UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-Q

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

For the Quarterly Period ended June 30, 2019

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 000-31311

PDF SOLUTIONS, INC.

(Exact name of Registrant as Specified in its Charter)

Delaware	**25-1701361**
(State or Other Jurisdiction of Incorporation or Organization)	(I.R.S. Employer Identification No.)
2858 De La Cruz Blvd. **Santa Clara, California**	**95050**
(Address of Principal Executive Offices)	(Zip Code)

(408) 280-7900
(Registrant's Telephone Number, Including Area Code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, $0.00015 par value	PDFS	The NASDAQ Stock Market LLC

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 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 pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☑ No ☐

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

Large accelerated filer ☐	Accelerated filer ☑
Non-accelerated filer ☐	Smaller reporting company ☑
	Emerging growth company ☐

If an emerging growth company, indicated 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 Exchange Act). Yes ☐ No ☑

There were 32,442,624 shares of the Registrant's Common Stock outstanding as of August 1, 2019.

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PART I — FINANCIAL INFORMATION

Item 1. Financial Statements

PDF SOLUTIONS, INC.
CONDENSED CONSOLIDATED BALANCE SHEETS
(unaudited)
(in thousands, except par value)

	June 30, 2019	December 31, 2018
ASSETS		
Current assets:		
Cash and cash equivalents	$ 86,817	$ 96,089
Accounts receivable, net of allowance for doubtful accounts of $332 in 2019 and 2018	52,381	51,570
Prepaid expenses and other current assets	8,843	9,562
Total current assets	148,041	157,221
Property and equipment, net	35,846	35,681
Operating lease right-of-use assets, net	7,974	—
Goodwill	2,293	1,923
Intangible assets, net	6,855	5,064
Deferred tax assets	21,378	19,044
Other non-current assets	7,284	6,972
Total assets	$ 229,671	$ 225,905
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 1,813	$ 2,454
Accrued compensation and related benefits	5,158	4,727
Accrued and other current liabilities	2,404	3,235
Operating lease liabilities – current portion	1,875	—
Deferred revenues – current portion	9,026	8,477
Billings in excess of recognized revenues	1,088	635
Total current liabilities	21,364	19,528
Long-term income taxes payable	3,571	3,751
Non-current operating lease liabilities	8,107	—
Other non-current liabilities	1,737	2,831
Total liabilities	34,779	26,110
Commitments and contingencies (Note 13)		
Stockholders' equity:		
Preferred stock, $0.00015 par value, 5,000 shares authorized, no shares issued and outstanding	—	—
Common stock, $0.00015 par value, 70,000 shares authorized: shares issued 41,326 and 40,677, respectively; shares outstanding 32,291 and 32,382, respectively	5	5
Additional paid-in-capital	318,356	310,660
Treasury stock at cost, 9,035 and 8,295 shares, respectively	(88,324)	(79,142)
Accumulated deficit	(33,853)	(30,452)
Accumulated other comprehensive loss	(1,292)	(1,276)
Total stockholders' equity	194,892	199,795
Total liabilities and stockholders' equity	$ 229,671	$ 225,905

See accompanying Notes to Condensed Consolidated Financial Statements (unaudited)

PDF SOLUTIONS, INC.
CONDENSED CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS
(unaudited)
(in thousands, except per share amounts)

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Revenues:				
Solutions	$ 13,429	$ 15,266	$ 30,090	$ 33,456
Gainshare performance incentives	7,139	5,853	11,019	12,400
Total revenues	20,568	21,119	41,109	45,856
Cost of Solutions				
Direct costs of solutions	7,689	10,774	15,413	22,112
Amortization of acquired technology	143	143	287	287
Total cost of solutions	7,832	10,917	15,700	22,399
Gross profit	12,736	10,202	25,409	23,457
Operating expenses:				
Research and development	7,312	7,100	15,558	14,345
Selling, general and administrative	6,940	5,919	13,950	12,294
Amortization of other acquired intangible assets	154	108	262	217
Restructuring charges	—	—	92	—
Total operating expenses	14,406	13,127	29,862	26,856
Loss from operations	(1,670)	(2,925)	(4,453)	(3,399)
Interest and other income (expense), net	111	390	105	59
Loss before income taxes	(1,559)	(2,535)	(4,348)	(3,340)
Income tax benefit	(849)	(439)	(947)	(820)
Net loss	$ (710)	$ (2,096)	$ (3,401)	$ (2,520)
Net loss per share:				
Basic	$ (0.02)	$ (0.07)	$ (0.10)	$ (0.08)
Diluted	$ (0.02)	$ (0.07)	$ (0.10)	$ (0.08)
Weighted average common shares:				
Basic	32,339	31,962	32,412	32,065
Diluted	32,339	31,962	32,412	32,065
Net loss	$ (710)	$ (2,096)	$ (3,401)	$ (2,520)
Other comprehensive income (loss):				
Foreign currency translation adjustments, net of tax	36	(771)	(16)	(246)
Comprehensive loss	$ (674)	$ (2,867)	$ (3,417)	$ (2,766)

See accompanying Notes to Condensed Consolidated Financial Statements (unaudited)

PDF SOLUTIONS, INC.
CONDENDSED CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(unaudited)
(in thousands)

	Six Months Ended June 30, 2019							
	Common Stock		Additional Paid-In Capital	Treasury Stock		Accumulated Deficit	Accumulated Other Comprehensive Loss	Total
	Shares	Amount		Shares	Amount			
Balances, December 31, 2018	32,382	$ 5	$ 310,660	8,295	$ (79,142)	$ (30,452)	$ (1,276)	$ 199,795
Issuance of common stock in connection with employee stock purchase plan	87	-	782	-	-	-	-	782
Issuance of common stock in connection with exercise of options	87	-	518	-	-	-	-	518
Vesting of restricted stock units	104	-	-	-	-	-	-	-
Purchases of treasury stock in connection with tax withholdings on restricted stock grants	-	-	-	54	(557)	-	-	(557)
Repurchases of common stock	(314)	-	-	314	(3,917)	-	-	(3,917)
Stock-based compensation	-	-	3,469	-	-	-	-	3,469
Comprehensive loss	-	-	-	-	-	(2,691)	(52)	(2,743)
Balances, March 31, 2019	32,346	5	315,429	8,663	(83,616)	(33,143)	(1,328)	197,347
Issuance of common stock in connection with employee stock purchase plan	-	-	-	-	-	-	-	-
Issuance of common stock in connection with exercise of options	69	-	326	-	-	-	-	326
Vesting of restricted stock units	176	-	-	-	-	-	-	-
Purchases of treasury stock in connection with tax withholdings on restricted stock grants	-	-	-	72	(918)	-	-	(918)
Repurchases of common stock	(300)	-	-	300	(3,790)	-	-	(3,790)
Stock-based compensation	-	-	2,601	-	-	-	-	2,601
Comprehensive income (loss)	-	-	-	-	-	(710)	36	(674)
Balances, June 30, 2019	32,291	$ 5	$ 318,356	9,035	$ (88,324)	$ (33,853)	$ (1,292)	$ 194,892

	Six Months Ended June 30, 2018							
	Common Stock		Additional Paid-In Capital	Treasury Stock		Accumulated Deficit	Accumulated Other Comprehensive Loss	Total
	Shares	Amount		Shares	Amount			
Balances, December 31, 2017	32,112	$ 5	$ 297,950	7,688	$ (71,793)	$ (27,089)	$ (705)	$ 198,368
Cumulative-effect adjustment from adoption of ASU 2014-09	-	-	-	-	-	4,353	-	4,353
Issuance of common stock in connection with employee stock purchase plan	108	-	1,007	-	-	-	-	1,007
Issuance of common stock in connection with exercise of options	8	-	39	-	-	-	-	39
Vesting of restricted stock units	74	-	-	-	-	-	-	-
Purchases of treasury stock in connection with tax withholdings on restricted stock grants	-	-	-	36	(557)	-	-	(557)
Repurchases of common stock	(338)	-	-	338	(4,123)	-	-	(4,123)
Stock-based compensation	-	-	2,871	-	-	-	-	2,871
Comprehensive income (loss)	-	-	-	-	-	(424)	525	101
Balances, March 31, 2018	31,964	5	301,867	8,062	(76,473)	(23,160)	(180)	202,059
Issuance of common stock in connection with employee stock purchase plan	-	-	-	-	-	-	-	-
Issuance of common stock in connection with exercise of options	51	-	377	-	-	-	-	377
Vesting of restricted stock units	159	-	-	-	-	-	-	-
Purchases of treasury stock in connection with tax withholdings on restricted stock grants	-	-	-	63	(819)	-	-	(819)
Repurchases of common stock	(99)	-	-	99	(1,125)	-	-	(1,125)
Stock-based compensation	-	-	2,699	-	-	-	-	2,699
Comprehensive loss	-	-	-	-	-	(2,096)	(771)	(2,867)

Balances, June 30, 2018	32,075	$ 5	$ 304,943	8,224	$ (78,417)	$ (25,256)	$ (951)	$ 200,324

See accompanying Notes to Condensed Consolidated Financial Statements (unaudited)

PDF SOLUTIONS, INC.
CONDENSED CONSOLIDATED STATEMENTS OF CASH FLOWS
(unaudited)
(in thousands)

	Six Months Ended June 30, 2019	Six Months Ended June 30, 2018
Operating activities:		
Net loss	$ (3,401)	$ (2,520)
Adjustments to reconcile net loss to net cash provided by operating activities:		
Depreciation and amortization	2,634	2,531
Stock-based compensation expense	5,910	5,557
Amortization of acquired intangible assets	549	505
Amortization of costs capitalized to obtain revenue contracts	227	179
Deferred taxes	(2,423)	(1,701)
Loss on disposal of property and equipment	130	3
Reversal of allowance for doubtful accounts	—	(42)
Unrealized loss (gain) on foreign currency forward contract	(55)	47
Changes in operating assets and liabilities:		
Accounts receivable	(811)	4,479
Prepaid expenses and other current assets	491	(1,383)
Other non-current assets	(181)	1,597
Accounts payable	188	(992)
Accrued compensation and related benefits	433	(818)
Accrued and other liabilities	(367)	(475)
Deferred revenues	1,189	2,745
Billings in excess of recognized revenues	453	7
Net cash provided by operating activities	4,966	9,719
Investing activities:		
Proceeds from the sale of property and equipment	50	—
Purchases of property and equipment	(4,054)	(4,810)
Payment for business acquisition	(2,660)	—
Net cash used in investing activities	(6,664)	(4,810)
Financing activities:		
Proceeds from exercise of stock options	844	416
Proceeds from employee stock purchase plan	782	1,007
Repurchases of common stock	(7,707)	(5,248)
Payments for taxes related to net share settlement of equity awards	(1,475)	(1,376)
Net cash used in financing activities	(7,556)	(5,201)
Effect of exchange rate changes on cash and cash equivalents	(18)	(59)
Net change in cash and cash equivalents	(9,272)	(351)
Cash and cash equivalents, beginning of period	96,089	101,267
Cash and cash equivalents, end of period	$ 86,817	$ 100,916
Supplemental disclosure of cash flow information:		
Cash paid during the period for taxes	$ 887	$ 1,104
Cash paid for amounts included in the measurement of operating lease liabilities	$ 781	$ —
Stock-based compensation capitalized as software development costs	$ 168	$ —
Property and equipment received and accrued in accounts payable and accrued and other liabilities	$ 859	$ 1,673

See accompanying Notes to Condensed Consolidated Financial Statements (unaudited)

PDF SOLUTIONS, INC.
NOTES TO CONDENSED CONSOLIDATED FINANCIAL STATEMENTS (UNAUDITED)

1. BASIS OF PRESENTATION AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation

The interim unaudited condensed consolidated financial statements included herein have been prepared by PDF Solutions, Inc. (the "Company") pursuant to the rules and regulations of the Securities and Exchange Commission ("SEC"), including the instructions to the Quarterly Report on Form 10-Q and Article 10 of Regulation S-X. Certain information and footnote disclosures normally included in annual financial statements prepared in accordance with accounting principles generally accepted in the United States of America ("U.S. GAAP") have been condensed or omitted. The interim unaudited condensed consolidated financial statements reflect, in the opinion of management, all adjustments necessary (consisting only of normal recurring adjustments), to present a fair statement of results for the interim periods presented. The operating results for any interim period are not necessarily indicative of the results that may be expected for other interim periods or the full fiscal year. The accompanying interim unaudited condensed consolidated financial statements should be read in conjunction with the audited consolidated financial statements and notes thereto in the Company's Annual Report on Form 10-K for the year ended December 31, 2018.

