consolidated Financial Statements.*

Foreign Currency

The Company has contracts denominated in foreign currencies and therefore a portion of the Company's revenue is subject to foreign currency risks. Gains and losses from foreign currency transactions, such as those resulting from the settlement of receivables, are classified in other income (expense), net included in the accompanying Consolidated Statements of Comprehensive Income (Loss).

The functional currency of PROS France SAS ("PROS France") is the Euro. The financial statements of this subsidiary are translated into U.S. dollars using period-end rates of exchange for assets and liabilities, historical rates of exchange for equity, and average rates of exchange for the period for revenue and expenses. Translation gains (losses) are recorded in accumulated other comprehensive income (loss) as a component of stockholders' equity.

Noncash Share-Based Compensation

The Company has two noncash share-based compensation plans, the 2007 Equity Incentive Plan ("2007 Stock Plan") and the 2017 Equity Incentive Plan ("2017 Stock Plan"), which authorize the discretionary granting of various types of stock awards to key employees, officers, directors and consultants. The 2007 Stock Plan expired in March 2017. The 2017 Stock Plan serves as the successor to the 2007 Stock Plan and was adopted in May 2017. The Company may provide noncash share-based compensation through the grant of: (i) restricted stock awards; (ii) restricted stock unit awards - time and market-based ("RSUs"); (iii) stock options; (iv) stock appreciation rights ("SARs"); (v) phantom stock; and (vi) performance awards, such as market stock units ("MSUs").

To date, the Company has granted stock options, SARs, RSUs, time-based and market-based, and MSUs. The Company issues common stock from its pool of authorized stock upon exercise of stock options, settlement of SARs and MSUs or upon vesting of RSUs.

The following table presents the number of awards outstanding for each award type as of December 31, 2018 and 2017 (in thousands):

Award type	Year Ended December 31,	
	2018	2017
Stock options	—	135
Restricted stock units (time-based)	1,969	2,133
Restricted stock units (market-based)	215	345
Stock appreciation rights	287	356
Market stock units	419	387

Stock options. The Company did not grant stock options during 2018 and 2017. The fair value of each stock option was estimated on the date of grant using the Black-Scholes option pricing model.

Restricted stock units. The fair value of the RSUs (time-based and performance-based) is based on the closing price of the Company's stock on the date of grant and is amortized over the vesting period. RSUs include (i) time-based awards, and (ii) market-based awards in which the number of shares that vest are based upon attainment of target average per share closing price over a requisite trading period. Market-based RSUs vest if the average trailing closing price of the Company's common stock meets certain minimum performance hurdles for at least 105 calendar days prior to September 9, 2020, with 25% vesting at \$27, an additional 25% vesting at \$33, and the remaining 50% vesting at \$41. The Company estimates the fair value and the derived service period of the market-based RSUs on the date of grant using a Monte Carlo simulation model. The model requires the use of a number of assumptions including the expected volatility of the Company's stock, its risk-free interest rate and expected dividends. The Company's expected volatility at the date of grant is based on the historical volatility of the Company over the performance period.

Stock appreciation rights. SARs will be settled in stock at the time of exercise and vest over four years from the date of grant. The Company used the Black-Scholes option pricing model to estimate the fair value of its SARs. The determination of the fair value of SARs utilizing the Black-Scholes model is affected by the Company's stock price and a number of assumptions, including expected volatility, expected life, delivery of risk-free interest rate and expected dividends. The Company estimates the expected volatility of common stock at the date of grant based on a combination of its historical volatility and the average volatility of comparable companies. The expected life of the SARs noncash share-based payment awards is a historical weighted average of the expected lives of similar securities of comparable public companies. The risk-free interest rate assumption is based on observed interest rates appropriate for the terms of the Company's awards. The dividend yield assumption is based on the Company's expectation of paying no dividends.

Market stock units. MSUs are performance-based awards that vest based upon the Company's relative shareholder return. The actual number of MSUs that will be eligible to vest is based on the total shareholder return of the Company relative to the total shareholder return of the Russell 2000 Index ("Index") over a three year period ending December 31, 2017, March 2, 2018, February 28, 2019, February 28, 2020, October 9, 2020 and December 31, 2020 ("Performance Period"), respectively. The MSUs vested on January 1, 2018 and March 3, 2018, and will vest on March 1, 2019, March 1, 2020, October 9, 2020 and January 10, 2021, respectively. The maximum number of shares issuable upon vesting is 200% of the MSUs initially granted based on the average price of the Company's common stock relative to the Index during the Performance Period. The Company estimates the fair value of MSUs on the date of grant using a Monte Carlo simulation model. The determination of fair value of the MSUs is affected by the Company's stock price and a number of assumptions including the expected volatility of the Company's stock and the Index, its risk-free interest rate and expected dividends. The Company's expected volatility at the date of grant was based on the historical volatilities of the Company and the Index over the Performance Period.

As the Company issues stock options and SARs, it evaluates the assumptions used to value its stock option awards and SARs. If factors change and the Company employs different assumptions, noncash share-based compensation expense may differ significantly from what has been recorded in the past. If there are any modifications or cancellations of the underlying unvested securities, the Company may be required to accelerate, increase or cancel any remaining unearned noncash share-based compensation expense. Future noncash share-based compensation expense and unearned noncash share-based compensation will increase to the extent that the Company grants additional equity awards to employees.

At December 31, 2018, there were an estimated \$33.3 million of total unrecognized compensation costs related to noncash share-based compensation arrangements. These costs will be recognized over a weighted average period of 2.4 years. *For further discussion of the Company's noncash share-based compensation plans, see Note 13 to the Consolidated Financial Statements.*

Product Warranties

For software-as-a-service application subscriptions, the Company generally issues a product warranty for the subscription term, depending on the contract. For on-premise software licenses, the Company generally issues a product warranty for 90 days following the first use of the software in a production environment, depending on the contract. In the Company's experience, warranty costs have been insignificant.

Income Taxes

The Company uses the asset and liability method to account for income taxes, including recognition of deferred tax assets and liabilities for the anticipated future tax consequences attributable to differences between financial statement amounts and their respective tax basis. The Company reviews its deferred tax assets for recovery. A valuation allowance is established when the Company believes that it is more-likely than not that some portion of its deferred tax assets will not be realized. Changes in the valuation allowance from period to period are included in the Company's tax provision in the period of change.

The Company accounts for uncertain income tax positions recognized in an enterprise's financial statements in accordance with the income tax topic of the ASC issued by the FASB. This interpretation requires companies to use a prescribed model for assessing the financial recognition and measurement of all tax positions taken or expected to be taken in its tax returns. This guidance provides clarification on recognition, classification, interest and penalties, accounting in interim periods, disclosures and transition. The Company recognized accrued interest and penalties related to income taxes as a component of income tax expense. *For additional information regarding the Company's income taxes, see Note 14 to the Consolidated Financial Statements.*

Segment Reporting

The Company reports as one operating segment with the Chief Executive Officer ("CEO") acting as the Company's chief operating decision maker. The Company's CEO reviews financial information presented on a consolidated basis for purposes of allocating resources and evaluating financial performance. The Company has a single reporting unit, and there are no segment managers who are held accountable for operations, operating results or components below the consolidated unit level.

Earnings Per Share

The Company computes basic earnings (loss) per share by dividing net income (loss) attributable to common stockholders by the weighted average number of common shares outstanding. Diluted earnings (loss) per share is computed by dividing net income (loss) attributable to common stockholders by the weighted average number of common shares and dilutive potential common shares then outstanding. Diluted earnings per share reflect the assumed conversion of all dilutive securities, using the treasury stock method. Dilutive potential common shares consist of shares issuable upon the exercise of stock options, shares of unvested RSUs, and settlement of SARs. When the Company incurs a net loss, the effect of the Company's outstanding stock options, SARs, RSUs and MSUs are not included in the calculation of diluted earnings (loss) per share as the effect would be anti-dilutive. Accordingly, basic and diluted net loss per share are identical.

Recently Adopted Accounting Pronouncements

Topic 606

In May 2014, the FASB issued Accounting Standards Update ("ASU") No. 2014-09, " *Revenue from Contracts with Customers (Topic 606)* " ("Topic 606"). Topic 606 replaces the prior revenue recognition requirements in ASC 605, " *Revenue Recognition* " ("Topic 605" or "Prior Guidance") with a comprehensive revenue measurement and recognition standard, and expanded disclosure requirements. The new standard also provides guidance on the recognition of costs related to obtaining customer contracts. Topic 606 took effect in the first quarter of 2018, including interim periods within that reporting period. The Company adopted Topic 606 and applied Topic 606 to those contracts which were not complete as of January 1, 2018 using the modified retrospective method by recognizing the cumulative effect of initially applying the new standard as an adjustment to the opening balance of accumulated deficit, while prior period amounts are not adjusted and continue to be reported in accordance with the Company's historic accounting under the Prior Guidance.

The most significant impact of Topic 606 relates to the Company's accounting for arrangements that include term-based software licenses bundled with maintenance and support, the deferral of incremental costs of obtaining a contract with a customer (including the period of amortization of such costs), and additional disclosures. Under the Prior Guidance, revenue attributable to term-based software licenses was recognized ratably over the term of the arrangement when vendor-specific objective evidence ("VSOE") did not exist for the undelivered maintenance and support element because it was not sold separately. Topic 606 does

not require VSOE for undelivered elements to separate revenue for the delivered software licenses. Accordingly, under the new standard, the Company is required to recognize as revenue a portion of the arrangement fee upon delivery of the software license. As a result of applying Topic 606, the adjustment to the Company's opening balance sheet of the accumulated deficit for all revenue-related items was a decrease of approximately \$2.7 million .

Topic 606 also requires the Company to capitalize and amortize the costs to obtain a contract over the expected period of customer benefit. The Company previously capitalized and amortized only direct and incremental commission costs over the term of the related contract. The expected period of customer benefit determined under Topic 606 is longer than the typical two to five year term of the Company's contracts as required under the Prior Guidance. As a result of applying Topic 606, the Company recorded a decrease to the opening balance sheet of the accumulated deficit for costs to obtain a contract of approximately \$7.0 million .

Impact to previous reported results

The Company applied Topic 606 using the modified retrospective method by recognizing the cumulative effect of initially applying Topic 606 as an adjustment to the opening balance sheet at January 1, 2018. Therefore, the comparative information has not been adjusted and continues to be reported under Topic 605. The differences between amounts reported under Topic 606 and what would have been reported Topic 605 are detailed below:

(in thousands)	December 31, 2018		
	As Reported	Adjustments	Balances Under Topic 605
Balance Sheets			
Trade and other receivables, net of allowance	\$ 41,822	\$ (232)	\$ 41,590
Deferred costs, current	4,089	(30)	4,059
Deferred costs, noncurrent	13,373	(8,278)	5,095
Deferred revenue, current	99,262	2,120	101,382
Deferred revenue, noncurrent	17,903	1,088	18,991
Accumulated deficit	\$ (292,708)	\$ (11,748)	\$ (304,456)

(in thousands, except per share amounts)	Year Ended December 31, 2018		
	As Reported	Adjustments	Balances Under Topic 605
Income Statements			
Total revenue	\$ 197,024	\$ (761)	\$ 196,263
Total cost of revenue	77,179	369	77,548
Selling and marketing	72,006	1,453	73,459
General and administrative	41,302	(318)	40,984
Research and development	55,657	(234)	55,423
Net loss	(64,246)	(2,031)	(66,277)
Basic and diluted loss per share	\$ (1.86)	\$ (0.06)	\$ (1.92)

Topic 230

In August 2016, the FASB issued ASU 2016-15, " *Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments* " which is intended to reduce the diversity in practice on classification of certain transactions in the statement of cash flows. The Company adopted this standard on January 1, 2018 and the adoption had no impact on its Consolidated Financial Statements and related disclosures.

In November 2016, the FASB issued ASU 2016-18, " *Statement of Cash Flows (Topic 230): Restricted Cash (a consensus of the FASB Emerging Issues Task Force)* " which is intended to define the presentation and related disclosures of restricted cash balances. The Company adopted this standard on January 1, 2018 and the adoption had no impact on its Consolidated Financial Statements and related disclosures.

Recent Accounting Pronouncements

In February 2016, the FASB issued ASU 2016-02, " *Leases (Topic 842)* " ("Topic 842"), which requires the lessee to recognize most leases on the balance sheet thereby resulting in the recognition of right-of-use ("ROU") lease assets and liabilities for those leases currently classified as operating leases. Lessor accounting remains largely unchanged from current guidance, however, Topic 842 provides improvements that are intended to align lessor accounting with the lessee model and with updated revenue recognition guidance. This standard is effective for interim and annual reporting periods beginning after December 15, 2018. The Company plans to adopt the standard as of January 1, 2019.

The Company will elect the package of practical expedients permitted under the transition guidance within the new Topic 842 standard, which among other things, allows the Company to carryforward the historical lease classification. The Company will also elect the hindsight practical expedient to determine the reasonably certain lease term for existing leases. The Company will make an accounting policy election to keep leases with an initial term of 12 months or less off of the balance sheet and will recognize those lease payments on a straight-line basis over the lease term. The adoption of the standard will have a material impact on the Company's Consolidated Balance Sheet as a result of the increase in assets and liabilities from recognition of ROU assets and lease liabilities. The Company does not believe the standard will have a material impact on the its Consolidated Statement of Comprehensive Income (Loss).

In January 2017, the FASB issued ASU 2017-04, " *Intangibles - Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment* " ("Topic 350"), which eliminates step two from the goodwill impairment test. Under the amendments in this standard, an entity should recognize an impairment charge for the amount by which the carrying amount of a reporting unit exceeds its fair value; however, the loss recognized should not exceed the total amount of goodwill allocated to that reporting unit. The standard is effective for interim and annual reporting periods beginning after December 15, 2019; earlier adoption is permitted for goodwill impairment tests performed on testing dates after January 1, 2017. The Company is currently assessing the impact of Topic 350 on its Consolidated Financial Statements.

With the exception of the new standards discussed above, there have been no other recent accounting pronouncements or changes in accounting pronouncements during the year ended December 31, 2018 , that are of significance or potential significance to the Company.

3. Business Combination

On August 3, 2017, the Company acquired 100% of the issued and outstanding stock of Vayant Travel Technologies, Inc. ("Vayant"), a privately held company based in Sofia, Bulgaria, for total cash consideration, net of cash acquired, of approximately \$34.1 million . Vayant is a cloud software company that provides advanced shopping, merchandising and inspirational travel solutions. The acquisition of Vayant strengthens the Company's modern commerce solutions for the travel industry and positions it to deliver greater value to its travel customers through an end-to-end offer optimization solution designed to help travel companies deliver personalized offers and expanded choices that drive loyalty and growth.

For the year ended December 31, 2018 , the Company included \$9.5 million of revenue and \$4.8 million of net loss related to Vayant in its Consolidated Statement of Comprehensive Income (Loss). During the years ended December 31, 2018 and 2017 , the Company incurred acquisition-related costs of \$0.1 million and \$0.7 million , respectively, primarily related to advisory and legal fees, accounting and professional fees, and retention of key employees.

All of the assets acquired and the liabilities assumed in the transaction have been recognized at their acquisition date fair values at August 3, 2017.

[Table of Contents](#)

The final allocation of the total purchase price for Vayant is as follows (in thousands):

Cash	\$	1,822
Other current assets		1,235
Noncurrent assets		86
Intangibles		18,600
Goodwill		17,052
Accounts payable and accrued liabilities		(1,668)
Deferred revenue		(600)
Deferred tax liability		(526)
Noncurrent liabilities		(49)
Net assets acquired	\$	<u>35,952</u>

The following are the identifiable intangible assets acquired (in thousands) and their respective useful lives:

	Amount	Useful Life (years)
Developed technology	\$ 11,600	7
Customer relationships	7,000	5
Total	<u>\$ 18,600</u>	

In performing the Vayant purchase price allocation, the Company considered, among other factors, its anticipated future use of the acquired assets, analysis of historical financial performance, and estimates of future cash flows from Vayant's products and services. The allocation resulted in acquired intangible assets of \$18.6 million. The acquired intangible assets consisted of developed technology and customer relationships and were valued using the income approach in which the after-tax cash flows are discounted to present value. The cash flows are based on estimates used to price the transaction, and the discount rates applied were benchmarked with reference to the implied rate of return from the transaction model as well as the weighted average cost of capital. Additionally, the Company assumed certain liabilities in the Vayant acquisition, including deferred revenue to which a fair value of \$0.6 million was ascribed using a cost-plus profit approach.

The Company made a preliminary determination that \$0.5 million of net deferred tax liabilities were assumed on the Vayant acquisition date. During the year ended December 31, 2018, the Company made a final determination upon filing of the pre-acquisition period tax return that \$0.8 million of net deferred tax liabilities were assumed on the Vayant acquisition date. The measurement period adjustment of \$0.3 million to the deferred tax liabilities recorded during the year ended December 31, 2018 resulted in an increase to the goodwill, a release of additional valuation allowance and a benefit to the income tax provision.

The excess of the purchase price over the estimated amounts of net assets as of the effective date of the acquisition was allocated to goodwill. The factors contributing to the recognition of the amount of goodwill are based on several strategic and synergistic benefits that are expected to be realized from the Vayant acquisition. These benefits include the expectation that the combined company's complementary products will strengthen the Company's modern commerce solutions for the travel industry. The Company believes the combined company will benefit from a broader global presence and, with the Company's direct sales force and larger channel coverage, significant cross-selling opportunities. None of the goodwill is expected to be currently deductible for tax purposes. In accordance with applicable accounting standards, goodwill will not be amortized but instead will be tested for impairment at least annually, or more frequently if certain indicators are present. In the event that the management of the combined company determines that the value of goodwill has become impaired, the combined company will incur a charge for the amount of the impairment during the fiscal quarter in which the impairment occurs.

Pro Forma Financial Information

The unaudited financial information in the table below summarizes the combined results of operations of the Company and Vayant, on a pro forma basis, as though the Company had acquired Vayant on January 1, 2016. The pro forma information for all periods presented also includes the effect of business combination accounting resulting from the acquisition, including amortization charges from acquired intangible assets.

(in thousands, except earnings per share)	Year Ended December 31,	
	2017	2016
Total revenue	\$ 173,866	\$ 160,696
Net loss	(81,476)	(81,652)
Earnings per share - basic and diluted	\$ (2.58)	\$ (2.69)

4. Trade and Other Receivables, Net

Accounts receivable at December 31, 2018 and 2017 , consists of the following (in thousands):

	December 31,	
	2018	2017
Accounts receivable	\$ 38,876	\$ 30,689
Unbilled receivables and contract assets	3,924	2,555
Total receivables	42,800	33,244
Less: Allowance for doubtful accounts	(978)	(760)
Trade and other receivables, net	\$ 41,822	\$ 32,484

The bad debt expense reflected in general and administrative expenses in the accompanying Consolidated Statements of Comprehensive Income (Loss) for the years ended December 31, 2018 , 2017 and 2016 , totaled approximately \$0.2 million , zero and \$0.2 million , respectively.

5. Deferred Costs

Deferred costs, which primarily consist of deferred sales commissions, were \$17.5 million and \$6.3 million as of December 31, 2018 and December 31, 2017 , respectively. Amortization expense for the deferred costs was \$3.0 million and \$2.5 million for the year ended December 31, 2018 and 2017 , respectively. There was no impairment loss in relation to the costs capitalized for the periods presented.

6. Deferred Implementation Costs

Deferred implementation costs, which related to certain customer contract fulfillment costs, were \$3.9 million and \$2.2 million as of December 31, 2018 and December 31, 2017 , respectively. Amortization expense for the deferred implementation costs was \$0.6 million and \$0.3 million for the year ended December 31, 2018 and 2017 , respectively. Deferred implementation costs are included in prepaid and other current assets and other assets, noncurrent in the Consolidated Balance Sheets. Amortization of deferred implementation costs is included in cost of subscription and cost of services revenues in the Consolidated Statements of Comprehensive Income (Loss). There was no impairment loss in relation to the costs capitalized for the periods presented.

7. Property and Equipment, Net

Property and equipment, net as of December 31, 2018 and 2017 consists of the following:

	Estimated useful life	December 31,	
		2018	2017
Furniture and fixtures	5-10 years	\$ 3,208	\$ 2,958
Computers and equipment	3-5 years	19,644	18,950
Software	3-6 years	5,432	5,430
Capitalized internal-use software development costs	3 years	8,775	4,102
Leasehold improvements	Shorter of lease term or useful life	5,587	5,650
Construction in progress		20	19
Property and equipment, gross		42,666	37,109
Less: Accumulated depreciation and amortization		(27,990)	(23,102)
Property and equipment, net		\$ 14,676	\$ 14,007

Depreciation and amortization was approximately \$5.5 million, \$5.4 million and \$6.4 million for the years ended December 31, 2018, 2017 and 2016, respectively. During the years ended December 31, 2018, 2017 and 2016, the Company disposed of approximately \$0.5 million, \$1.8 million and \$2.3 million, respectively, of fully depreciated assets. During the years ended December 31, 2018, 2017 and 2016, the Company recognized immaterial amounts of loss on disposal of certain non-fully depreciated assets, respectively. As of December 31, 2018 and 2017, the Company had approximately \$14.0 million and \$11.1 million, respectively, of fully depreciated assets in use.