The condensed consolidated financial statements include the accounts of the Company and its wholly-owned subsidiaries after the elimination of all intercompany balances and transactions.

The condensed consolidated balance sheet at December 31, 2018, has been derived from the audited consolidated financial statements but does not include all disclosures required by accounting principles generally accepted in the United States of America.

Use of Estimates

The preparation of financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Significant estimates in these financial statements include revenue recognition, impairment of goodwill and long-lived assets, accounting for stock-based compensation expense, and income taxes. Actual results could differ from those estimates.

Reclassification of Prior Period Amount

Certain prior period amounts have been reclassified to conform to current year presentation of reporting amortization of costs capitalized to obtain revenue contracts on the Condensed Consolidated Statements of Cash Flows. This reclassification had no effect on the Company's reported net loss or net cash provided by operating activities.

Recently Adopted Accounting Standards

Leases

In February 2016, the Financial Accounting Standards Board (or FASB) issued Accounting Standards Update (ASU) 2016-02, Leases (Topic 842) and subsequent amendments to the initial guidance: ASU 2017-13, ASU 2018-10, ASU 2018-11, ASU 2018-20 and ASU 2019-01 (collectively, Topic 842). Topic 842 aims to increase transparency and comparability among organizations by requiring lessees to recognize leases with a term greater than 12 months as a right-of-use asset ("ROU") and corresponding lease liabilities on the balance sheet, regardless of lease classification, and requiring disclosure of key information about leasing arrangements. The lease liability should be initially measured at the present value of the remaining contractual lease payments. Subsequently, the ROU assets will be amortized generally on a straight-line basis over the lease term, and the lease liability will bear interest expense and be reduced for lease payments. Topic 842 became effective for public companies' financial statements issued for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. A modified retrospective application is required with an option to not restate comparative periods in the period of adoption. The Company adopted Topic 842 on January 1, 2019 using the modified retrospective approach, and financial information for the comparative period was not updated.

In addition, the Company elected the transition package of three practical expedients which allow companies not to reassess (i) whether agreements contain leases, (ii) the classification of leases, and (iii) the capitalization of initial direct costs. Further, the Company elected to not separate lease and non-lease components for all of its leases. The Company also made an accounting policy election to recognize lease expense for leases with a term of 12 months or less on a straight-line basis over the lease term and recognize no right of use asset or lease liability for those leases.

The Company's lease portfolio consists primarily of real estate assets, which include administrative and sales offices, and its research and development laboratory and clean room. Some of these leases also require the Company to pay maintenance, utilities, taxes, insurance, and other operating expenses associated with the leased space. Based upon the nature of the items leased and the structure of the leases, the Company's leases are classified as operating leases and continue to be classified as operating leases under the new accounting standard.

As a result of the adoption of the new lease accounting guidance, the Company recognized on January 1, 2019:

- operating lease liabilities of approximately $10.5 million, which represent the present value of the remaining lease payments, as of the date of adoption, discounted using the Company's incremental borrowing rate of 5.3%, and
- operating lease ROU assets of approximately $8.7 million which represent the operating lease liabilities of $10.5 million, adjusted for (1) deferred rent of approximately $0.3 million, and (2) lease incentives or tenant improvement allowance of $1.5 million.

The adoption of the new lease accounting standard did not have any other impact on the Company's condensed consolidated balance sheet, and did not impact the Company's operating results and cash flows. See Leases, in Note 5 for further information, including further discussion on the impact of adoption and changes in accounting policies relating to leases.

Income Statement – Reporting Comprehensive Income (Loss)

In February 2018, the FASB issued ASU No. 2018-02, Income Statement – Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effect from Accumulated Other Comprehensive Income. This update allows a reclassification from accumulated other comprehensive income to retained earnings for stranded tax effects resulting from the Tax Cuts and Job Act (TCJA) enacted in December 2017. This update became effective for the Company for fiscal years beginning after December 15, 2018 and interim periods within those fiscal years. The Company adopted this standard on January 1, 2019, and it did not have a material impact on its condensed consolidated financial statements and footnote disclosures.

Compensation - Stock Compensation

In June 2018, the FASB issued ASU 2018-07, Compensation – Stock Compensation (Topic 718), Improvements to Nonemployee Share-Based Payment Accounting. This ASU simplifies several aspects of the accounting for nonemployee share-based payment transactions resulting from expanding the scope of Topic 718, to include share-based payment transactions for acquiring goods and services from nonemployees and making guidance consistent with the accounting for employee share-based compensation. The Company adopted this standard on January 1, 2019, and it did not have a material impact on its condensed consolidated financial statements and footnote disclosures.

Management has reviewed other recently issued accounting pronouncements and has determined there are not any that would have a material impact on the condensed consolidated financial statements.

Accounting Standards Not Yet Effective

In June 2016, the FASB issued ASU 2016-13, Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments (ASU 2016-13) and also issued subsequent amendments to the initial guidance: ASU 2018-19, Codification Improvements to Topic 326, Financial Instruments – Credit Losses, ASU 2019-04, Codification Improvements to Topic 326, Financial Instruments – Credit Losses, Topic 815, Derivatives and Hedging, and Topic 825, Financial Instrument, and ASU 2019-05, Financial Instrument – Credit Losses (Topic 326): Targeted Transition Relief (collectively, Topic 326). Topic 326 requires measurement and recognition of expected credit losses for financial assets held at the reporting date based on external information, or a combination of both relating to past events, current conditions, and reasonable and supportable forecasts. The amendments affect loans, debt securities, trade receivables, net investments in leases, off-balance-sheet credit exposures, reinsurance receivables, and other financial assets that represent a right to receive cash. Topic 326 is effective for the Company beginning in the first quarter of 2020. Early adoption is permitted. The Company has not yet determined the impact of this standard on its condensed consolidated financial statements.

In January 2017, the FASB issued ASU No. 2017-04, Intangibles – Goodwill and Other (Topic 350). This standard eliminates step 2 from the annual goodwill impairment test. This update is effective for annual periods beginning after December 15, 2019, and interim periods within those fiscal years, with early adoption permitted, and is to be applied on a prospective basis. The Company does not anticipate that the adoption of this standard will have a significant impact on its condensed consolidated financial statements or the related disclosures.

In August 2018, the FASB issued ASU No. 2018-15, Intangibles – Goodwill and Other – Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract. The new guidance clarifies the accounting for implementation costs incurred to develop or obtain internal-use software in cloud computing arrangements. Further, the standard also requires entities to expense the capitalized implementation costs of a hosting arrangement over the term of the hosting arrangement. This standard is effective for the Company beginning in the first quarter of 2020. Early adoption is permitted. ASU No. 2018-15 should be applied either retrospectively or prospectively to all implementation costs incurred after the date of adoption. The Company has not yet determined the impact of this standard on its condensed consolidated financial statements.

2. BUSINESS COMBINATION

On April 29, 2019 (the "Acquisition Date"), the Company acquired certain assets from StreamMosaic, Inc., a privately held provider of artificial intelligence and machine learning solutions, including the Stream.AI software product line and related assets. Pursuant to the terms of an asset purchase agreement, the Company acquired certain assets, including all intellectual property, from StreamMosaic and certain related liabilities for the purpose of enhancing the Company's position in advanced data analytics for semiconductors and electronics by broadening its product offering and expanding its customer reach. In connection with the acquisition, the Company paid a total consideration of approximately $2.7 million using cash on hand.

The Company accounted for this acquisition as a business combination. This method requires that assets acquired and liabilities assumed in a business combination be recognized at their fair values as of the Acquisition Date. The excess of purchase consideration over the fair value of net tangible and identifiable intangible assets acquired was recorded as goodwill. The goodwill recorded from this acquisition represents business benefits the Company anticipates from assembled workforce and expectation for expanded sales opportunities in advanced data analytics for semiconductors and electronics. The amount of goodwill expected to be deductible for tax purposes is $370,000. Pro-forma results of operations have not been presented because the effect of the acquisition was not material to our financial results.

Intangible assets consist of developed technology and customer relationships. The value assigned to intangibles are based on estimates and judgments regarding expectations for success and life cycle of intangibles acquired. The following table summarizes the allocation of the fair values of the assets acquired and liabilities assumed and the related useful lives, where applicable:

	(in thousands)	Amortization period (years)
Finite-lived intangible assets:		
Developed technology	$ 1,640	9
Customer relationship	700	9
Deferred revenue	(50)	
Net asset acquired	**$ 2,290**	
Goodwill	370	
Purchase consideration	**$ 2,660**	

3. REVENUE FROM CONTRACTS WITH CUSTOMERS

The Company derives revenue from two sources: Solutions revenue and Gainshare performance incentives.

Revenue is recognized when control of products or services is transferred to customers, in an amount that reflects the consideration the Company expects to be entitled to in exchange for those promised products or services.

The Company determines revenue recognition through the following five steps:

- Identification of the contract, or contracts, with a customer
- Identification of the performance obligations in the contract
- Determination of the transaction price
- Allocation of the transaction price to the performance obligations in the contract
- Recognition of revenue when, or as, performance obligations are satisfied

The Company accounts for a contract when it has approval and commitment from both parties, the rights of the parties are identified, payment terms are identified, the contract has commercial substance and collectability of consideration is probable.

The Company enters into contracts that can include various combinations of licenses, products and services, some of which are distinct and are accounted for as separate performance obligations. For contracts with multiple performance obligations, the Company allocates the transaction price of the contract to each performance obligation, generally on a relative basis using its standalone selling price. The Company does not adjust transaction price for the effects of a significant financing component when the period between the transfers of the promised good or service to the customer and payment for that good or service by the customer is expected to be one year or less. The Company assessed each of its revenue generating arrangements in order to determine whether a significant financing component exists, and determined its contracts did not include a significant financing component for the three and six months ended June 30, 2019 and 2018.

Nature of Products and Services

Solutions revenue – The Company recognizes revenue for each element of solutions revenue as follows:

The Company licenses majority of its software products separately from project-based solution implementation service contracts, in particular, its Exensio big data platform and related products. The majority of this software is delivered as on-premise software licenses, while others can be delivered entirely or partially through Software-as-a-Service (SaaS) or cloud delivery models. Revenue from perpetual (one-time charge) license software is recognized at a point in time at the inception of the arrangement when control transfers to the client, if the software license is distinct from the services offered by the Company. Revenue from post-contract support subscription is recognized over the contract term on a straight-line basis, because the Company is providing a service of standing ready to provide support, when-and-if needed, and is providing unspecified software upgrades on a when-and-if available basis over the contract term. Revenue from time-based license software is allocated to each performance obligation and is recognized either at a point in time or over time. The license component is recognized at a point in time, at the delivery of the software license, with the post-contract support subscription component being recognized ratably over for the committed term of the contract. Revenue from software hosting or SaaS arrangements that allow for the use of a hosted software product or service over a contractually determined period of time without taking possession of software is accounted for as subscriptions and recognized as revenue ratably, on a straight-line basis, over the coverage period beginning on the date the service is made available to customers.

The Company also licenses the Design-for-Inspection ("DFI") system as a separate component of fixed-price service contracts that are not project-based solutions implementation services contracts. The Company allocates revenue to all deliverables under these DFI contracts based on their standalone selling prices, or SSP. In such instances, the Company applies judgment to estimate the range of SSPs for each performance obligation.

The Company generates a portion of its solutions revenue from fixed-price, project-based solution implementation service contracts that are associated with its classic yield ramp business, which services are delivered over a specific period of time. Revenue under these project–based contracts for solution implementation services is recognized as services are performed, using a percentage of completion method based on costs or labor-hours inputs, depending on whichever is the most appropriate measure of the progress towards completion of the contract. Due to the nature of the work performed in these arrangements, the estimation of costs or hours at completion is complex, subject to many variables and requires significant judgment. Key factors reviewed by the Company to estimate costs to complete each contract are future labor and product costs and expected productivity efficiencies. If circumstances arise that change the original estimates of revenues, costs, or extent of progress toward completion, revisions to the estimates are made. These revisions may result in increases or decreases in estimated revenues or costs. Losses on fixed-price solution implementation contracts are recognized in the period when they become probable. Revisions in profit estimates are reflected in the period in which the conditions that require the revisions become known and can be estimated (the cumulative catch-up method).

The Company typically includes some of its products and other technology as components of its fixed-price, project-based services contracts. In such instances, the Company determines whether the services performed and products/technology included, are distinct. In most cases, the arrangement is a single performance obligation and therefore follows the pattern of transfer as the service is provided. The Company applies a measure of progress (typically hours-to-hours or cost-to-cost) to any fixed consideration. As a result, revenue is generally recognized over the period the services are performed using percentage of completion method. This results in revenue recognition that corresponds with the value to the client for the services transferred to date relative to the remaining services promised.

Gainshare Performance Incentives — When the Company enters into a project-based solution implementation services contract, the contract usually includes two components: (1) a fixed fee for performance by the Company of services delivered over a specific period of time; and (2) a Gainshare performance incentive component where the customer pays a variable fee, usually after the fixed fee period has ended, related to continued usage of the Company's intellectual property. Revenue derived from Gainshare performance incentives is contingent upon the Company’s customers reaching certain defined production yield levels. Gainshare performance incentive periods are usually subsequent to the delivery of all contractual services and performance obligations. The Company records Gainshare revenue as a usage-based royalty based on customers' usage of intellectual property and records in the same period in which the usage occurs.

Disaggregation of revenue

The Company disaggregates revenue from contracts with customers into geographical regions, major contract performance obligations and timing of transfer of goods and services. The Company determined that disaggregating revenue into these categories achieves the disclosure objective to depict how the nature, amount, timing, and uncertainty of revenue and cash flows are affected by economic factors.

The following table shows the revenues from contracts with customers by the nature of transactions (in thousands):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Licenses and Gainshare Performance Incentives	$ 8,725	$ 6,828	$ 13,906	$ 14,315
Support and Services	11,779	14,200	27,031	31,190
Other	64	91	172	351
Total	$ 20,568	$ 21,119	$ 41,109	$ 45,856

Licenses and Gainshare Performance Incentives revenue is comprised of (i) the software license fees for perpetual and time-based software license contracts where the standalone selling prices are estimable by the Company, or distinct and separate performance obligations; and (ii) the variable fee component of the Company’s yield improvement service contracts, or Gainshare Performance Incentives, which is usually recognized as revenue subsequent to the delivery of all contractual services and performance obligations. The services component of such contracts, including recurring fees for unspecified software updates and technical support, is presented as support and services.

The Company's performance obligations are satisfied either over time or at a point-in-time. The following table represents a disaggregation of revenue by timing of revenue:

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Over time	58%	68%	66%	68%
Point-in-time	42%	32%	34%	32%
Total	100%	100%	100%	100%

International revenues accounted for approximately 58% and 56% of our total revenues for the three and six months ended June 30, 2019, respectively, compared to 58% and 59% of our total revenues for the three and six months ended June 30, 2018, respectively. See Note 11. Customer and Geographic Information.

Significant Judgments

Judgments and estimates are required under ASU No. 2014-09, Revenue from Contracts with Customers (Topic 606). Due to the complexity of certain contracts, the actual revenue recognition treatment required under Topic 606 for the Company's arrangements may be dependent on contract-specific terms and may vary in some instances.

In services arrangements, the Company typically satisfies the performance obligation and recognizes revenue over time. In Design-to-silicon-yield service arrangements, the performance obligation is satisfied over time either because the client controls the asset as it is created (e.g., when the asset is built at the customer site) or because the Company's performance does not create an asset with an alternative use and the Company has an enforceable right to payment plus a reasonable profit for performance completed to date. In most other services arrangements, the performance obligation is satisfied over time because the client simultaneously receives and consumes the benefits provided as the Company performs the services.

For revenue under project-based contracts for fixed-price solution implementation services, revenue is recognized as services are performed using a percentage-of-completion method based on costs or labor-hours input method, whichever is the most appropriate measure of the progress towards completion of the contract. Due to the nature of the work performed in these arrangements, the estimation of percentage of completion method is complex, subject to many variables and requires significant judgment. Key factors reviewed by the Company to estimate costs to complete each contract are future labor and product costs and expected productivity efficiencies. If circumstances arise that change the original estimates of revenues, costs, or extent of progress toward completion, revisions to the estimates are made. These revisions may result in increases or decreases in estimated revenues or costs, and such revisions are reflected in revenue on a cumulative catch-up basis in the period in which the circumstances that gave rise to the revision become known.

The Company's contracts with customers often include promises to transfer products, licenses and services, including professional services, technical support services, and rights to unspecified updates to a customer. Determining whether products, licenses and services are distinct performance obligations that should be accounted for separately, or not distinct and thus accounted for together, requires significant judgment. The Company rarely licenses or sells products on a standalone basis, so the Company is required to estimate the range of SSPs for each performance obligation. In instances where SSP is not directly observable because the Company does not sell the license, product or service separately, the Company determines the SSP using information that may include market conditions and other observable inputs. The Company, in some cases, has more than one SSP for individual performance obligations. In these instances, the Company may use information such as the size of the customer and geographic region of the customer in determining the SSP.

The Company is required to record Gainshare royalty revenue in the same period in which the usage occurs. Because the Company generally does not receive the acknowledgment reports from its customers during a given quarter within the time frame necessary to adequately review the reports and include the actual amounts in quarterly results for such quarter, the Company accrues the related revenue based on estimates of customer's underlying sales achievement. The Company's estimation process can be based on historical data, trends, seasonality, changes in the contract rate, knowledge of the changes in the industry and changes in the customer's manufacturing environment learned through discussions with customers and sales personnel. As a result of accruing revenue for the quarter based on such estimates, adjustments will be required in the following quarter to true-up revenue to the actual amounts reported.

Contract Balances

The Company performs its obligations under a contract with a customer by transferring products or services in exchange for consideration from the customer. The timing of the Company's performance often differs from the timing of the customer's payment, which results in the recognition of a receivable, a contract asset or a contract liability.

The Company classifies the right to consideration in exchange for products or services transferred to a client as either a receivable or a contract asset. A receivable is a right to consideration that is unconditional as compared to a contract asset which is a right to consideration that is conditional upon factors other than the passage of time. The majority of the Company's contract assets represent unbilled amounts related to fixed-price solution implementation service contracts when the costs or labor-hours input method of revenue recognition is utilized and revenue recognized exceeds the amount billed to the client, and the right to consideration is subject to milestone completion or client acceptance. The contract assets are generally classified as current and are recorded on a net basis with deferred revenue (i.e., contract liabilities) at the contract level. At June 30, 2019 and December 31, 2018, contract assets of $2.3 million and $2.7 million, respectively, are included in prepaid expenses and other current assets in the condensed consolidated balance sheets. The change in the contract assets balance during the period relates to the recording of revenues for which the right to consideration is subject to milestone completion or client acceptance and movement of previously recorded contract assets to receivables as the right to consideration becomes unconditional.

Contract liabilities primarily consist of deferred revenues and billings in excess of recognized revenues. Deferred revenues consist substantially of amounts invoiced in advance of revenue recognition and is recognized as the revenue recognition criteria are met. Deferred revenues that will be recognized during the succeeding twelve-month period are recorded as current deferred revenues, and the remaining portion is recorded as non-current deferred revenues. This balance was recorded in the other non-current liabilities in the accompanying condensed consolidated balance sheets. The non-current portion of deferred revenue included in other non-current liabilities was $1.7 million and $1.0 million, respectively, as of June 30, 2019 and December 31, 2018. Billings in excess of recognized revenues included in the condensed consolidated balance sheets are attributable to billings in excess of costs under the percentage of completion method representing the difference between contractually invoiced amounts (billings) and revenue recognized based on costs incurred to total estimated total costs at end of period. Billings in excess of recognized revenues are expected to be realized during the succeeding twelve-month period. Revenue recognized for the three months ended June 30, 2019 and 2018, that was included in the deferred revenues and billings in excess of recognized revenues balances at the beginning of each reporting period was $4.7 million and $5.0 million, respectively. Revenue recognized for the six months ended June 30, 2019, and 2018, that was included in the deferred revenues and billings in excess of recognized revenues balances at the beginning of each reporting period was $8.7 million and $7.6 million, respectively.

At June 30, 2019, the aggregate amount of the transaction price allocated to the remaining performance obligations related to customer contracts that were unsatisfied or partially unsatisfied was approximately $37.4 million. Given the applicable contract terms, the majority of this amount is expected to be recognized as revenue over the next two years, with the remainder in the following five years. This amount does not include contracts to which the customer is not committed, nor contracts with original expected lengths of one year or less, nor contracts for which we recognize revenue equal to the amount we have the right to invoice for services performed, or future sales-based or usage-based royalty payments in exchange for a license of intellectual property. This amount is subject to change due to future revaluations of variable consideration, terminations, other contract modifications, or currency adjustments. The estimated timing of the recognition remaining unsatisfied performance obligations is subject to change and is affected by changes to the scope, change in timing of delivery of products and services, or contract modifications.

Payment terms and conditions vary by contract type, although terms generally include a requirement of payment within 30 to 90 days. In instances where the timing of revenue recognition differs from the timing of invoicing, the Company has determined that its contracts generally do not include a significant financing component. The primary purpose of invoicing terms is to provide customers with simplified and predictable ways of purchasing the Company's products and services, and not to facilitate financing arrangements.

The adjustment to revenue recognized in the three months ended June 30, 2019 and 2018 from performance obligations satisfied (or partially satisfied) in previous periods was an increase of $0.3 million and a decrease of $0.2 million, respectively. The adjustment to revenue recognized in the six months ended June 30, 2019 and 2018 from performance obligations satisfied (or partially satisfied) in previous periods was a decrease of $0.2 million and an increase of $0.3 million, respectively. These amounts primarily represent changes in estimated percentage-of-completion based contracts and changes in estimated Gainshare performance incentives for those customers that reported actual Gainshare revenue with some time lag.