During the years ended December 31, 2018 and 2017, the Company capitalized internal-use software development costs of approximately \$4.7 million and \$3.0 million, respectively, related to its subscription solutions. As of December 31, 2018 and 2017, \$2.8 million and \$1.0 million, respectively, of capitalized internal-use software development costs were subject to amortization and \$1.1 million and \$0.1 million, respectively, of capitalized internal-use software development costs were included in accumulated depreciation and amortization for the years ended December 31, 2018 and 2017.

No impairment was recorded for the years ended December 31, 2018, 2017 and 2016.

8. Goodwill and Intangible Assets

The change in the carrying amount of goodwill for the years ended December 31, 2018 and 2017, was as follows (in thousands):

Balance as of December 31, 2016	\$	20,096
Goodwill acquired		17,052
Foreign currency translation adjustments		1,310
Balance as of December 31, 2017		38,458
Purchase accounting adjustments		252
Foreign currency translation adjustments		(479)
Balance as of December 31, 2018	\$	38,231

The goodwill balance related to PROS France is denominated in Euro and the goodwill balance related to Vayant is denominated in the U.S. dollar.

Intangible assets consisted of the following as of December 31, (in thousands):

	Weighted average useful life (years)	December 31, 2018		
		Gross Carrying Amount	Accumulated Amortization*	Net Carrying Amount
Developed technology	7	\$ 25,584	\$ 13,890	\$ 11,694
Maintenance relationships	8	3,485	2,488	997
Customer relationships	6	11,802	6,884	4,918
Acquired technology	2	1,925	180	1,745
Total		\$ 42,796	\$ 23,442	\$ 19,354

*Cumulative foreign currency translation adjustments, reflecting movement in the currencies of the underlying entities, decreased total intangible assets by approximately \$0.2 million as of December 31, 2018.

	Weighted average useful life (years)	December 31, 2017		
		Gross Carrying Amount	Accumulated Amortization*	Net Carrying Amount
Developed technology	7	\$ 26,023	\$ 9,560	\$ 16,463
Maintenance relationships	8	3,565	2,207	1,358
Customer relationships	6	11,840	4,482	7,358
Acquired technology	3	1,750	—	1,750
Total		\$ 43,178	\$ 16,249	\$ 26,929

*Cumulative foreign currency translation adjustments, reflecting movement in the currencies of the underlying entities, increased total intangible assets by approximately \$0.7 million as of December 31, 2017.

Customer relationships are amortized over five or eight years.

In December 2016, the Company purchased a technology-based intangible asset in connection with the equity securities investment made during the same period. The Company estimates that the intangible will be amortized over approximately a 2-year period. During the second half of 2017 and 2018, the Company purchased an additional technology-based intangible asset which is expected to be amortized over approximately a 1-year period.

Intangible asset amortization expense for the years ended December 31, 2018 , 2017 and 2016 was \$7.6 million , \$5.2 million and \$3.0 million , respectively. As of December 31, 2018 , the expected future amortization expense for the acquired intangible assets for each of the five succeeding years and thereafter was as follows (in thousands):

Year Ending December 31,	Amount
2019	\$ 6,575
2020	5,791
2021	3,021
2022	1,921
2023	1,292
2024 and thereafter	754
Total amortization expense	\$ 19,354

9. Fair Value Measurements

The Company adopted fair value measurements guidance for financial and nonfinancial assets and liabilities. The guidance defines fair value, establishes a framework for measuring fair value in GAAP and expands disclosures about fair value measurements.

The guidance defines fair value as the price that would be received to sell an asset, or paid to transfer a liability, in an orderly transaction between market participants. The guidance establishes a fair value hierarchy for valuation inputs that gives the highest priority to quoted prices in active markets for identical assets or liabilities and the lowest priority to unobservable inputs. The fair value hierarchy is as follows:

Level 1 : Unadjusted quoted prices in active markets that are accessible at the measurement date for identical, unrestricted assets or liabilities;

Level 2 : Quoted prices for similar assets or liabilities in markets that are not active or inputs which are observable, either directly or indirectly, for substantially the full term of the asset or liability; and

Level 3 : Prices or valuation techniques that require inputs that are both significant to the fair value measurement and unobservable (i.e., supported by little or no market activity).

A portion of the Company's existing cash and cash equivalents are invested in short-term interest bearing obligations with original maturities less than 90 days, principally various types of money market funds. The Company does not enter into investments for trading or speculative purposes.

At December 31, 2018 and 2017 , the Company had approximately \$268.6 million and \$131.4 million invested in treasury money market funds. The fair value of the treasury money market funds is determined based on quoted market prices, which represents level 1 in the fair value hierarchy as defined by Accounting Standard Codification ("ASC") 820, " *Fair Value Measurement and Disclosure* ."

The fair value of the Company's Notes is classified in the level 2 hierarchy. *See Note 15 for further detail regarding the Notes.*

In December 2016, the Company purchased \$2.0 million equity securities in a privately held company. This investment is accounted for at cost, less impairment and adjusted for subsequent observable price changes obtained from orderly transactions for identical or similar investments issued by the same investee. The Company estimates fair value of its equity investment considering available information such as pricing in recent rounds of financing, current cash positions, earnings and cash flow

forecasts, recent operational performance and any other readily available market data, which represents level 3 in the fair value hierarchy. An impairment charge to current earnings is recorded when the cost of the investment exceeds its fair value and this condition is determined to be other-than-temporary. As of December 31, 2018 and 2017, the Company determined there were no other-than-temporary impairments on its equity investment.

10. Deferred Revenue and Performance Obligations

Deferred Revenue

For the year ended December 31, 2018 and 2017, the Company recognized approximately \$74.6 million and \$65.6 million, respectively, in each case of revenue that was included in the deferred revenue balances at the beginning of the respective periods and primarily related to subscription services, maintenance and support, and other services.

Performance Obligations

As of December 31, 2018, the Company expects to recognize approximately \$336.5 million of revenue from remaining performance obligations. The Company expects to recognize revenue on approximately \$162.2 million of these performance obligations over the next 12 months, with the balance recognized thereafter.

11. Stockholders' equity

Equity Offering

In August 2018, the Company completed a follow-on public offering of 3,800,000 shares of the Company's common stock at an offering price of \$34 per share (the "Secondary Offering"). Additionally, as part of the Secondary Offering the underwriters exercised, in full, their over-allotment option to purchase an additional 570,000 shares of the Company's common stock at the offering price of \$34 per share. The aggregate gross proceeds from the Secondary Offering, including the exercise of the over-allotment, were \$148.6 million, and net proceeds received after underwriting fees and offering expenses were approximately \$142.0 million.

Stock Repurchase

On August 25, 2008, the Company's Board of Directors approved a stock repurchase program that authorized the Company to purchase up to \$15.0 million of the Company's outstanding shares of common stock. Under the board-approved repurchase program, share purchases may be made from time to time in the open market or through privately negotiated transactions depending on market conditions, share price, trading volume and other factors, and such purchases, if any, will be made in accordance with applicable insider trading and other securities laws and regulations. These repurchases may be commenced or suspended at any time or from time to time without prior notice.

The Company did not repurchase any shares under this plan for the years ended December 31, 2018 and 2017. The remaining amount available to purchase common stock under this plan was \$10.0 million as of December 31, 2018.

12. Earnings Per Share

The following table sets forth the computation of basic and diluted earnings per share:

	For the Year Ended December 31,		
	2018	2017	2016
Numerator:			
Net loss	\$ (64,246)	\$ (77,926)	\$ (75,225)
Denominator:			
Weighted average shares (basic)	34,465	31,627	30,395
Dilutive effect of stock options, restricted stock units and stock appreciation rights	—	—	—
Weighted average shares (diluted)	34,465	31,627	30,395
Basic earnings per share	\$ (1.86)	\$ (2.46)	\$ (2.47)
Diluted earnings per share	\$ (1.86)	\$ (2.46)	\$ (2.47)

Dilutive potential common shares consist of shares issuable upon the exercise of stock options, settlement of SARs, and the vesting of RSUs and MSUs. Potential common shares determined to be antidilutive and excluded from diluted weighted average shares outstanding were approximately 2.1 million, 2.0 million and 1.8 million for the years ended December 31, 2018, 2017 and 2016, respectively.

Since the Company has the intention and ability to settle the principal amount of its Notes (see Note 15) in cash, the treasury stock method is expected to be used for calculating any potential dilutive effect of the conversion spread on diluted net income per share, if applicable. The conversion spread will have a dilutive impact on diluted net income per share of common stock when the average market price of common stock for a given period exceeds the conversion price of \$33.79 and \$48.63 per share, for the 2019 Notes and 2047 Notes, respectively, and when the Company has net income.

13. Noncash Share-Based Compensation***Employee Noncash Share-based Compensation Plans***

The Company has two noncash share-based compensation plans, the 2007 Stock Plan and the 2017 Stock Plan (collectively the "Stock Plans"). These plans authorize the discretionary granting of various types of stock awards to key employees, officers, directors and consultants. The discretionary issuance of stock awards generally contains vesting provisions ranging from one to four years.

2007 Stock Plan. The Company's 2007 Stock Plan expired in March 2017 for purposes of granting future equity awards. As of December 31, 2018, the Company had outstanding equity awards to acquire 1,908,003 shares of its common stock held by the Company's employees, directors and consultants under the 2007 Stock Plan (assuming MSU performance at 100% of the MSUs initially granted), and inclusive of zero stock options, 1,358,819 RSUs, 286,584 SARs and 262,600 MSUs.

2017 Stock Plan. The Company's 2017 Stock Plan provides for the issuance of awards to employees, officers, directors and certain other individuals providing services to the Company are eligible to receive awards. The 2017 Stock Plan reserved an aggregate amount of 2,500,000 shares for issuance. The Company may provide these incentives through the grant of: (i) restricted stock awards; (ii) RSUs; (iii) stock options; (iv) SARs; (v) phantom stock; and (vi) performance awards, such as MSUs.

As of December 31, 2018, the Company had outstanding equity awards to acquire 981,746 shares of its common stock held by the Company's employees, directors and consultants under the 2017 Stock Plan (assuming MSU performance at 100% of the MSUs initially granted), and inclusive of 825,178 RSUs and 156,568 MSUs. As of December 31, 2018, 1,347,240 shares remain available for grant under the 2017 Stock Plan. As of December 31, 2018, there were no options, SARs, restricted stock awards or phantom stock issued under the 2017 Stock Plan.