Costs to obtain or fulfill a contract

The Company capitalizes the incremental costs to obtain or fulfill a contract with a customer, including direct sales commissions and related fees, when it expects to recover those costs. As a result, these costs will need to be capitalized and amortized over an appropriate period, which may exceed the initial contract term. The incremental costs of obtaining a contract are costs that would not have been incurred if the contract had not been obtained. The Company uses the portfolio method to recognize the amortization expense related to these capitalized costs related to initial contracts and renewals and such expense is recognized over the period associated with the revenue of the related portfolio. Total capitalized direct sales commission costs as of June 30, 2019 and December 31, 2018 were $0.6 million and $0.5 million, respectively. Amortization of these assets during each of the three months ended June 30, 2019 and 2018 was $0.1 million. Amortization of these assets during each of the six months ended June 30, 2019 and 2018 was $0.2 million. There was no impairment loss in relation to the costs capitalized for the periods presented. Certain eligible initial project costs are capitalized when the costs relate directly to the contract, the costs generate or enhance resources of the Company that will be used in satisfying the performance obligation in the future, and the costs are expected to be recovered.

These costs primarily consist of transition and set-up costs related to the installation of systems and processes and other deferred fulfillment costs eligible for capitalization. Capitalized costs are amortized consistent with the transfer to the client of the services to which the asset relates and recorded as a component of cost of revenues. The Company also incurred certain direct costs to provide solution implementation services in relation to the specific anticipated contracts. The Company recognizes such costs as a component of cost of revenues, the timing of which is dependent upon identification of a contract arrangement. The Company also defers costs from arrangements that required us to defer the revenues, typically due to the pattern of transfer of the performance obligations in the contract. These costs are recognized in proportion to the related revenue. At the end of the reporting period, the Company evaluates its deferred costs for their probable recoverability. The Company recognizes impairment of deferred costs when it is determined that the costs no longer have future benefits and are no longer recoverable. Deferred costs balance was $1.0 million and $0.2 million as of June 30, 2019 and December 31, 2018, respectively. The balance was included in prepaid expenses and other current assets and other non-current assets in the accompanying condensed consolidated balance sheets.

4. BALANCE SHEET COMPONENTS

Accounts receivable

Account receivable includes amounts that are unbilled at the end of the period that are expected to be billed and collected within 12-month period. Unbilled accounts receivable, included in accounts receivable, totaled $13.4 million and $22.2 million as of June 30, 2019 and December 31, 2018, respectively. Unbilled accounts receivable that are not expected to be billed and collected during the succeeding 12-month period are recorded in other non-current assets and totaled $5.6 million and $5.3 million as of June 30, 2019, and December 31, 2018, respectively.

Property and equipment

Property and equipment, net consists of (in thousands):

	June 30, 2019	December 31, 2018
Property and equipment, net:		
Computer equipment	$ 10,660	$ 10,536
Software	4,214	4,112
Furniture, fixtures and equipment	4,836	4,688
Leasehold improvements	5,996	5,474
Test equipment	21,952	14,697
Construction-in-progress	14,262	20,293
	61,920	59,800
Less: accumulated depreciation and amortization	(26,074)	(24,119)
Total	$ 35,846	$ 35,681

Test equipment includes DFI assets at customer sites that are contributing to DFI solution revenues. The construction-in-progress balance as of June 30, 2019 and December 31, 2018 was primarily related to construction of DFI assets. Depreciation and amortization expense was $1.3 million for both the three months ended June 30, 2019 and 2018. Depreciation and amortization expense for the six months ended June 30, 2019 and 2018 was $2.6 million and $2.5 million, respectively.

Goodwill and Intangible Assets

As of June 30, 2019, and December 31, 2018, the carrying amounts of goodwill were $2.3 million and $1.9 million, respectively.

Intangible assets balance was $6.9 million and $5.1 million as of June 30, 2019 and December 31, 2018, respectively. Intangible assets as of June 30, 2019 and December 31, 2018 consist of the following (in thousands):

		June 30, 2019			December 31, 2018		
	Amortization Period (Years)	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Acquired identifiable intangibles:							
Customer relationships	1 – 9	$ 7,440	$ (4,712)	$ 2,728	$ 6,740	$ (4,514)	$ 2,226
Developed technology	4 – 9	17,460	(13,723)	3,737	15,820	(13,404)	2,416
Tradename	2 – 7	790	(660)	130	790	(648)	142
Patent	7 – 10	1,800	(1,540)	260	1,800	(1,520)	280
Total		$ 27,490	$ (20,635)	$ 6,855	$ 25,150	$ (20,086)	$ 5,064

The weighted average amortization period for acquired identifiable intangible assets was 6.6 years as of June 30, 2019. For both the three months ended June 30, 2019 and 2018, intangible asset amortization expense was $0.3 million. For both the six months ended June 30, 2019 and 2018, total intangible asset amortization expense was $0.5 million. The Company expects annual amortization of acquired identifiable intangible assets to be as follows (in thousands):

Year ending December 31,	Amount
2019 (remaining six months)	$ 634
2020	1,269
2021	1,093
2022	886
2023	886
2024 and thereafter	2,087
Total future amortization expense	$ 6,855

Intangible assets are amortized over their useful lives unless these lives are determined to be indefinite. Intangible assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset or asset group may not be recoverable. During the three and six months ended June 30, 2019, there were no indicators of impairment related to the Company’s intangible assets.

5. LEASES

The Company leases administrative and sales offices and certain equipment under noncancelable operating leases, which contain various renewal options and, in some cases, require payment of common area costs, taxes and utilities. These operating leases expire at various times through 2028. The Company had no leases that were classified as a financing lease as of June 30, 2019.

Leases with an initial term of 12 months or less are not recorded on the balance sheet, and the Company recognizes lease expense for these leases on a straight-line basis over the lease term. Long-term operating leases are included in operating lease ROU assets and operating lease liabilities in the Company’s condensed consolidated balance sheet as of June 30, 2019.

ROU assets represent the Company’s right to use an underlying asset for the lease term and operating lease liabilities represent the Company’s obligation to make lease payments arising from the lease. Effective January 1, 2019, operating lease ROU assets and liabilities are recognized based on the present value of remaining lease payments over the lease term. In determining the present value of lease payments, implicit rate must be used when readily determinable. As the Company’s leases do not provide implicit rates, at the date of the Company’s adoption of the new lease standard, the discount rate is calculated using the Company’s incremental borrowing rate determined based on the information available. The operating lease ROU asset also includes any lease payments made and excludes lease incentives or tenant improvement allowance. The Company’s lease terms may include options to extend or terminate the lease when it is reasonably certain that the Company will exercise that option. Lease expense for lease payments is recognized on a straight-line basis over the lease term.

Operating lease expense was $0.6 million and $0.7 million for the three months ended June 30, 2019 and 2018, respectively. Operating lease expense was $1.1 million and $1.3 million for the six months ended June 30, 2019 and 2018, respectively. Operating lease cost includes short-term leases and variable lease costs, which are immaterial.

Maturity of operating lease liabilities as of June 30, 2019, are as follows (in thousands):

Year ending December 31,		**Amount**[1]
2019 (remaining six months)	$	882
2020		1,862
2021		1,711
2022		1,526
2023		1,409
2024 and thereafter		4,750
Total future minimum lease payments	$	12,140
Less: Interest[2]		(2,158)
Present value of operating lease liabilities[3]	$	9,982

(1) As of June 30, 2019, the total operating lease liability includes $1.0 million related to an option to extend a lease term that is reasonably certain to be exercised.

(2) Calculated using incremental borrowing interest rate for each lease.

(3) Includes the current portion of operating lease liabilities of $1.9 million as of June 30, 2019.

As of June 30, 2019, the weighted average remaining lease term under operating ROU leases was 7.6 years.

As of June 30, 2019, the weighted average discount rate for operating lease liabilities was approximately 5.3%.

No new operating lease ROU asset was obtained in exchange for operating lease liabilities during the three and six months ended June 30, 2019.

6. STOCKHOLDERS' EQUITY

Stock Repurchase Program

On October 25, 2016, the Board of Directors adopted a program that was effective immediately to repurchase up to $25.0 million of the Company's common stock both on the open market and in privately negotiated transactions over the next two years. On May 29, 2018, the Board of Directors terminated that 2016 stock repurchase program, and adopted a new program to repurchase up to $25.0 million of the Company's common stock both on the open market and in privately negotiated transactions, from time to time, over the next two years. During the three and six months ended June 30, 2019, the Company repurchased approximately 300,000 shares and 614,000 shares, respectively. As of June 30, 2019, approximately 614,000 shares had been repurchased at an average price of $12.54 per share, for a total price of $7.7 million under the 2018 program. During the three and six months ended June 30, 2018, the Company repurchased approximately 99,000 and 437,000 shares, respectively, under the 2016 program. As of June 30, 2018, 1,279,189 shares had been repurchased at an average price of $14.59 per share under the 2016 program, for a total purchase of $18.7 million. Under the 2018 program, as of June 30, 2019, $17.3 million of the Company's common stock remained available for future repurchases.

7. EMPLOYEE BENEFIT PLANS

On June 30, 2019, the Company had the following stock-based compensation plans:

Employee Stock Purchase Plan

In July 2001, the Company adopted a ten-year Employee Stock Purchase Plan (as amended, the “Purchase Plan”) under which eligible employees can contribute up to 10% of their compensation, as defined in the Purchase Plan, towards the purchase of shares of PDF common stock at a price of 85% of the lower of the fair market value at the beginning of the offering period or the end of the purchase period. The Purchase Plan consists of twenty-four-month offering periods with four six-month purchase periods in each offering period. Under the Purchase Plan, on January 1 of each year, starting with 2002, the number of shares reserved for issuance will automatically increase by the lesser of (1) 675,000 shares, (2) 2% of the Company’s outstanding common stock on the last day of the immediately preceding year, or (3) the number of shares determined by the board of directors. At the annual meeting of stockholders on May 18, 2010, the Company’s stockholders approved an amendment to the Purchase Plan to extend it through May 17, 2020.

The Company estimated the fair value of purchase rights granted under the Purchase Plan during the period using the Black-Scholes-Merton option-pricing model with the following weighted average assumptions, resulting in the following weighted average fair values:

	Six Months Ended June 30,	
	2019	**2018**
Expected life (in years)	1.25	1.25
Volatility	45.19%	37.23%
Risk-free interest rate	2.52%	1.93%
Expected dividend	—	—
Weighted average fair value per share of options granted during the period	$ 3.67	$ 4.32

During the three months ended June 30, 2019 and 2018, no shares were issued under the Purchase Plan. During the six months ended June 30, 2019 and 2018, a total of approximately 87,000 and 108,000 shares, respectively, were issued at a weighted-average purchase price of $8.93 and $9.29 per share, respectively. As of June 30, 2019, there was $1.0 million of unrecognized compensation cost related to the Purchase Plan. That cost is expected to be recognized over a weighted average period of 1.6 years. As of June 30, 2019, 5.2 million shares were available for future issuance under the Purchase Plan.

Stock Incentive Plans

On November 16, 2011, the Company’s stockholders approved the 2011 Stock Incentive Plan, which has been amended and restated a number of times (as amended, the “2011 Plan”). Under the 2011 Plan, the Company may award stock options, stock appreciation rights, stock grants or stock units covering shares of the Company’s common stock to employees, directors, non-employee directors and contractors. The aggregate number of shares reserved for awards under this plan is 10,300,000 shares, plus up to 3,500,000 shares previously issued under the 2001 Plan that are forfeited or repurchased by the Company or shares subject to awards previously issued under the 2001 Plan that expire or that terminate without having been exercised or settled in full on or after November 16, 2011. In case of awards other than options or stock appreciation rights, the aggregate number of shares reserved under the plan will be decreased at a rate of 1.33 shares issued pursuant to such awards. The exercise price for stock options must generally be at prices no less than the fair market value at the date of grant. Stock options generally expire ten years from the date of grant and become vested and exercisable over a four-year period.

In 2001, the Company adopted a 2001 Stock Plan (the “2001 Plan”). In 2003, in connection with its acquisition of IDS Systems Inc., the Company assumed IDS’ 2001 Stock Option / Stock Issuance Plan (the “IDS Plan”). Both of the 2001 and the IDS Plans expired in 2011. Stock options granted under the 2001 and IDS Plans generally expire ten years from the date of grant and become vested and exercisable over a four -year period. Although no new awards may be granted under the 2001 or IDS Plans, awards made under the 2001 and IDS Plans that are currently outstanding remain subject to the terms of each such plan.

As of June 30, 2019, 10.8 million shares of common stock were reserved to cover stock-based awards under the 2011 Plan, of which 4.4 million shares were available for future grant. The number of shares reserved and available under the 2011 Plan includes 0.5 million shares that were subject to awards previously made under the 2001 Plan and were forfeited, expired or repurchased by the Company after adoption of the 2011 Plan through June 30, 2019. As of June 30, 2019, there were no outstanding awards that had been granted outside of the 2011, 2001 or the IDS Plans (collectively, the "Stock Plans").

The Company estimated the fair value of share-based awards granted under the 2011 Stock Plan during the period using the Black-Scholes-Merton option-pricing model with the following weighted average assumptions, resulting in the following weighted average fair values:

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	**2018**	**2019**	**2018**
Expected life (in years)	4.46	—	4.46	4.43
Volatility	42.19	—	44.71	42.22
Risk-free interest rate	1.94	—	2.44	2.52%
Expected dividend	—	—	—	—
Weighted average fair value per share of options granted during the period	$ 4.67	$ —	$ 4.54	$ 4.28

No stock options were granted during the three months ended June 30, 2018.

Stock-based compensation is estimated at the grant date based on the award's fair value and is recognized on a straight-line basis over the vesting periods, generally four years. Stock-based compensation expense before taxes related to the Company's stock plans and employee stock purchase plan was allocated as follows (in thousands):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	**2018**	**2019**	**2018**
Cost of solutions	$ 799	$ 968	$ 1,659	$ 1,981
Research and development	901	845	2,619	1,724
Selling, general and administrative	734	889	1,632	1,852
Stock-based compensation expenses	$ 2,434	$ 2,702	$ 5,910	$ 5,557

The stock-based compensation expense in the table above includes immaterial expense or credit adjustments related to cash-settled stock appreciation rights ("SARs") granted to certain employees. The Company accounted for these awards as liability awards and the amount was included in accrued compensation and related benefits. Stock-based compensation capitalized in the capitalized software development costs included in the Property and Equipment, net, was approximately $0.2 million at June 30, 2019.

Additional information with respect to options under the Stock Plans during the six months ended June 30, 2019, was as follows:

	Number of Options (in thousands)	**Weighted Average Exercise Price per Share**	**Weighted Average Remaining Contractual Term (years)**	**Aggregate Intrinsic Value (in thousands)**
Outstanding, January 1, 2019	1,027	$ 9.75		
Granted (weighted average fair value of $4.54 per share)	37	$ 11.43		
Exercised	(156)	$ 5.42		
Canceled	(70)	$ 14.64		
Expired	(12)	$ 17.13		
Outstanding, June 30, 2019	826	$ 10.11	4.08	$ 3,086
Vested and expected to vest, June 30, 2019	813	$ 10.09	4.00	$ 3,062
Exercisable, June 30, 2019	656	$ 9.59	2.84	$ 2,788

The aggregate intrinsic value in the table above represents the total intrinsic value based on the Company's closing stock price of $13.12 per share as of June 30, 2019. The total intrinsic value of options exercised during the six months ended June 30, 2019, was $1.0 million.

As of June 30, 2019, there was $0.6 million of total unrecognized compensation cost related to unvested stock options. That cost is expected to be recognized over a weighted average period of 2.8 years. The total fair value of shares vested during the six months ended June 30, 2019, was $0.1 million.

Nonvested restricted stock units activity during the six months ended June 30, 2019, was as follows:

	Shares (in thousands)	Weighted Average Grant Date Fair Value Per Share
Nonvested, January 1, 2019	1,835	$ 11.93
Granted	162	$ 12.28
Vested	(406)	$ 13.29
Forfeited	(113)	$ 11.78
Nonvested, June 30, 2019	1,478	$ 11.61

As of June 30, 2019, there was $13.5 million of total unrecognized compensation cost related to nonvested restricted stock units. That cost is expected to be recognized over a weighted average period of 2.5 years. Restricted stock units do not have rights to dividends prior to vesting.

8. RESTRUCTURING CHARGES

On September 27, 2018, the Board of Directors of the Company approved a reduction in its workforce to reduce expenses and align its operations with evolving business needs. Notifications to the affected employees began on October 24, 2018.

From inception of the restructuring plan to June 30, 2019, the Company has recorded restructuring charges of $0.7 million, primarily consisting of employee separation charges. The Company is in the process of implementing the restructuring plan, and the remaining charges expected to be incurred are not expected to be significant.

The following table summarizes the activities of restructuring liabilities under this plan (in thousands):

	Three Months Ended June 30, 2019	Six Months Ended June 30, 2019
Beginning balance	$ 91	$ 244
Restructuring charges	—	92
Cash payments	(91)	(336)
Ending balance	$ —	$ —

9. INCOME TAXES

Income tax benefit increased $0.1 million for the six months ended June 30, 2019, to a $0.9 million income tax benefit as compared to an income tax benefit of $0.8 million for the six months ended June 30, 2018. The Company's effective tax rate benefit was 22% and 25% for the six months ended June 30, 2019 and 2018, respectively. The Company's effective tax rate benefit decreased in the six months ended June 30, 2019, as compared to the same period in 2018, primarily due to favorable reductions in excess tax benefits related to employee stock compensation and changes in the level of profitability and forecasted income.

The Company's total amount of unrecognized tax benefits, excluding interest and penalties, as of June 30, 2019, was $13.5 million, of which $7.9 million, if recognized, would affect the Company's effective tax rate. The Company's total amount of unrecognized tax benefits, excluding interest and penalties, as of December 31, 2018, was $13.3 million, of which $7.8 million, if recognized, would affect the Company's effective tax rate. As of June 30, 2019, the Company has recorded unrecognized tax benefits of $3.0 million, including interest and penalties of $0.7 million, as long-term taxes payable in its condensed consolidated balance sheet. The remaining $11.3 million has been recorded net of our deferred tax assets, of which $5.6 million is subject to a full valuation allowance.

The valuation allowance was approximately $10.2 million and $9.8 million as of June 30, 2019, and December 31, 2018, respectively, which was related to California R&D tax credits and California net operating losses related to the Company's acquisition of Syntricity. The Company has recorded a valuation allowance against these deferred tax assets because it believes that it is more likely than not that these tax attributes will not be realized.

Effective January 1, 2018, the Tax Act creates a new requirement to include in U.S. income global intangible low-taxed income ("GILTI") earned by controlled foreign corporations ("CFCs"). The GILTI must be included currently in the gross income of the CFCs' U.S. shareholder. Under U.S. GAAP, the Company is allowed to make an accounting policy choice of either (1) treating taxes due on future U.S. inclusions related to GILTI as a current-period expense when incurred (the "period cost method") or (2) factoring such amounts into a company's measurement of its deferred taxes (the "deferred method"). During the first quarter of 2018, the Company selected the period cost method in recording the tax effects of GILTI in its condensed consolidated financial statements.

The Company conducts business globally and, as a result, files numerous consolidated and separate income tax returns in the U.S. federal, various state and foreign jurisdictions. Because the Company used some of the tax attributes carried forward from previous years to tax years that are still open, statutes of limitation remain open for all tax years to the extent of the attributes carried forward into tax year 2002 for federal and California tax purposes. The Company is not subject to income tax examinations in any of its major foreign subsidiaries' jurisdictions.

10. NET LOSS PER SHARE

Basic net loss per share is computed by dividing net loss by weighted average number of common shares outstanding for the period (excluding outstanding stock options and shares subject to repurchase). Diluted net loss per share is computed using the weighted-average number of common shares outstanding for the period plus the potential effect of dilutive securities which are convertible into common shares (using the treasury stock method), except in cases in which the effect would be anti-dilutive. The following is a reconciliation of the numerators and denominators used in computing basic and diluted net loss per share (in thousands except per share amount):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Numerator:				
Net loss	$ (710)	$ (2,096)	$ (3,401)	$ (2,520)
Denominator:				
Basic weighted-average common shares outstanding	32,339	31,962	32,412	32,065
Effect of dilutive options and restricted stock	—	—	—	—
Diluted weighted average shares outstanding	32,339	31,962	32,412	32,065
Net loss per share – Basic	$ (0.02)	$ (0.07)	$ (0.10)	$ (0.08)
Net loss per share – Diluted	$ (0.02)	$ (0.07)	$ (0.10)	$ (0.08)

For the three and six months ended June 30, 2019 and 2018, the Company was in a loss position, basic net loss per share is the same as diluted net loss per share as the inclusion of the potential common shares would have been anti-dilutive.

The following table sets forth potential shares of common stock that are not included in the diluted net loss per share calculation above because to do so would be anti-dilutive for the periods indicated (in thousands):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Outstanding options	606	621	614	638
Nonvested restricted stock units	813	1,108	781	1,034
Employee Stock Purchase Plan	18	—	198	16
Total	1,437	1,729	1,593	1,688

11. CUSTOMER AND GEOGRAPHIC INFORMATION

Operating segments are defined as components of an enterprise about which separate financial information is available that is evaluated regularly by the chief operating decision maker, or group, in deciding how to allocate resources and in assessing performance.

The Company's chief operating decision maker, the chief executive officer, reviews discrete financial information presented on a consolidated basis for purposes of regularly making operating decisions and assessing financial performance. Accordingly, the Company considers itself to be in one operating segment, specifically the licensing and implementation of yield improvement solutions for companies designing and/or manufacturing integrated circuits.

The Company had revenues from individual customers in excess of 10% of total revenues as follows:

	Three Months Ended June 30,		Six Months Ended June 30,	
Customer	2019	2018	2019	2018
A	33%	40%	34%	39%
B	*%	10%	*%	*%

The Company had gross accounts receivable from individual customers in excess of 10% of gross accounts receivable as follows:

Customer	June 30, 2019	December 31, 2018
A	31%	35%
B	22%	21%

* represents less than 10%

Revenues from customers by geographic area based on the location of the customers' work sites are as follows (in thousands):

	Three Months Ended June 30,			
	2019		2018	
	Revenues	Percentage of Revenues	Revenues	Percentage of Revenues
United States	$ 8,547	42%	$ 8,982	42%
China	3,267	16	4,360	21
Taiwan	2,341	11	1,038	5
Rest of the world	6,413	31	6,739	32
Total revenue	$ 20,568	100%	$ 21,119	100%

	Six Months Ended June 30,			
	2019		2018	
	Revenues	Percentage of Revenues	Revenues	Percentage of Revenues
United States	$ 17,862	44%	$ 19,065	41%
China	6,250	15	9,542	21
Taiwan	4,096	10	3,173	7
Rest of the world	12,901	31	14,076	31
Total revenue	$ 41,109	100%	$ 45,856	100%

Long-lived assets, net by geographic area are as follows (in thousands):

	June 30, 2019(1)	December 31, 2018(2)
United States	$ 41,379	$ 35,173
Rest of the world	2,441	508
Total long-lived assets, net	$ 43,820	$ 35,681

(1) Amounts consist of property and equipment, net, and operating lease right-of-use assets, net

(2) Amounts consist of property and equipment, net

12. FAIR VALUE MEASUREMENTS

Fair value is the exit price, or the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants as of the measurement date. The multiple assumptions used to value financial instruments are referred to as inputs, and a hierarchy for inputs used in measuring fair value is established, that maximizes the use of observable inputs and minimizes the use of unobservable inputs by requiring that the most observable inputs be used when available. Observable inputs reflect assumptions market participants would use in pricing an asset or liability based on market data obtained from independent sources while unobservable inputs reflect a reporting entity's pricing based upon its own market assumptions. These inputs are ranked according to a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value into three broad levels.