Noncash share-based compensation expense for all noncash share-based payment awards granted is determined based on the grant date fair value of the award. The Company recognizes compensation expense, net of estimated forfeitures, which represents noncash share-based awards expected to vest on a straight-line basis over the requisite service period of the award, which is generally the vesting term. Noncash share-based awards typically vest over four years. Stock options are generally granted for a ten-year term. The Company estimates forfeiture rates based on its historical experience for grant years where the majority

of the vesting terms have been satisfied. Changes in estimated forfeiture rates are recognized through a cumulative catch-up adjustment in the period of change and thus impact the amount of noncash share-based compensation expense to be recognized in future periods.

Noncash share-based compensation expense is allocated to expense categories on the Consolidated Statements of Comprehensive Income (Loss). The following table summarizes noncash share-based compensation expense, net of amounts capitalized, for the years ended December 31, 2018, 2017 and 2016 (in thousands).

	For the Year Ended December 31,		
	2018	2017	2016
Share-based compensation:			
Cost of revenue	\$ 1,721	\$ 1,971	\$ 2,267
Operating expenses:			
Selling and marketing	4,396	4,348	3,824
General and administrative	10,717	11,163	9,040
Research and development	4,619	5,314	5,335
Total included in operating expenses	19,732	20,825	18,199
Total share-based compensation expense	\$ 21,453	\$ 22,796	\$ 20,466

At December 31, 2018, there was an estimated \$33.3 million of total unrecognized compensation costs related to noncash share-based compensation arrangements. These costs will be recognized over a weighted average period of 2.4 years.

Stock Options

The following table summarizes the Company's stock option activity for the year ended December 31, 2018 (number of shares and intrinsic value in thousands):

	Number of shares under option	Weighted average exercise price	Weighted average remaining contractual term (year)	Aggregate intrinsic value (1)
Outstanding, December 31, 2017	135	\$ 12.52		
Granted	—	—		
Exercised	(135)	12.52		
Forfeited	—	—		
Expired	—	—		
Outstanding, December 31, 2018	—	\$ —	0	\$ —
Vested and exercisable at December 31, 2018	—	\$ —	0	\$ —

(1) The aggregate intrinsic value was calculated based on the positive difference between the estimated fair value of the Company's common stock on December 31, 2018 of \$31.40 and the grant date fair value.

For the years ended December 31, 2018 and 2017, respectively, the Company did not grant any stock options. The total intrinsic value of stock options exercised for the years ended December 31, 2018, 2017 and 2016 was \$2.5 million, \$7.2 million and \$1.0 million, respectively.

RSUs (time-based)

The Company has granted RSUs under the Stock Plans. Time-based RSUs granted to employees, directors and consultants vest in equal annual installments over a one to four year period from the grant date.

The following table summarizes the Company's unvested time-based RSUs as of December 31, 2018, and changes during the year then ended (number of shares and intrinsic value in thousands):

	Number of shares	Weighted average grant date fair value	Weighted average remaining contractual term (year)	Aggregate intrinsic value (1)
Unvested at December 31, 2017	2,133	\$ 18.90		
Granted	829	27.61		
Vested	(792)	20.49		
Forfeited	(201)	20.45		
Unvested at December 31, 2018	<u>1,969</u>	\$ 21.77	2.02	\$ 61,827
Expected to vest at December 31, 2018	1,902	\$ 21.65	2.00	\$ 59,731

(1) The aggregate intrinsic value was calculated based on the fair value of the Company's common stock on December 31, 2018 of \$31.40 .

The weighted average grant-date fair value of the time-based RSUs granted during the years ended December 31, 2018 , 2017 and 2016 was \$27.61 , \$21.63 and \$11.69 , respectively.

RSUs (market-based)

During 2016, under the 2007 Stock Plan, the Company granted 460,000 RSUs with a market-based vesting condition to certain executive employees. These market-based RSUs will vest if the average trailing closing price of the Company's Common Stock meets certain minimum performance hurdles for at least 105 calendar days prior to September 9, 2020, with 25% vesting at \$27 , an additional 25% vesting at \$33 , and the remaining 50% vesting at \$41 .

The following table summarizes the Company's unvested market-based RSUs as of December 31, 2018 , and changes during the year then ended (number of shares and intrinsic value in thousands):

	Number of shares	Weighted average grant date fair value	Weighted average remaining contractual term (year)	Aggregate intrinsic value (1)
Unvested at December 31, 2017	345	\$ 10.86		
Granted	—	—		
Vested	(115)	12.61		
Forfeited	(15)	9.98		
Unvested at December 31, 2018	<u>215</u>	\$ 9.98	1.69	\$ 6,751
Expected to vest at December 31, 2018	211	\$ 9.98	1.69	\$ 6,611

(1) The aggregate intrinsic value was calculated based on the fair value of the Company's common stock on December 31, 2018 of \$31.40 .

The Company estimates the fair value and the derived service period of the market-based RSUs on the date of grant using a Monte Carlo simulation model. The model requires the use of a number of assumptions including the expected volatility of the Company's stock, its risk-free interest rate and expected dividends. The Company's expected volatility at the date of grant was based on the historical volatility of the Company over the performance period.

The assumptions used to value the market-based RSUs granted in 2016 were as follows:

	December 31, 2016
Volatility	44.98%
Risk-free interest rate	1.08%
Dividend yield	—

The fair value of the market-based RSUs is expensed over the derived service period for each separate vesting tranche. The derived service period for the vesting tranches of the market-based RSUs ranges between 1.01 and 1.98 years.

SARs

The Company has granted SARs under the 2007 Stock Plan. The SARs will be settled in stock at the time of exercise and vest four years from the date of grant subject to the recipient's continued employment with the Company. The number of shares issued upon the exercise of the SARs is calculated as the difference between the share price of the Company's stock on the date of exercise and the date of grant multiplied by the number of SARs divided by the share price on the exercise date.

The following table summarizes the Company's SARs activity for the year ended December 31, 2018 (number of shares and intrinsic value in thousands):

	Stock appreciation rights	Weighted average exercise price	Weighted average remaining contractual term (year)	Aggregate intrinsic value (1)
Outstanding, December 31, 2017	356	\$ 10.97		
Granted	—	—		
Exercised	(69)	11.17		
Forfeited	—	—		
Expired	—	—		
Outstanding, December 31, 2018	287	\$ 10.92	1.86	\$ 5,869
Exercisable at December 31, 2018	287	\$ 10.92	1.86	\$ 5,869
Vested and expected to vest at December 31, 2018	287	\$ 10.92	1.86	\$ 5,869

(1) The aggregate intrinsic value was calculated based on the positive difference between the estimated fair value of the Company's common stock on December 31, 2018 of \$31.40 and the exercise price of the underlying SARs.

The Company did not grant SARs in 2018, 2017 and 2016.

MSUs

In 2018, 2017 and 2016, the Company granted MSUs to certain executive employees under the Stock Plans. The MSUs are performance-based awards that vest based upon the Company's relative shareholder return. The actual number of MSUs that will be eligible to vest is based on the total shareholder return of the Company relative to the total shareholder return of the Index over the three year Performance Period. The MSUs vested on January 1, 2018 and March 3, 2018, and will vest on March 1, 2019, March 1, 2020, October 9, 2020 and January 10, 2021, respectively. The MSUs maximum number of shares issuable upon vesting is 200% of the MSUs initially granted.

The following table summarizes the Company's MSUs activity for the year ended December 31, 2018 (number of shares and intrinsic value in thousands):

	Number of unvested awards	Weighted average grant date fair value	Weighted average remaining contractual term (year)	Aggregate intrinsic value (1)
Unvested at December 31, 2017	387	\$ 23.48		
Granted	117	38.18		
Exercised	(85)	31.83		
Forfeited	—	—		
Expired	—	—		
Unvested at December 31, 2018	419	\$ 25.90	1.10	\$ 13,162

(1) The aggregate intrinsic value was calculated based on the positive difference between the estimated fair value of the Company's common stock on December 31, 2018 of \$31.40 and the grant date fair value of the underlying MSUs.

The Company estimates the fair value of MSUs on the date of grant using a Monte Carlo simulation model. The determination of fair value of the MSUs is affected by the Company's stock price and a number of assumptions including the expected volatilities of the Company's stock and the Index, its risk-free interest rate and expected dividends. The Company's expected volatility at the date of grant was based on the historical volatilities of the Company and the Index over the Performance

Period. The Company did not estimate a forfeiture rate for the MSUs due to the limited size, the vesting period and nature of the grantee population and the lack of history of granting this type of award.

Significant assumptions used in the Monte Carlo simulation model for MSUs granted during the years ended December 31, 2018, 2017 and 2016 are as follows:

	For the Year Ended December 31,		
	2018	2017	2016
Volatility	43.67%	45.38%	44.06%
Risk-free interest rate	2.12%	1.56%	1.04%
Expected option life in years	2.97	3.07	2.93
Dividend yield	—	—	—

The assumptions related to fiscal year 2017 are presented on a weighted average basis for the various awards granted throughout the period.

Employee Stock Purchase Plan

In June 2013, the Board of Directors authorized an Employee Stock Purchase Plan ("ESPP") which provides for eligible employees to purchase shares on an after-tax basis in an amount between 1% and 10% of their annual pay: (i) on June 30 of each year at a 5% discount of the fair market value of the Company's common stock on January 1 or June 30, whichever is lower, and (ii) on December 31 of each year at a 5% discount of the fair market value of the Company's common stock on July 1 or December 31, whichever is lower. An employee may not purchase more than \$5,000 in either of the six-month measurement periods described above or more than \$10,000 annually. In November 2015, the Board of Directors amended the ESPP plan to increase the discount to 15% of the fair market value of the Company's common stock effective January 1, 2016. The amendment did not change the accounting treatment of the ESPP plan. During the year ended December 31, 2018, the Company issued 75,546 shares under the ESPP. As of December 31, 2018, 215,555 shares remain authorized and available for issuance under the ESPP. As of December 31, 2018, the Company held approximately \$0.9 million on behalf of employees for future purchases under the ESPP and this amount was recorded in accrued liabilities in the Company's Consolidated Balance Sheet.