Level 1 - Inputs are quoted prices in active markets for identical assets or liabilities.

Level 2 - Inputs are quoted prices for similar assets or liabilities in an active market, quoted prices for identical or similar assets or liabilities in markets that are not active, inputs other than quoted prices that are observable and market-corroborated inputs which are derived principally from or corroborated by observable market data.

Level 3 - Inputs are derived from valuation techniques in which one or more significant inputs or value drivers are unobservable.

The following table represents the Company's assets measured at fair value on a recurring basis as of June 30, 2019, and the basis for that measurement (in thousands):

Assets	Total	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Money market mutual funds	$ 27,375	$ 27,375	$ —	$ —

The following table represents the Company's assets measured at fair value on a recurring basis as of December 31, 2018, and the basis for that measurement (in thousands):

Assets	Total	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Money market mutual funds	$ 27,068	$ 27,068	$ —	$ —

The Company enters into foreign currency forward contracts from time to time to reduce the exposure to foreign currency exchange rate fluctuations on certain foreign currency denominated monetary assets and liabilities, primarily on third-party accounts payables and intercompany balances. The primary objective of the Company's hedging program is to reduce volatility of earnings related to foreign currency exchange rate fluctuations. The counterparty to these foreign currency forward contracts is a large global financial institution that the Company believes is creditworthy, and therefore, the Company believes the credit risk of counterparty nonperformance is not significant. These foreign currency forward contracts are not designated for hedge accounting treatment.

Therefore, the change in fair value of these contracts is recorded into earnings as a component of other income (expense), net, and offsets the change in fair value of the foreign currency denominated assets and liabilities, which is also recorded in other income (expense), net. For the three months ended June 30, 2019 and 2018, the Company recognized a realized loss of $22,000 and a realized loss of $551,000 on the contracts, respectively, which was recorded in other income (expense), net in the Company's Condensed Consolidated Statements of Operations and Comprehensive Loss. For the six months ended June 30, 2019 and 2018, the Company recognized a realized loss of $292,000 and a realized loss of $365,000 on the contracts, respectively, which was recorded in other income (expense), net in the Company's Condensed Consolidated Statements of Operations and Comprehensive Loss.

The Company carries these derivatives financial instruments on its condensed consolidated balance sheets at their fair values. The Company's foreign currency forward contracts are classified as Level 2 because they are not actively traded and the valuation inputs are based on quoted prices and market observable data of similar instruments. As of June 30, 2019, the Company had no outstanding forward contract. As of December 31, 2018, the Company had one outstanding forward contract with a notional amount of $8.2 million and recorded $55,000 other current liability associated with the outstanding forward contract.

13. COMMITMENTS AND CONTINGENCIES

Indemnifications — The Company generally provides a warranty to its customers that its software will perform substantially in accordance with documented specifications typically for a period of 90 days following initial delivery of its products. The Company also indemnifies certain customers from third-party claims of intellectual property infringement relating to the use of its products. Historically, costs related to these guarantees have not been significant. The Company is unable to estimate the maximum potential impact of these guarantees on its future results of operations.

Purchase obligations — The Company has purchase obligations with certain suppliers for the purchase of goods and services entered in the ordinary course of business. As of June 30, 2019, total outstanding purchase obligations were $11.0 million, which are primarily due within the next 12 months.

Indemnification of Officers and Directors — As permitted by the Delaware general corporation law, the Company has included a provision in its certificate of incorporation to eliminate the personal liability of its officers and directors for monetary damages for breach or alleged breach of their fiduciary duties as officers or directors, other than in cases of fraud or other willful misconduct.

In addition, the Bylaws of the Company provide that the Company is required to indemnify its officers and directors even when indemnification would otherwise be discretionary, and the Company is required to advance expenses to its officers and directors as incurred in connection with proceedings against them for which they may be indemnified. The Company has entered into indemnification agreements with its officers and directors containing provisions that are in some respects broader than the specific indemnification provisions contained in the Delaware general corporation law. The indemnification agreements require the Company to indemnify its officers and directors against liabilities that may arise by reason of their status or service as officers and directors other than for liabilities arising from willful misconduct of a culpable nature, to advance their expenses incurred as a result of any proceeding against them as to which they could be indemnified, and to obtain directors' and officers' insurance if available on reasonable terms. The Company has obtained directors' and officers' liability insurance in amounts comparable to other companies of the Company's size and in the Company's industry. Since a maximum obligation of the Company is not explicitly stated in the Company's Bylaws or in its indemnification agreements and will depend on the facts and circumstances that arise out of any future claims, the overall maximum amount of the obligations cannot be reasonably estimated.

Litigation — From time to time, the Company is subject to various claims and legal proceedings that arise in the ordinary course of business. The Company accrues for losses related to litigation when a potential loss is probable and the loss can be reasonably estimated in accordance with FASB requirements. As of June 30, 2019, the Company was not party to any material legal proceedings, thus no loss was probable and no amount was accrued.

Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations

Forward-Looking Statements

The following discussion of our financial condition and results of operations contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934. All statements other than statements of historical fact may be forward-looking statements. In some cases, you can identify forward-looking statements by terminology such as "may," "could," "should," "expect," "plan," "anticipate," "believe," "estimate," "predict," "potential", "target" or "continue," the negative effect of terms like these or other similar expressions. Any statement concerning future financial performance (including future revenues, earnings or growth rates), ongoing business strategies or prospects, and possible actions taken by us or our subsidiaries, which may be provided by us are also forward-looking statements. These forward-looking statements are only predictions. Forward-looking statements are based on current expectations and projections about future events and are inherently subject to a variety of risks and uncertainties, many of which are beyond our control, which could cause actual results to differ materially from those anticipated or projected. All forward-looking statements included in this document are based on information available to us on the date of filing and we further caution investors that our business and financial performance are subject to substantial risks and uncertainties. We assume no obligation to update any such forward-looking statements. In evaluating these statements, you should specifically consider various factors, including the risk factors set forth in Item 1. "Business" and Item 7. "Management's Discussion and Analysis of Financial Condition and Results of Operations" in our Annual Report on Form 10-K for the year ended December 31, 2018, filed with the Securities and Exchange Commission on March 8, 2019. All references to "we", "us", "our", "PDF", "PDF Solutions" or "the Company" refer to PDF Solutions, Inc.

Overview

We analyze our customers' integrated circuit ("IC") design and manufacturing processes to identify, quantify, and correct the issues that cause yield loss to improve our customers' profitability by improving time-to-market, increasing yield and reducing total design and manufacturing costs. We package our solutions in various ways to meet our customers' specific business and budgetary needs, each of which provides us various revenue streams. We receive a mix of fixed fees and variable, performance-based fees for the vast majority of our yield improvement solutions. The fixed fees are typically reflective of the length of time and the resources needed to characterize a customer's manufacturing process and receive preliminary results of proposed yield improvement suggestions. We receive license fees and service fees for related installation, integration, training, and maintenance and support services for our software and hardware that we license on a stand-alone basis.

Industry Trend

The logic foundry market at the leading edge nodes, such as 10nm and 7nm, is undergoing significant change. The leading foundry has increased market share as other foundries have either suspended 7nm development, forecasted a later start of mass production, or started later than originally forecast in some cases. This trend will likely negatively impact our future yield ramp solutions business on these nodes. For many foundries, utilization rates for 28nm fabs remain suppressed. We expect most logic foundries to invest in derivatives of older process nodes, such as 28nm and 20nm, to extract additional value as many of their customers will not move to advanced nodes due to either technological barriers or restrictive economics. Foundries that participate at leading edge nodes are expected to continue to invest in new technologies such as memory, packaging, and multi-patterned and EUV lithography, as well as new innovations in process control and variability management. We expect China's investment in semiconductors to continue for at least the next few years. In order for these trends to provide opportunities for us to increase our business in process control and electrical characterization, Chinese semiconductors manufacturers will need to increase their production volumes on advanced technology nodes and continue to engage foreign suppliers.

Generally, the demand for consumer electronics, communications devices, and high performance computing continues to drive technological innovation in the semiconductor industry as the need for products with greater performance, lower power consumption, reduced costs and smaller size continues to grow with each new product generation. In addition, advances in computing systems and mobile devices have fueled demand for higher capacity memory chips. To meet these demands, IC manufacturers and designers are constantly challenged to improve the overall performance of their ICs by designing and manufacturing ICs with more embedded applications to create greater functionality while lowering power and cost per transistor. As this trend continues, companies will continually be challenged to improve process capabilities to optimally produce ICs with minimal random and systematic yield loss, which is driven by the lack of compatibility between the design and its respective manufacturing process. We believe that these difficulties will create a greater need for products and services that address yield loss across the IC product life cycle.

The interest in Industry 4.0 (i.e., the fourth industrial revolution or the digital transformation of manufacturing technologies) is another trend that should drive increased innovation in semiconductor and electronics manufacturing. The ability to add cost-effective sensors to monitor every step of a manufacturing process and the continual reduction in the cost per terabyte of data storage is moving companies that manufacture products directly or through a supply chain to collect as much manufacturing and test data as possible in order to analyze it and optimize every aspect of manufacturing and test operations to lower costs and improve product quality and profitability. Many software companies, both large and small, are developing advanced analytics solutions that employ both artificial intelligence and machine learning algorithms to identify and optimize these inefficiencies in the manufacturing supply chain. We believe that this trend will continue for the next few years, and the challenges involved in finding new insights will create opportunities for companies that have a combination of advanced analytics capabilities, domain-specific IP, and professional services.

Customer Contracts

Although a substantial portion of our total revenues is concentrated in a small number of customers, the total revenues for each of these customers in any period is the result of Solutions revenue and Gainshare performance incentives revenues recognized in the period under multiple, separate contracts, with no interdependent performance obligations. In general, our customer contracts are non-cancellable. These contracts were all entered into in the ordinary course of our business and contain general terms and conditions that are standard across most of our yield improvement solutions customers, including providing services typically targeted to one manufacturing process node, for example the 28 or 14 nanometer node. Fluctuations in future results may occur if any of these customers renegotiate pre-existing contractual commitments due to adverse changes in their own business. For example, during the third quarter of 2018, a major customer publicly announced that it was indefinitely suspending the development and production of its 7nm technology node. This customer’s decision negatively impacted our Solutions revenue in the fourth quarter of 2018 and Gainshare performance incentives revenues in the first quarter of 2019. In March 2019, we entered into an amendment to the 7nm technology development agreement with this customer. Even though we were able to recognize Solutions revenue from this customer during the first quarter of 2019 as a result of this amendment, we expect that Gainshare performance incentives revenues related to this contract will not be recognized in the long-term as Gainshare performance incentives revenues are based on the future production of the customer.

See the additional discussion in Part I, Item 1, “Customers,” on page 9 of our Annual Report on Form 10-K for the year ended December 31, 2018, and in Item 1A, “Risk Factors,” on pages 12 through 21 of our Annual Report on Form 10-K for the year ended December 31, 2018, for related information on the risks associated with customer concentration and Gainshare performance incentives revenue.

Financial Highlights

Financial highlights for the three months ended June 30, 2019, were as follows:

- Total revenues were $20.6 million, which was a decrease of $0.6 million, or 3%, compared to the year-ago period. Solutions revenue was $13.4 million, which was a decrease of $1.8 million, or 12%, compared to the year-ago period. The decrease in Solutions revenue was primarily due to the decrease in revenue from our yield ramp solutions resulting from lower hours worked across multiple contracts and customers, which was partially offset by increases in Exensio big data solution revenues that were driven by higher business activity. Deferred revenue for the second fiscal quarter of 2019 includes $1.0 million associated with one customer in China that is significantly delinquent in payments, which revenue we expect to recognize in the future when it is more than likely that such payments will be made in the near term. Gainshare performance incentives revenue was $7.1 million, an increase of $1.3 million, or 22%, compared to the year-ago period. The increase was primarily due to higher Gainshare performance incentives revenue from 14nm technology node.

- Gross margin for the three months ended June 30, 2019 was 62%, compared to 48% for the year-ago period. During the three months ended June 30, 2019, our gross profit was significantly higher than the prior period due primarily to an increase in Gainshare performance incentives and reduction in headcount primarily related to our yield ramp business, which is a cost of revenues. Cost of solutions decreased for the three months ended June 30, 2019, compared to the year-ago period, primarily due to (i) a $2.2 million decrease in personnel-related cost driven by lower headcount and lower chargeable hours incurred across multiple contracts and customers, and a decrease in stock-based compensation expense, (ii) a $0.4 million decrease in hardware and equipment expense due to lower solutions revenue, and (iii) a $0.3 million decrease in travel expenses resulting from our cost management efforts.

- Net loss was $0.7 million, compared to a net loss of $2.1 million for the year-ago period. The decrease in net loss was primarily attributable to (i) a $1.8 million decrease in cost of solutions and operating expenses related to a decrease in personnel-related costs driven by lower headcount, hardware and equipment, travel, and subcontractor expenses and accounting and audit fees, partially offset by increase in legal fees, facilities and depreciation and amortization expense, and (ii) a higher tax benefit mainly driven by the changes in forecasted income/loss between fiscal 2019 and 2018, and higher excess tax benefit for employee stock compensation compared to the year-ago period. The decreases in costs of solutions and operating expenses and higher tax benefit for the three months ended June 30, 2019 were partially offset by a $0.6 million decrease in total revenues.

- Net loss per basic and diluted share was $(0.02) for the three months ended June 30, 2019, compared to net loss per basic and diluted share of $(0.07), for the three months ended June 30, 2018, a decrease of $0.05 per basic and diluted share.

- Cash and cash equivalents decreased $9.3 million to $86.8 million at June 30, 2019, from $96.1 million at December 31, 2018, primarily due to cash used in investing activities related to the property and equipment purchased for the development our Design-for-Inspection (DFI) solution, expansion of our research and development laboratory and clean room, and a payment for a business acquisition, and cash used in financing activities primarily due to repurchases of our common stock.

Financial highlights for the six months ended June 30, 2019, were as follows:

- Total revenues were $41.1 million, which was a decrease of $4.7 million, or 10%, compared to the compared to the year-ago period. Solutions revenues were $30.1 million, which was a decrease of $3.4 million, or 10%, compared to the year-ago period. The decrease in solutions revenue was primarily related to lower hours worked across multiple contracts and customers, which was partially offset by increases in Exensio big data solution revenues that were driven by higher business activity. Deferred revenue for the second fiscal quarter of 2019 includes $1.0 million associated with one customer in China that is significantly delinquent in payments, which revenue we expect to recognize in the future when it is more than likely that such payments will be made in the near term. Gainshare performance incentives revenue was $11.0 million, a decrease of $1.4 million, or 11%, compared to the year-ago period. The decrease in Gainshare performance incentives revenue was primarily due to lower incentives revenue from the 28nm technology node.

- Gross margin for the six months ended June 30, 2019 was 62%, compared to 51% for the year-ago period. During the six months ended June 30, 2019, our gross profit was significantly higher than the prior period due primarily to recognition of Solutions revenue of $3.3 million from a customer contract amendment during the first quarter of fiscal year 2019, without which our gross margin would be approximately 3.5% lower, and a reduction in headcount primarily related to our yield ramp business, which is a cost of revenues. Cost of solutions decreased for the six months ended June 30, 2019, compared to the year-ago period, primarily due to (i) a $5.0 million decrease in personnel-related cost driven by lower headcount and lower chargeable hours incurred across multiple contracts and customers, and a decrease in stock-based compensation expense, partially offset by a provision for discretionary employee bonuses for fiscal year 2019, (ii) a $0.9 million decrease in hardware and equipment expense due to lower solutions revenue, (iii) a $0.5 million decrease in travel expenses resulting from our cost management effort, and (iv) a $0.3 million decrease in facilities expense. These increases in gross margin were partially offset by a $1.4 million decrease in Gainshare performance incentives.

- Net loss was $3.4 million, compared to a net loss of $2.5 million for the year-ago period. The increase in net loss was primarily attributable to 10% lower revenues, partially offset by (i) a $3.7 million decrease in cost of solutions and operating expenses related to a decrease in personnel-related costs driven by lower headcount, hardware and equipment, travel, operating lease and subcontractor expenses and accounting and audit fees, partially offset by increase in recruiting and legal fees, facilities and depreciation and amortization expenses, and (ii) a higher tax benefit mainly driven by the changes in forecasted income/loss between fiscal 2019 and 2018, and higher excess tax benefit for employee stock compensation compared to the year-ago period.

- Net loss per basic and diluted share was $(0.10) for the six months ended June 30, 2019, compared to net loss per basic and diluted share of $(0.08), for the six months ended June 30, 2018, an increase of $0.02 per basic and diluted share.

Critical Accounting Policies and Estimates

See Note 1 of "Notes to Condensed Consolidated Financial Statements (Unaudited)" of this Quarterly Report on Form 10-Q for a description of recent accounting pronouncements and accounting changes, including the expected dates of adoption and estimated effects, if any, on our condensed consolidated financial statements, and to Management's Discussion and Analysis of Financial Condition and Results of Operations contained in Part II, Item 7 of our Annual Report on Form 10-K for the year ended December 31, 2018.

With the exception of the changes made to our accounting for leases as a result of the adoption of ASC 842, there have been no material changes during the six months ended June 30, 2019 to the items that we disclosed as our critical accounting policies and estimates in Management's Discussion and Analysis of Financial Condition and Results of Operations in our Annual Report on Form 10-K for the fiscal year ended December 31, 2018.

The following is a brief discussion of the more significant accounting policies and methods that we use.

General

Our discussion and analysis of our financial conditions, results of operations and cash flows are based on our condensed consolidated financial statements, which have been prepared in conformity with accounting principles generally accepted in the United States of America. Our preparation of these consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the dates of the financial statements and the reported amounts of revenues and expenses during the reporting periods. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances. The most significant estimates and assumptions relate to revenue recognition, stock-based compensation and the realization of deferred tax assets. Actual amounts may differ from such estimates under different assumptions or conditions.

Revenue Recognition

We derive revenues from two sources: Solutions revenue and Gainshare performance incentives.

Solutions revenue — We recognize revenue for each element of solutions revenue as follows:

We license the majority of our software products separately from project-based solution implementation service contracts, in particular, our Exensio big data platform and related products. The majority of this software is delivered as on-premise software licenses, while others can be delivered entirely or partially through Software-as-a-Service (SaaS) or cloud delivery models. Revenue from perpetual (one-time charge) license software is recognized at a point in time at the inception of the arrangement when control transfers to the client, if the software license is distinct from the services offered by us. Revenue from post-contract support subscription is recognized over the contract term on a straight-line basis, because we are providing a service of standing ready to provide support, when-and-if needed, and is providing unspecified software upgrades on a when-and-if available basis over the contract term. Revenue from time-based license software is allocated to each performance obligation and is recognized either at a point in time or over time. The license component is recognized at a point in time, at the delivery of the software license, with the post-contract support subscription component being recognized ratably over for the committed term of the contract. Revenue from software hosting or SaaS arrangements that allow for the use of a hosted software product or service over a contractually determined period of time without taking possession of software are accounted for as subscriptions and recognized as revenue ratably, on a straight-line basis, over the coverage period beginning on the date the service is made available to customers.

We also license our DFI system as a separate component of fixed-price service contracts that are not project-based solutions implementation services contracts. We allocate revenue to all deliverables under these DFI contracts based on their standalone selling prices, or SSP. In such instances, we apply judgment to estimate the range of SSPs for each performance obligation.

We generate a portion of our solutions revenue from fixed-price, project-based solution implementation service contracts that are associated with our classic yield ramp business, which services are delivered over a specific period of time. Revenue under these project–based contracts for solution implementation services is recognized as services are performed using a percentage of completion method based on costs or labor-hours inputs, depending on whichever is the most appropriate measure of the progress towards completion of the contract. Due to the nature of the work performed in these arrangements, the estimation of costs or hours at completion is complex, subject to many variables and requires significant judgment. Key factors reviewed by us to estimate costs to complete each contract are future labor and product costs and expected productivity efficiencies. If circumstances arise that change the original estimates of revenues, costs, or extent of progress toward completion, revisions to the estimates are made. These revisions may result in increases or decreases in estimated revenues or costs. Losses on fixed-price solution implementation contracts are recognized in the period when they become probable. Revisions in profit estimates are reflected in the period in which the conditions that require the revisions become known and can be estimated (the cumulative catch-up method).

We typically include some of our products and other technology as components of our fixed-price, project-based services contracts. In such instances, we determine whether the services performed and products/technology included, are distinct. In most cases, the arrangement is a single performance obligation and therefore follows the pattern of transfer as the service is provided. We apply a measure of progress (typically hours-to-hours or cost-to-cost) to any fixed consideration. As a result, revenue is generally recognized over the period the services are performed using the percentage of completion method. This results in revenue recognition that corresponds with the value to the client of the services transferred to date relative to the remaining services promised.

Gainshare Performance Incentives — When we enter into a project-based solution implementation services contract, the contract usually includes two components: (1) a fixed fee for performance by the Company of services delivered over a specific period of time; and (2) a Gainshare performance incentive component where the customer pays a variable fee, usually after the fixed fee period has ended, related to continued usage of the Company's intellectual property. Revenue derived from Gainshare performance incentives is contingent upon our customers reaching certain defined production yield levels. Gainshare performance incentive periods are usually subsequent to the delivery of all contractual services and performance obligations. We recorded Gainshare revenue as a usage-based royalty based on customers' usage of intellectual property and recorded in the same period in which the usage occurs.

Income Taxes

The Company's provision for income tax comprises its current tax liability and change in deferred tax assets and liabilities. Deferred tax assets and liabilities are recognized for the expected tax consequences of temporary differences between the tax bases of assets and liabilities. The measurement of current and deferred tax assets and liabilities is based on provisions of enacted tax laws; the effect of future changes in tax laws or rates is not factored in. Valuation allowances are provided to reduce deferred tax assets to an amount that in management's judgment is more likely than not to be recoverable against future taxable income. No U.S. taxes are provided on earnings of non-U.S. subsidiaries, to the extent such earnings are deemed to be permanently invested. The Company's income tax calculations are based on application of the respective U.S. federal, state or foreign tax laws. The Company's tax filings, however, are subject to audit by the respective tax authorities. Accordingly, the Company recognizes tax liabilities based upon its estimate of whether, and the extent to which, additional taxes will be due when such estimates are more-likely-than-not to be sustained. An uncertain income tax position will not be recognized if it has less than a 50% likelihood of being sustained. To the extent the final tax liabilities are different from the amounts originally accrued, the increases or decreases are recorded as income tax expense or benefit in the condensed consolidated statements of operations and comprehensive loss.