14. Income Taxes

The income tax provision consisted of the following for the years ended December 31, 2018, 2017 and 2016 (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Current:			
Federal	\$ (252)	\$ —	\$ 19
State and Foreign	663	669	402
	411	669	421
Deferred:			
Federal	(211)	(488)	51
State	—	(32)	(2)
Income tax provision	<u>\$ 200</u>	<u>\$ 149</u>	<u>\$ 470</u>

The differences between the effective tax rates reflected in the total provision for income taxes and the U.S. federal statutory rate of 34% for the years ended December 31, 2018, 2017 and 2016, respectively, were as follows (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Provision at the U.S. federal statutory rate	\$ (13,464)	\$ (26,443)	\$ (25,338)
Increase (decrease) resulting from:			
State income taxes, net of federal taxes	46	18	3
Nondeductible expenses	414	373	457
Acquisition-related expense	—	245	(4)
Statutory to GAAP income adjustment	(221)	(77)	(274)
Foreign Tax Expense	—	—	2
Noncash share-based compensation	(394)	(3,405)	604
Other	(153)	—	49
Incremental benefits for tax credits	(1,656)	(1,711)	(1,663)
Change in tax rate/income subject to lower tax rates	(1,824)	2,625	—
Change related to prior tax years	(4,800)	(2,331)	(856)
Change related to US tax reform	1,835	31,359	—
Change in valuation allowance	20,417	(504)	27,490
Income tax provision	<u>\$ 200</u>	<u>\$ 149</u>	<u>\$ 470</u>

The Company's effective tax rate was 0% , 0% and (1)% for the years ended December 31, 2018 , 2017 and 2016 , respectively. During the year ended December 31, 2018 , the Company's effective tax rate was impacted primarily by changes in valuation allowance, foreign income taxes and other nondeductible expenses.

On December 22, 2017, the Tax Cuts and Jobs Act ("TCJA") was signed into law in the U.S. and included a broad range of tax reform proposals affecting businesses, including corporate tax rates, business deductions, and international tax provisions. The Tax Cuts and Jobs Act reduced the U.S. corporate income tax rate to 21% effective January 1, 2018.

The TCJA imposes a repatriation tax on any accumulated offshore earnings and profit. As of December 31, 2018 , the Company has reviewed the offshore earnings and profits and has no additional earnings to repatriate and has provided for no tax. . Based on the current accumulated loss in the foreign jurisdictions, the Company has no global intangible low-taxed income ("GILTI") to report for December 31, 2018. The Company is under the revenue requirements to be subject to the base erosion and avoidance tax ("BEAT"), however, it has reviewed the transactions with foreign affiliates and does not believe there are payments that qualify under BEAT. The TCJA created the foreign derived intangible income ("FDII") which allows for a deduction for certain types of foreign income. However, since the Company is in a current net operating loss position, no deduction is allowable for the current year.

In December 2017, the SEC staff issued Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act (SAB 118), which allowed the Company to record provisional amounts during a measurement period not to extend beyond one year of the enactment date. As a result, the Company previously provided a provisional estimate of the effect of the TCJA in the Consolidated Financial Statements. Upon filing of the 2017 income tax returns in the fourth quarter of 2018, the Company completed its analysis to determine the final effect of the TCJA on year end 2017. The Company recorded a final SAB 118 adjustment on the remeasurement of deferred taxes of approximately \$1.8 million . This amount was fully offset by a change in valuation allowance.

The tax effects of temporary differences and other tax attributes that give rise to significant portions of the deferred tax assets and liabilities as of December 31, 2018 and 2017 are as follows (in thousands):

	Year Ended December 31,	
	2018	2017
Noncurrent deferred taxes:		
Property and equipment	\$ (528)	\$ (847)
Noncash share-based compensation	6,922	6,373
Disallowed interest expense	4,574	—
Capitalized software	(1,533)	(1,397)
Amortization	(4,110)	(5,096)
R&E tax credit carryforwards	10,603	9,340
Deferred revenue	2,680	2,996
Federal Net Operating Losses ("NOLs")	58,601	46,907
State NOLs	2,319	1,050
State Credits	2,005	1,613
Foreign NOLs	8,945	9,057
Foreign tax credit carryforward	2,462	2,521
Other	1,291	1,425
Total noncurrent deferred tax assets	94,231	73,942
Less: Valuation allowance	(94,231)	(74,153)
Total noncurrent deferred tax liability	—	(211)
Total net deferred tax liability	\$ —	\$ (211)

The net deferred tax liability is classified as other liabilities, noncurrent in the accompanying Consolidated Balance Sheets.

The Company has federal and state net operating loss carryforwards related to current and prior year operations and acquisitions. Internal Revenue Code Section 382 ("Section 382") places certain limitations on the annual amount of U.S. net operating loss carryforwards that can be utilized when a change of ownership occurs. The Company believes the past acquisitions were changes in ownership pursuant to Section 382, subjecting federal acquired net operating losses to limitations. According to French tax law the net operating loss carryforwards are not subject to ownership change limitations.

The U.S. federal and foreign net operating loss and R&E tax credit carryforward amount available to be used in future periods, taking into account the Section 382 annual limitation and current year losses, is approximately \$310.0 million and \$12.6 million, respectively. The Company's net operating losses will begin to expire in 2024, R&E credits will begin to expire in 2031, and foreign tax credits will begin to expire in 2022. The U.S. net operating losses generated in 2018 have no expiration. Also included in net operating losses are \$35.8 million of French carryforwards which have no expiration.

As of December 31, 2014, the Company determined it was more likely than not that it would be unable to fully utilize the majority of its U.S. and state deferred tax assets. As a result, the Company had recorded a valuation allowance against those assets to the extent that they cannot be realized through net operating loss carrybacks to prior years. This valuation allowance is evaluated periodically and will be reversed partially or in whole if business results and the economic environment have sufficiently improved to support realization of some or all of the Company's deferred tax assets. In performing the analysis throughout 2018, the Company determined that there was no sufficient positive evidence to outweigh the current and historic negative evidence to determine that it was more likely than not that the deferred assets would not be realized. Therefore, the Company continues to have a valuation allowance against net deferred tax assets as of December 31, 2018 and 2017. During the year ended December 31, 2018, the Company finalized the deferred tax liabilities assumed upon the acquisition of Vayant. An additional release of valuation allowance was recorded in that period.

Undistributed earnings of the Company's foreign subsidiaries are considered permanently reinvested and, accordingly, no provision for U.S. federal or state income taxes or non-U.S. withholding taxes has been provided thereon. The cumulative amount of positive undistributed earnings of the Company's non-U.S. subsidiaries, if any, was minimal for the years ended December 31, 2018 and 2017. The determination of the related deferred tax liability, which requires complex analysis of international tax situations related to repatriation, is not practical at this time. The Company is presently investing in international operations located in Europe, North America, and Australia. The Company is funding the working capital needs of its foreign

operations through its U.S. operations. In the future, the Company plans to utilize its foreign undistributed earnings, as well as continued funding from its U.S. operations, to support its continued foreign investment.

For each of the years ended December 31, 2018, 2017 and 2016, the Company had approximately \$0.2 million of net unrecognized tax benefits which, if recognized, would impact the Company's effective tax rate. The Company recorded immaterial amounts for interest and penalties to tax expense as of December 31, 2018, 2017 and 2016, respectively. The Company believes that it is reasonably possible that there will be no change in the unrecognized tax benefits within the next twelve months.

The Company is not subject to or aware of any forth-coming income tax examinations at this time. The Company has received a notice of a transfer pricing review by the Bulgarian tax authorities. At this time, there is no adjustment expected. The Company files tax returns in the U.S. and various foreign jurisdictions. The Company is subject to U.S. federal income tax examination for the calendar tax years 2016, 2015, 2014 and, 2013 and state and foreign income tax examination for various years depending on the statutes of limitation of those jurisdictions.

The following table sets forth the changes to the Company's unrecognized tax benefit for the year ended December 31, 2018, 2017 and 2016 (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Beginning balance	\$ 183	\$ 192	\$ 192
Changes based on tax positions related to prior year	—	—	—
Changes due to settlement	—	(9)	—
Ending balance	<u>\$ 183</u>	<u>\$ 183</u>	<u>\$ 192</u>

The table above has been updated to reflect gross tax liability, exclusive of interest and penalties and other offsetting amounts.

15. Convertible Senior Notes

The Company issued \$143.8 million principal amount of convertible senior notes in December 2014 (the "2019 Notes") and \$106.3 million principal amount of convertible senior notes in June 2017 (the "2047 Notes" and collectively with the 2019 Notes, the "Notes"). The interest rates for the Notes are fixed at 2.0% per annum. Interest is payable semi-annually in arrears on June 1 and December 1 of each year, commencing on June 1, 2015 for the 2019 Notes, and on December 1, 2017 for the 2047 Notes. The 2019 Notes mature on December 1, 2019, unless redeemed or converted in accordance with their terms prior to such date. The 2047 Notes mature on June 1, 2047, unless repurchased, redeemed or converted in accordance with their terms prior to such date.

Each \$1,000 of principal of the 2019 Notes will initially be convertible into 29.5972 shares of the Company's common stock, which is equivalent to an initial conversion price of approximately \$33.79 per share. Each \$1,000 of principal amount at maturity of the 2047 Notes had an issue price of \$880, and will initially be convertible into 20.5624 shares of the Company's common stock, which is equivalent to an initial conversion price of approximately \$48.63 per share. The initial conversion price for each of the Notes is subject to adjustment upon the occurrence of certain specified events. An amount equal to the difference between the issue price and the principal amount at maturity will accrete to the 2047 Notes in accordance with the schedule set forth in the 2047 Notes. The issue price plus such accreted amount of the 2047 Notes is referred to herein as the "accreted principal amount." On June 1, 2022, the accreted principal amount will accrete to 100% of the principal amount at maturity.

The Notes are each general unsecured obligations and rank senior in right of payment to all of the Company's indebtedness that is expressly subordinated in right of payment to the Notes, rank equally in right of payment with all of the Company's existing and future liabilities that are not so subordinated, are effectively junior to any of the Company's secured indebtedness to the extent of the value of the assets securing such indebtedness and are structurally subordinated to all indebtedness and other liabilities (including trade payables but excluding intercompany obligations owed to the Company or its subsidiaries).

On or after September 1, 2019 to the close of business on the second scheduled trading day immediately preceding the maturity date, holders may convert all or any portion of their 2019 Notes regardless of the contingent conversion conditions described herein. Upon conversion, the Company will pay or deliver cash, shares of its common stock or a combination of cash and shares of its common stock, at its election, as described in the indenture governing the 2019 Notes.

On or before June 1, 2021, and subject to the satisfaction of certain conditions, the Company is entitled to elect to redeem all or any portion of the 2047 Notes at a redemption price equal to 100% of the accreted principal amount of the 2047 Notes, plus accrued and unpaid interest to, but excluding, the redemption date, if the daily volume weighted average price of the Company's common stock is greater than or equal to 130% of the conversion price for at least 20 trading days during any 30 consecutive trading day period. After June 1, 2021, the Company will be entitled to elect to redeem all or any portion of the 2047 Notes (without regard to the price of the Company's common stock) at a redemption price equal to the then current accreted principal amount of the 2047 Notes, plus accrued and unpaid interest to, but excluding, the redemption date.

Holders may convert their 2019 Notes at their option at any time prior to the close of business on the business day immediately preceding September 1, 2019 only under the following circumstances:

- during any calendar quarter commencing after the calendar quarter ending on March 31, 2015, if the last reported sale price of the common stock for at least 20 trading days (whether or not consecutive) during a period of 30 consecutive trading days ending on the last trading day of the immediately preceding calendar quarter is greater than or equal to 130% of the conversion price on each applicable trading day;
- during the five consecutive business day period immediately following any five consecutive trading day period in which the trading price per \$1,000 principal amount of 2019 Notes for each trading day of the measurement period was less than 98% of the product of the last reported sale price of the Company's common stock and the conversion rate on each such trading day; or
- upon the occurrence of specified corporate events.

Holders may convert their 2047 Notes at their option on any day prior to the close of business on the business day immediately preceding March 1, 2047 under the following circumstances:

- during any calendar quarter commencing after the calendar quarter ending September 30, 2017, if the last reported sale price of the Company's common stock for 20 or more trading days (whether or not consecutive) in a period of 30 consecutive trading days ending on the last trading day of the immediately preceding calendar quarter exceeds 130% of the applicable conversion price in effect on each such trading day;
- during the five consecutive business day period immediately following any five consecutive trading day period (the "Measurement Period") in which the trading price per 2047 Note for each day of that Measurement Period was less than 98% of the product of the last reported sale price of the Company's common stock and the conversion rate on each such day; or
- upon the occurrence of specified corporate events.

The 2047 Notes will also be convertible, regardless of the foregoing circumstances, at any time from, and including, March 1, 2047 until the close of business on the second scheduled trading day immediately preceding the applicable maturity date. Each holder of the 2047 Notes has the right to require the Company to repurchase for cash all or any portion of such holder's 2047 Notes on June 1, 2022 at a price per \$1,000 principal amount of the 2047 Notes equal to the accreted principal amount at maturity plus accrued and unpaid interest to, but excluding, the repurchase date.

If a fundamental change (as defined in the relevant indenture governing the applicable series of Notes) occurs prior to the maturity date, holders of each of the 2019 Notes and 2047 Notes may require the Company to repurchase all or a portion of their notes for cash at a repurchase price equal to 100% of the principal amount at maturity of the Notes, plus any accrued and unpaid interest to, but excluding, the repurchase date. If such a fundamental change occurs prior to June 1, 2022, holders of the 2047 Notes may also require the Company to repurchase all or a portion of their notes for cash at a repurchase price equal to the then current accreted principal amount of the Notes, plus any accrued and unpaid interest to, but excluding, the repurchase date. In addition, if specific corporate events occur prior to the applicable maturity date, the Company will be required to increase the conversion rate for holders who elect to convert their notes in certain circumstances. Holders who convert their 2047 Notes in connection with a Make-Whole Fundamental Change (as defined in the indenture governing the 2047 Notes) or in connection with a redemption of such 2047 Notes on or prior to June 1, 2021 will, under certain circumstances, be entitled to a make-whole premium in the form of an increase in the conversion rate determined by reference to a make-whole table set forth in such indenture.

As of December 31, 2018, the 2019 Notes and the 2047 Notes are not yet convertible.

In accordance with accounting guidance on embedded conversion features, the Company valued and bifurcated the conversion options associated with each of the 2019 Notes and 2047 Notes from the respective host debt instrument, which is

referred to as debt discount and recorded the conversion option of each of the Notes in stockholders' equity. The equity component for each Note is not remeasured as long as such Note continues to meet the conditions for equity classification.

In accounting for the transaction costs for each of the Notes issuances, the Company allocated the costs incurred to the liability and equity components in proportion to the allocation of the proceeds from issuance to the liability and equity components. Issuance costs attributable to the liability component, totaling \$4.3 million for the 2019 Notes and \$2.7 million for the 2047 Notes, are being amortized to expense over the expected life of each Note using the effective interest method. Issuance costs attributable to the equity component related to the conversion option, totaling \$1.2 million for the 2019 Notes and \$0.3 million for the 2047 Notes, were netted with the equity component in stockholders' equity.

The Notes consist of the following (in thousands):

	December 31, 2018	December 31, 2017
Liability component:		
Principal	\$ 250,000	\$ 250,000
Less: debt discount, net of amortization	(24,810)	(36,797)
Net carrying amount	<u>\$ 225,190</u>	<u>\$ 213,203</u>
Equity component ⁽¹⁾	<u>\$ 37,560</u>	<u>\$ 37,560</u>

(1) Recorded within additional paid-in capital in the Consolidated Balance Sheet. As of December 31, 2018, it included \$28.7 million and \$8.8 million related to the 2019 Notes and the 2047 Notes, respectively, net of \$1.2 million and \$0.3 million issuance cost in equity, respectively.

The following table sets forth total interest expense recognized related to the Notes (in thousands):

	Year Ended December 31,	
	2018	2017
2.0% coupon	\$ 5,000	\$ 3,991
Amortization of debt issuance costs	1,419	1,127
Amortization of debt discount	10,567	8,100
Total	<u>\$ 16,986</u>	<u>\$ 13,218</u>

As of December 31, 2018 and December 31, 2017, the fair value of the principal amount of the Notes was \$251.5 million and \$246.6 million, respectively. The estimated fair value was determined based on inputs that are observable in the market or that could be derived from, or corroborated with, observable market data, including the Company's stock price and interest rates, which represents level 2 in the fair value hierarchy.

As of December 31, 2018, the remaining life of the 2019 Notes and the 2047 Notes is approximately 11 months and 41 months, respectively.

Note Hedge and Warrant Transactions

Concurrently with the offering of the 2019 Notes, the Company entered into separate convertible note hedge (the "Note Hedge") and warrant (the "Warrant") transactions. Taken together, the purchase of the Note Hedge and the sale of the Warrant are intended to offset any actual dilution from the conversion of the 2019 Notes and to effectively increase the overall conversion price of the 2019 Notes from \$33.79 to \$45.48 per share. The total cost of the Note Hedge transaction was \$29.4 million. The Company received \$17.1 million in cash proceeds from the sale of the Warrant.

Pursuant to the Warrants, if the average market value per share of the Company's common stock for the reporting period, as measured under the Warrant, exceeds the strike price of the Warrant, the Warrant will have a dilutive effect on the Company's earnings per share. Holders of the 2019 Notes and Note Hedge will not have any rights with respect to the Warrant, as the Note Hedge is not part of the 2019 Notes or the Warrant. The Warrant is not part of the 2019 Notes or Note Hedge. Both the Note Hedge and Warrant have been accounted for as part of additional paid-in capital.

16. Credit Facility

In January 2017, the Company, through its wholly owned subsidiary PROS, Inc., entered into an amendment to extend its \$50 million secured Credit Agreement (the "Revolver") with the lenders party thereto and Wells Fargo Bank, National Association as agent for the lenders party thereto. The Revolver is for a five year term expiring in July 2022, with interest paid at the end of the applicable one month, three month or six month interest period at a rate per annum equal to LIBOR plus an applicable margin of 1.5% to 2.25% or the Federal Funds Rate plus an applicable margin of 1.5% to 2.25% . Borrowings under the Revolver are collateralized by a first priority interest in and lien on all of the Company's material assets .

The Revolver contains affirmative and negative covenants, including covenants which restrict the ability of the Company to, among other things, create liens, incur additional indebtedness and engage in certain other transactions, in each case subject to certain exclusions. In addition, the Revolver contains certain financial covenants which become effective in the event the Company's liquidity falls below \$50 million or upon the occurrence of an event of default. As of December 31, 2018 , the Company was in compliance with all financial covenants in the Revolver.

As of December 31, 2018 and 2017 , \$0.1 million and \$0.2 million , respectively, of unamortized debt issuance costs related to the Revolver is included in prepaid and other current assets and other assets, noncurrent in the Consolidated Balance Sheets, respectively. For the years ended December 31, 2018 and 2017 , the Company recorded an immaterial amount of amortization of debt issuance cost which is included in other income (expense), net in the Consolidated Statements of Comprehensive Income (Loss). As of December 31, 2018 , the Company had no outstanding borrowings under the Revolver.

17. Commitments and Contingencies

Litigation

The Company is involved in various legal proceedings, claims and litigation which arise in the ordinary course of the business. The Company makes a provision for a liability relating to legal matters when it is both probable that a liability has been incurred and the amount of the loss can be reasonably estimated. These provisions are reviewed at least quarterly and adjusted to reflect the impacts of negotiations, settlements, rulings, advice of legal counsel and other information and events pertaining to a particular matter. The Company is not currently involved in any outstanding litigation that it believes, individually or in the aggregate, will have a material adverse effect on its business, financial condition, results of operations or cash flows.

Purchase Commitments

In the ordinary course of business, the Company enters into various purchase commitments for goods and services.

In December 2018, the Company entered into a noncancelable agreement with a computing infrastructure vendor that expires in December 2021. The purchase commitment as of December 31, 2018 was \$6.4 million for the remaining period under the three-year agreement.

In June 2017, the Company entered into a noncancelable agreement with a computing infrastructure vendor that expires in June 2020. The purchase commitment as of December 31, 2018 was \$12.6 million for the remaining period under the three-year agreement.

Contractual Obligations

In September 2018, the Company entered into an agreement of limited partnership related to a venture fund, pursuant to which the Company committed to make a capital contribution of \$2.3 million within the next five years.

Indemnification

The Company's software agreements generally include certain provisions for indemnifying customers against liabilities if the Company's software solutions infringe a third party's intellectual property rights. To date, the Company has not incurred any losses as a result of such indemnifications and has not accrued any liabilities related to such obligations in the Company's Consolidated Financial Statements.

Lease Commitments

The Company leases office space and office equipment under non-cancelable operating leases that expire at various dates. The Company incurred approximately \$4.3 million , \$3.9 million and \$4.1 million of total rent expense for the years ended December 31, 2018 , 2017 and 2016 , respectively. As of December 31, 2018 , the future minimum lease commitments related to lease agreements were as follows:

Year Ending December 31,	Amount
2019	\$ 4,164
2020	1,649
2021	5,115
2022	6,181
2023	5,679
2024 and thereafter	57,365
Total minimum lease payments	\$ 80,153

The Company's headquarters are located in Houston, Texas, where it currently leases approximately 98,000 square feet of office space until October 31, 2019. In November, 2018, the Company entered into an agreement to lease approximately 118,000 square feet of office space for a new headquarter location which is expected to be occupied in the fourth quarter of 2019. The lease expires in August 2033.

The Company also has smaller regional offices, including in London, England; Toulouse, France; San Francisco, California; and Sofia, Bulgaria. The Company leases approximately 3,000 square feet of office space in London, approximately 14,000 square feet of space in Toulouse, approximately 6,600 of space in San Francisco, and approximately 23,000 square feet of space in Sofia.

The Company had no capital leases at December 31, 2018 and 2017 .

18. Segment and Geographic Information

The Company operates as one segment with a single reporting unit. Operating segments are the components of an enterprise where separate financial information is evaluated regularly by the chief operating decision-maker, who is the Company's Chief Executive Officer, in deciding how to allocate resources and assessing financial performance. The Company's chief operating decision maker allocates resources and assesses performance based upon discrete financial information at the consolidated level.

Revenue by Geography

The Company presents financial information on a consolidated basis and does not assess the profitability of its geographic regions. Accordingly the Company does not attempt to comprehensively assign or allocate costs to these regions and does not produce reports for, or measure the performance of, its geographic regions based on any asset-based metrics.

International revenue for the years ended December 31, 2018 , 2017 and 2016 , amounted to approximately \$128.5 million , \$105.7 million and \$96.5 million , respectively, representing 65% , 63% and 63% , respectively, of annual revenue.

The following geographic information is presented for the years ended December 31, 2018, 2017 and 2016. The Company categorizes geographic revenues based on the location of the customer's headquarters.

	Year Ended December 31,					
	2018		2017		2016	
	Revenue	Percent	Revenue	Percent	Revenue	Percent
The Americas:						
United States of America	\$ 68,482	35%	\$ 63,097	37%	\$ 56,774	37%
Other	18,378	9%	13,645	8%	9,335	6%
Subtotal	86,860	44%	76,742	45%	66,109	43%
Germany	20,171	10%	17,421	10%	10,042	7%
The Rest of Europe	40,776	21%	33,852	20%	34,613	23%
Asia Pacific	32,090	16%	26,528	16%	30,457	20%
The Middle East	15,092	8%	11,437	7%	10,567	7%
Africa	2,035	1%	2,836	2%	1,488	1%
Total revenue	\$ 197,024	100%	\$ 168,816	100%	\$ 153,276	100%

19. Concentrations of Credit Risk

The Company's financial instruments that are exposed to concentrations of credit risk consist primarily of cash and cash equivalents, marketable securities and trade accounts receivable. The Company's deposits exceed federally insured limits. For the year ended December 31, 2018, no customer accounted for 10% or more of trade accounts receivables. For the years ended December 31, 2018, 2017 and 2016, no single customer accounted for 10% or more of revenue.

20. Related-Party Transactions

The Company currently has employment agreements with its executive officers. In the event of termination of employment other than for cause, the employment agreements provide separation benefits, including twelve to eighteen months of salary, as well as the vesting of certain equity awards.

21. Employee Retirement Savings Plan

The Company has a 401(k) savings plan for all eligible employees in the United States. Historically, the Company's matching contribution has been 50% of the first 6% of employee contributions, and the Company may also make discretionary contributions. Matching contributions by the Company in 2018, 2017 and 2016 totaled approximately \$2.4 million, \$2.0 million and \$1.9 million, respectively.

22. Quarterly Results (Unaudited)

The following table presents certain unaudited quarterly financial data for the years ended December 31, 2018 and 2017. This information has been prepared on the same basis as the accompanying Consolidated Financial Statements and all necessary adjustments have been included in the amounts below to state fairly the selected quarterly information when read in conjunction with the accompanying Consolidated Financial Statements and Notes thereto.

	Quarter Ended			
	December 31, 2018	September 30, 2018	June 30, 2018	March 31, 2018
Total revenue	\$ 52,613	\$ 49,075	\$ 47,426	\$ 47,910
Gross profit	\$ 33,155	\$ 29,599	\$ 28,702	\$ 28,389
Loss from operations	\$ (9,609)	\$ (11,866)	\$ (12,993)	\$ (14,747)
Net loss attributable to PROS Holdings, Inc.	\$ (12,760)	\$ (15,786)	\$ (16,844)	\$ (18,856)
Net loss attributable to common stockholders per share:				
Basic	\$ (0.34)	\$ (0.44)	\$ (0.52)	\$ (0.58)
Diluted	\$ (0.34)	\$ (0.44)	\$ (0.52)	\$ (0.58)

	Quarter Ended			
	December 31, 2017	September 30, 2017	June 30, 2017	March 31, 2017
Total revenue	\$ 46,344	\$ 41,937	\$ 40,406	\$ 40,129
Gross profit	\$ 28,197	\$ 24,213	\$ 24,320	\$ 23,520
Loss from operations	\$ (12,815)	\$ (17,750)	\$ (16,710)	\$ (17,668)
Net loss attributable to PROS Holdings, Inc.	\$ (16,980)	\$ (21,226)	\$ (19,513)	\$ (20,207)
Net loss attributable to common stockholders per share:				
Basic	\$ (0.53)	\$ (0.67)	\$ (0.62)	\$ (0.65)
Diluted	\$ (0.53)	\$ (0.67)	\$ (0.62)	\$ (0.65)

Schedule II
Valuation and Qualifying Accounts

	Balance at beginning of period	Additions charged to costs and expenses	Deductions (1)	Other (2)	Balance at end of period
Allowance for doubtful accounts					
2018	\$ 760	\$ 223	\$ —	\$ (5)	\$ 978
2017	\$ 760	\$ —	\$ —	\$ —	\$ 760
2016	\$ 586	\$ 887	\$ (713)	\$ —	\$ 760
Valuation allowance					
2018	\$ 74,153	\$ 20,417	\$ —	\$ (339)	\$ 94,231
2017	\$ 69,049	\$ 5,872	\$ —	\$ (768)	\$ 74,153
2016	\$ 44,321	\$ 26,634	\$ —	\$ (1,906)	\$ 69,049

(1) Deductions column represents the reversal of additions previously charged to costs and expenses and uncollectible accounts written off, net of recoveries.

(2) Other column represents the cumulative translation adjustment impact on the allowance.

Item 16. Form 10-K summary

Registrants may voluntarily include a summary of information required by Form 10-K under this Item 16. The Registrant has elected not to include such summary information.

Signatures

Pursuant to the requirements of Section 13 or 15(d) of the Exchange Act, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized, on February 15, 2019 .

PROS Holdings, Inc.

By: /s/ Andres Reiner
Andres Reiner
President and Chief Executive Officer

KNOW BY THESE PRESENT, that each person whose signature appears below constitutes and appoints each of Andres Reiner and Stefan Schulz, his attorney-in-fact, with the power of substitution, for him in any and all capacities, to sign any amendments to this report on Form 10-K and to file the same, with exhibits thereto and other documents in connection therewith, with the Securities and Exchange Commission, hereby ratifying and confirming all that each of the attorney-in-fact, or his substitute or substitutes, may do or cause to be done by virtue hereof.

Pursuant to the requirement of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

<u>Signatures</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Andres Reiner</u> Andres Reiner	President, Chief Executive Officer, and Director (Principal Executive Officer)	February 15, 2019
<u>/s/ Stefan Schulz</u> Stefan Schulz	Executive Vice President and Chief Financial Officer (Principal Accounting Officer)	February 15, 2019
<u>/s/ William Russell</u> William Russell	Chairman of the Board	February 15, 2019
<u>/s/ Penelope Herscher</u> Penelope Herscher	Director	February 15, 2019
<u>/s/ Greg B. Petersen</u> Greg B. Petersen	Director	February 15, 2019
<u>/s/ Leslie J. Rechan</u> Leslie J. Rechan	Director	February 15, 2019
<u>/s/ Timothy V. Williams</u> Timothy V. Williams	Director	February 15, 2019
<u>/s/ Mariette M. Woestemeyer</u> Mariette M. Woestemeyer	Director	February 15, 2019
<u>/s/ Ronald F. Woestemeyer</u> Ronald Woestemeyer	Director	February 15, 2019

Exhibit Index

Exhibit No.	Description	Provided Herewith	Incorporated by Reference	
			Form	Filing Date
3.1	Amended and Restated Certificate of Incorporation.		S-1/A	6/15/2007
3.2	Amended and Restated Bylaws.		8-K	8/21/2013
4.1	Specimen certificate for shares of common stock.		S-1/A	6/11/2007
4.2	Indenture, dated December 10, 2014, between Registrant and Wilmington Trust, National Association, as trustee.		8-K	12/10/2014
4.3	Global Note, dated December 10, 2014, between Registrant and Wilmington Trust, National Association, as trustee.		8-K	12/10/2014
4.4	Indenture, dated June 21, 2017, between Registrant and Wilmington Trust, National Association, as trustee.		8-K	6/22/2017
10.1+	2007 Equity Incentive Plan.		S-1/A	6/11/2007
10.2+	Form of Stock Appreciation Rights Agreement under the 2007 Equity Incentive Plan.		10-K	2/22/2013
10.3+	Form of Restricted Stock Units Agreement under the 2007 Equity Incentive Plan.		10-K	2/22/2013
10.4+	Form of Market Stock Units Agreement under the 2007 Equity Incentive Plan.		10-Q	5/2/2013
10.5+	Form of Market Stock Units Agreement under the 2007 Equity Incentive Plan.		10-K	2/15/2017
10.6+	2017 Equity Incentive Plan.		10-Q	8/3/2017
10.7+	Form of Notice of Grant of Market Stock Units and Award Agreement under the 2017 Equity Incentive Plan.		10-Q	8/3/2017
10.8+	Form of Notice of Grant of Stock Option and Award Agreement under the 2017 Equity Incentive Plan.		10-Q	8/3/2017
10.9+	Form of Notice of Grant of Performance Restricted Stock Units and Award Agreement under the 2017 Equity Incentive Plan.		10-Q	8/3/2017
10.10+	Form of Notice of Grant of Restricted Stock Units and Award Agreement under the 2017 Equity Incentive Plan.		10-Q	8/3/2017
10.11+	Form of Notice of Grant of Stock Appreciation Rights and Award Agreement under the 2017 Equity Incentive Plan.		10-Q	8/3/2017
10.12+	Form of Non-Plan Market Stock Units Agreement.		S-8	2/24/2014
10.13+	Form of Non-Plan Restricted Stock Units Agreement.		S-8	2/24/2014
10.14+	Form of Non-Plan Restricted Stock Units Agreement (France).		S-8	2/24/2014
10.15+	Form of Non-Plan Restricted Stock Units Agreement (Performance France).		S-8	2/24/2014
10.16+	Form of Performance Restricted Stock Unit Agreement.		8-K	9/12/2016
10.17+	2013 Employee Stock Purchase Plan.		8-K	6/7/2013
10.18+	Stock Purchase and Stockholders Agreement, dated June 8, 1998, by and among Registrant (as successor in interest to PROS Strategic Solutions, Inc.) and certain stockholders.		S-1	4/4/2007
10.18.1+	Amendment to Stock Purchase and Stockholders Agreement, dated March 26, 2007, by and among Registrant and certain stockholders.		S-1	4/4/2007
10.19+	Registration Rights Agreement, dated June 8, 2007, by and among Registrant, Mariette M. Woestemeyer and Ronald F. Woestemeyer.		S-1/A	6/11/2007
10.20	Office Lease, dated January 31, 2001, by and between PROS, Inc. (as successor in interest to PROS Revenue Management L.P.) and Houston Community College System.		S-1	4/7/2007
10.20.1	First Amendment to Office Lease, dated March 31, 2006, by and between PROS, Inc. (as successor in interest to PROS Revenue Management L.P.) and Houston Community College System.		S-1	4/7/2007
10.20.2	Second Amendment to Office Lease, dated March 1, 2007, by and between PROS, Inc. (as successor in interest to PROS Revenue Management L.P.) and Houston Community College System.		10-K	2/22/2013

10.20.3	<u>Third Amendment to Office Lease, dated July 29, 2011, by and between PROS, Inc. (as successor in interest to PROS Revenue Management L.P.) and Houston Community College System.</u>	8-K	8/3/2011
10.20.4	<u>Fourth Amendment to Office Lease, dated June 27, 2012, by and between PROS, Inc. (as successor in interest to PROS Revenue Management L.P.) and Houston Community College System.</u>	10-K	2/22/2013
10.20.5	<u>Fifth Amendment to Office Lease, dated June 9, 2016, by and between PROS, Inc., and Houston Community College System.</u>	8-K	6/14/2016
10.21	<u>Office Lease Agreement, dated November 30, 2018, by and between PROS, Inc., and Thor Kirby 3 Group, LLC.</u>	8-K	12/4/2018
10.22+	<u>Second Amended and Restated Employment Agreement, dated December 3, 2018, by and between PROS, Inc., Registrant, and Andres D. Reiner.</u>	8-K	12/4/2018
10.23+	<u>Offer Letter, dated as of January 15, 2015, by and between PROS, Inc. and Stefan Schulz.</u>	8-K	1/20/2015
10.24+	<u>Amended and Restated Employment Agreement, dated December 3, 2018, by and between PROS, Inc., Registrant, and Stefan B. Schulz.</u>	8-K	12/4/2018
10.25+	<u>Offer Letter by and between PROS, Inc. and Thomas Dziersk, dated as of October 6, 2017.</u>	8-K	10/6/2017
10.26+	<u>Employment Agreement by and between PROS, Inc., Registrant and Thomas Dziersk, dated as of October 9, 2017.</u>	8-K	10/10/2017
10.27+	<u>Form of Indemnity Agreement entered into among Registrant, its affiliates and its directors and officers.</u>	8-K	8/21/2013
10.28+	<u>Form of Indemnification Agreement to be entered into among Registrant, its affiliates and its directors and officers.</u>	10-K	2/15/2017
10.29	<u>Tender Offer Agreement, dated October 24, 2013, by and between Registrant and Cameleon Software.</u>	8-K	10/24/2013
10.30	<u>Agreement and Plan of Merger, dated December 16, 2013, by and among PROS, Inc., Pandora Merger Sub Corporation, SignalDemand, Inc. and Fortis Advisors LLC.</u>	8-K	12/16/2013
10.31	<u>Agreement and Plan of Merger, dated August 3, 2017, by and among Registrant, Wisdom U.S. Merger Sub Corporation, Vayant Travel Technologies, Inc. and NEVEQ Capital Partners, as agent for Target's securityholders thereunder.</u>	8-K	8/3/2017
10.32	<u>Credit Agreement, dated July 2, 2012, by and among PROS, Inc., Wells Fargo Bank, National Association, as administrative agent, and the Lenders party thereto.</u>	8-K	7/9/2012
10.32.1	<u>Third Amendment to Credit Agreement, dated December 3, 2014, by and among PROS, Inc., Wells Fargo Bank, National Association, as administrative agent, and the Lenders party thereto.</u>	8-K	12/5/2014
10.32.2	<u>Seventh Amendment to Credit Agreement, dated January 27, 2017, by and among PROS, Inc., Wells Fargo Bank, National Association, as administrative agent, and the Lenders party thereto.</u>	8-K	2/2/2017
10.32.3	<u>Ninth Amendment to Credit Agreement, dated June 15, 2017, by and between PROS, Inc., Wells Fargo Bank, National Association, as administrative agent, and the Lenders party thereto.</u>	8-K	6/16/2017
10.33	<u>Purchase Agreement, dated December 4, 2014 by and among Registrant, Goldman, Sachs & Co. and Deutsche Bank Securities Inc., as representatives of the several initial purchasers named therein.</u>	8-K	12/10/2014
10.34	<u>Base Bond Hedge Confirmation, dated December 4, 2014 by and between Registrant and Goldman, Sachs & Co.</u>	8-K	12/10/2014
10.35	<u>Base Bond Hedge Confirmation, dated December 4, 2014 by and between Registrant and Deutsche Bank AG, London Branch.</u>	8-K	12/10/2014
10.36	<u>Additional Bond Hedge Confirmation, dated December 5, 2014 by and between Registrant and Goldman, Sachs & Co.</u>	8-K	12/10/2014
10.37	<u>Additional Bond Hedge Confirmation, dated December 5, 2014 by and between Registrant and Deutsche Bank AG, London Branch.</u>	8-K	12/10/2014
10.38	<u>Base Warrant Confirmation, dated December 4, 2014 by and between Registrant and Goldman, Sachs & Co.</u>	8-K	12/10/2014
10.39	<u>Base Warrant Confirmation, dated December 4, 2014 by and between Registrant and Deutsche Bank AG, London Branch.</u>	8-K	12/10/2014

10.40	Additional Warrant Confirmation, dated December 5, 2014 by and between Registrant and Goldman, Sachs & Co.	8-K	12/10/2014
10.41	Additional Warrant Confirmation, dated December 5, 2014 by and between Registrant and Deutsche Bank AG, London Branch.	8-K	12/10/2014
10.42	Form of Private Placement Purchase Agreement, dated June 15, 2017, between Registrant and each purchaser named therein.	8-K	6/21/2017
21.1	List of Subsidiaries.	X	
23.1	Consent of PricewaterhouseCoopers LLP.	X	
24.1*	Power of Attorney.	X	
31.1	Certification of Chief Executive Officer Pursuant to Exchange Act Rule 13a-14(a)/15d-14(a).	X	
31.2	Certification of Chief Financial Officer Pursuant to Exchange Act Rule 13a-14(a)/ 15d-14(a).	X	
32.1**	Certifications of Chief Executive Officer and Chief Financial Officer Pursuant to 18 U.S.C. Section 1350.	X	

Exhibit No.	Description
--------------------	--------------------

101.INS	XBRL Instance Document.
101.SCH	XBRL Taxonomy Extension Schema Document.
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document.
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document.
101.LAB	XBRL Taxonomy Extension Label Linkbase Document.
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document.

* Reference is made to page F-38 of this Annual Report on Form 10-K.

** This certification shall not be deemed "filed" for purposes of Section 18 of the Securities Act of 1934, or otherwise subject to the liability of that Section, nor shall it be deemed to be incorporated by reference into any filing under the Securities Act of 1933 or the Securities Exchange Act of 1934.

+ Indicates a management contract or compensatory plan or arrangement.

PROS Holdings, Inc.
List of Subsidiaries as of December 31, 2018

<u>Name of Entity</u>	<u>State/Country of Incorporation/Organization</u>
PROS Bulgaria EOOD	Bulgaria
PROS Canada Operations, Ltd.	Canada
PROS CPQ, Inc.	Illinois
PROS Europe Limited	England and Wales
PROS France SAS	France
PROS Germany GmbH	Germany
PROS, Inc.	Delaware
PROS International Technology Limited	Ireland
PROS Middle East Technology Systems L.L.C.	United Arab Emirates
PROS Technology Australia Pty. Ltd.	Australia
PROS Travel Commerce, Inc.	Delaware

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statement on Form S-3 (No. 333-226812) and Form S-8 (Nos. 333-219192, 333-215623, 333-209067, 333-201412, 333-194105, 333-193867, 333-186857, 333-179721, 333-172516, 333-165362, 333-157555, 333-149359 and 333-145237) of PROS Holdings, Inc. of our report dated February 15, 2019 relating to the consolidated financial statements, financial statement schedule and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP

San Jose, California

February 15, 2019

**CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER
PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002**

I, Andres Reiner, certify that:

1. I have reviewed this annual report on Form 10-K of PROS Holdings, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;
 - c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

February 15, 2019

/s/ Andres Reiner

Andres Reiner

President and Chief Executive Officer

**CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER
PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002**

I, Stefan Schulz, certify that:

1. I have reviewed this annual report on Form 10-K of PROS Holdings, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;
 - c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

February 15, 2019

/s/ Stefan Schulz

Stefan Schulz

Executive Vice President and Chief Financial Officer

**CERTIFICATION OF CHIEF EXECUTIVE OFFICER AND CHIEF FINANCIAL OFFICER
PURSUANT TO 18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002**

I, Andres Reiner, certify pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that the annual report of PROS Holdings, Inc., on Form 10-K for the period ended December 31, 2018 fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934 and the information contained in such Form 10-K fairly presents, in all material respects, the financial condition and results of operations of PROS Holdings, Inc.

February 15, 2019

/s/ Andres Reiner

Andres Reiner

President and Chief Executive Officer

I, Stefan Schulz, certify pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that the annual report of PROS Holdings, Inc., on Form 10-K for the period ended December 31, 2018 fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934 and the information contained in such Form 10-K fairly presents, in all material respects, the financial condition and results of operations of PROS Holdings, Inc.

February 15, 2019

/s/ Stefan Schulz

Stefan Schulz

Executive Vice President and Chief Financial Officer

A signed original of this written statement required by Section 906 of the Sarbanes-Oxley Act of 2002 has been provided to PROS Holdings, Inc. and will be retained by PROS Holdings, Inc. and furnished to the Securities and Exchange Commission or its staff upon request. This certification "accompanies" the Form 10-K to which it relates, is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of the Company under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended (whether made before or after the date of the Form 10-K), irrespective of any general incorporation language contained in such filing.