Recent Accounting Pronouncements and Accounting Changes

See Note 1 of "Notes to Condensed Consolidated Financial Statements (Unaudited)" of this Quarterly Report on Form 10-Q for a description of recent accounting pronouncements and accounting changes, including the expected dates of adoption and estimated effects, if any, on our condensed consolidated financial statements.

Results of Operations

Discussion of Financial Data for the Three and Six Months Ended June 30, 2019 and 2018

Revenues

	Three Months Ended June 30,		Change		Six Months Ended June 30,		Change	
(Dollars in thousands)	**2019**	**2018**	**$**	**%**	**2019**	**2018**	**$**	**%**
Solutions	$ 13,429	$ 15,266	$ (1,837)	(12)%	$ 30,090	$ 33,456	$ (3,366)	(10)%
Gainshare performance incentives	7,139	5,853	1,286	22%	11,019	12,400	(1,381)	(11)%
Total revenues	$ 20,568	$ 21,119	$ (551)	(3)%	$ 41,109	$ 45,856	$ (4,747)	(10)%
Solutions revenue as a percentage of total revenues	65%	72%			73%	73%		
Gainshare performance incentives as a percentage of total revenues	35%	28%			27%	27%		

Solutions revenue is derived from services (including solution implementations, software support and maintenance, consulting, and training) and software and hardware licenses provided during our customer yield improvement engagements as well as during solution product sales. Solutions revenue decreased $1.8 million and $3.4 million for the three and six months ended June 30, 2019, compared to the year-ago periods, due primarily to the decrease in the revenue from our yield ramp solutions resulting from lower hours worked across multiple contracts and customers, which was partially offset by increases in Exensio big data solution revenues that were driven by higher business activity. Deferred revenue for the second fiscal quarter of 2019 includes $1.0 million associated with one customer in China that is significantly delinquent in payments, which revenue we expect to recognize in the future when it is more than likely that such payments will be made in the near term. Our Solutions revenue may fluctuate in the future and is dependent on a number of factors, including the semiconductor industry's continued acceptance of our solutions, the timing of purchases by existing and new customers, cancellations by existing customers, and our ability to attract new customers and penetrate new markets, and further penetration of our current customer base. Fluctuations in future results may also occur if any of our significant customers renegotiate pre-existing contractual commitments, including due to adverse changes in their own business.

Gainshare performance incentives revenues represent royalties and performance incentives earned contingent upon our customers reaching certain defined operational levels. Revenue derived from Gainshare performance incentives increased by $1.3 million for the three months ended June 30, 2019, compared to the year-ago period, due primarily to higher Gainshare performance incentives revenues from 14nm technology node. Revenue derived from Gainshare performance incentives decreased by $1.4 million for the six months ended June 30, 2019, compared to the year-ago period, due primarily to lower Gainshare performance incentives revenues from 28nm technology node during the first quarter of fiscal year 2019. Our Gainshare performance incentives revenue may continue to fluctuate from period to period. Gainshare performance incentives revenue is dependent on many factors that are outside our control, including among others, continued production of ICs by our customers at facilities at which we generate Gainshare, sustained yield improvements by our customers, and our ability to enter into new solutions contracts containing Gainshare performance incentives.

Gross Margin

	Three Months Ended June 30,		Change		Six Months Ended June 30,		Change	
(Dollars in thousands)	**2019**	**2018**	**$**	**%**	**2019**	**2018**	**$**	**%**
Solutions	$ 5,597	$ 4,349	$ 1,248	29%	$ 14,390	$ 11,057	$ 3,333	30%
Gainshare performance incentives	7,139	5,853	1,286	22%	11,019	12,400	(1,381)	(11)%
Gross profit	$ 12,736	$ 10,202	$ 2,534	25%	$ 25,409	$ 23,457	$ 1,952	8%
Gross margin – Solutions revenue	27%	20%			35%	24%		
Gross margin – Gainshare performance incentives	35%	28%			27%	27%		
Gross margin – Total Company	62%	48%			62%	51%		

Gross margin increased for the three months ended June 30, 2019 compared to the year-ago period, due primarily to an increase in Gainshare performance incentives and reduction in headcount primarily related to our yield ramp business, which is a cost of revenues. Cost of solutions decreased for the three months ended June 30, 2019, compared to the year-ago period, primarily due to (i) a $2.2 million decrease in personnel-related cost driven by lower headcount and lower chargeable hours incurred across multiple contracts and customers, and a decrease in stock-based compensation expense, (ii) a $0.4 million decrease in hardware and equipment expense due to lesser solutions revenue, and (iii) a $0.3 million decrease in travel expenses resulting from our cost management effort.

Gross margin increased for the six months ended June 30, 2019 compared to the year-ago period, due primarily to recognition of Solutions revenue of $3.3 million from a customer contract amendment during the first quarter of fiscal year 2019, without which our gross margin would be approximately 3.5% lower, and reduction in headcount primarily related to our yield ramp business, which is a cost of revenues. Cost of solutions decreased for the six months ended June 30, 2019, compared to the year-ago period, primarily due to (i) a $5.0 million decrease in personnel-related cost driven by lower headcount and lower chargeable hours incurred across multiple contracts and customers, and a decrease in stock-based compensation expense, partially offset by a provision for discretionary employee bonuses for fiscal year 2019, (ii) a $0.9 million decrease in hardware and equipment expense due to lesser solutions revenue, (iii) a $0.5 million decrease in travel expenses resulting from our cost management effort, and (iv) a $0.3 million decrease in facilities expense. These increases in gross margin were partially offset by a $1.4 million decrease in Gainshare performance incentives

Research and Development

	Three Months Ended June 30,		Change		Six Months Ended June 30,		Change	
(Dollars in thousands)	**2019**	**2018**	**$**	**%**	**2019**	**2018**	**$**	**%**
Research and development	$ 7,312	$ 7,100	$ 212	3%	$ 15,558	$ 14,345	$ 1,213	8%
Research and development as a percentage of total revenues	36%	34%			38%	31%		

Research and development expenses consist primarily of personnel-related costs to support product development activities, including compensation and benefits, outside development services, travel, facilities cost allocations, and stock-based compensation charges.

Research and development expenses slightly increased for the three months ended June 30, 2019, compared to the year-ago period, primarily due to (i) a $0.1 million increase in personnel-related cost driven primarily by salary expenses related to our annual merit performance program, and higher payroll expenses charged due to the shifting of more resources from our yield ramp business to research and development activities, and (ii) a $0.3 million increase in facilities and other expenses. These increases in research and development expense were partially offset by a $0.2 million decrease in subcontractor expenses that is primarily related to our DFI and Exensio solutions.

Research and development expenses increased for the six months ended June 30, 2019, compared to the year-ago period due primarily to (i) a $1.4 million increase in personnel-related expense driven by an increase in stock based compensation expense of $0.9 million, higher payroll expenses charged due to the shifting of more resources from our yield ramp business to research and development activities, a provision for discretionary employee bonuses for fiscal year 2019, and salary expenses related to our worldwide merit increases, and (ii) a $0.3 million increase in facilities expense. These increases in research and development expense were partially offset by a $0.6 million decrease in subcontractor expenses that is primarily related to our DFI and Exensio solutions.

We anticipate our expenses in research and development will fluctuate in absolute dollars from period to period as a result of cost control initiatives and the timing of product development projects and revenue generating activity requirements.

Selling, General and Administrative

	Three Months Ended June 30,		Change		Six Months Ended June 30,		Change	
(Dollars in thousands)	**2019**	**2018**	**$**	**%**	**2019**	**2018**	**$**	**%**
Selling, general and administrative	$ 6,940	$ 5,919	$ 1,021	17%	$ 13,950	$ 12,294	$ 1,656	13%
Selling, general and administrative as a percentage of total revenues	34%	28%			34%	27%		

Selling, general and administrative expenses consist primarily of compensation and benefits for sales, marketing and general and administrative personnel, legal and accounting services, marketing communications, travel and facilities cost allocations, and stock-based compensation charges.

Selling, general and administrative expenses increased for the three months ended June 30, 2019, compared to the year-ago period, primarily due to (i) a $0.9 million increase in personnel-related expenses driven by higher payroll expenses allocated to selling and marketing activities as a result of shifting of resources from our yield ramp business, provision for discretionary and other employee bonuses for fiscal year 2019 and increase in accrued vacation benefits, partially offset by a decrease in stock-based compensation, (ii) a $0.4 million increase in legal expense due primarily to a business acquisition, and (iii) $0.2 million increase in facilities and depreciation and amortization expense. These increases in selling, general and administrative expenses were partially offset by a $0.2 million decrease in professional fees due to lower audit fees, a $0.2 million decrease in travel expenses resulting from our cost management effort, and a $0.1 million decrease in operating lease expense.

Selling, general and administrative expenses increased for the six months ended June 30, 2019, compared to the year-ago period, primarily due to (i) a $1.6 million increase in personnel-related expenses driven by higher payroll expenses allocated to selling and marketing activities as a result of the shifting of resources from our yield ramp business, a provision for discretionary employee bonuses for fiscal year 2019 and increase in accrued vacation benefits, partially offset by a decrease in stock-based compensation, (ii) a $0.3 million increase in legal expense due primarily related to a business acquisition, (iii) a $0.2 million increase in recruiting expense, and (iv) a $0.3 million increase in facilities and depreciation and amortization expense. These increases in selling, general and administrative expenses were partially offset by a $0.4 million decrease in professional fees due to lower audit fees, a $0.2 million decrease in travel expenses resulting from our cost management effort, and a $0.2 million decrease in operating lease expense.

Amortization of Other Acquired Intangible Assets

	Three Months Ended June 30,		Change		Six Months Ended June 30,		Change	
(Dollars in thousands)	**2019**	**2018**	**$**	**%**	**2019**	**2018**	**$**	**%**
Amortization of other acquired intangible assets	$ 154	$ 108	$ 46	43%	$ 262	$ 217	$ 45	21%

Amortization of other acquired intangible assets consists of amortization of intangibles acquired as a result of certain business combination. The increase in amortization of other acquired intangible assets for the three and six months ended June 30, 2019, compared to the year-ago periods, was primarily related to amortization of other acquired intangible assets related to acquisition of certain assets from StreamMosaic, Inc.

Interest and Other Income (Expense), Net

	Three Months Ended June 30,		Change		Six Months Ended June 30,		Change	
(Dollars in thousands)	**2019**	**2018**	**$**	**%**	**2019**	**2018**	**$**	**%**
Interest and other income (expense), net	$ 111	$ 390	$ (279)	(72)%	$ 105	$ 59	$ 46	78%

Interest and other income (expense), net, primarily consists of interest income and foreign currency transaction exchange gain (loss). Interest and other income (expense), net, decreased for the three months ended June 30, 2019, compared to the year-ago period primarily due to net unfavorable fluctuations in foreign exchange rates. Interest and other income (expense), net, slightly increased for the six months ended June 30, 2019, compared to the year-ago period, primarily due to increase in interest income and decrease in other charges.

Income Tax Benefit

	Three Months Ended June 30,		Change		Six Months Ended June 30,		Change	
(Dollars in thousands)	**2019**	**2018**	**$**	**%**	**2019**	**2018**	**$**	**%**
Income tax benefit	$ (849)	$ (439)	$ 410	93%	$ (947)	$ (820)	$ 127	15%

Income tax benefit increased for the three and six months ended June 30, 2019, compared to the year-ago periods, primarily due to the changes in forecasted income/loss between fiscal year 2019 and 2018, and higher excess tax benefit for employee stock compensation compared to the year-ago periods.

Liquidity and Capital Resources

As of June 30, 2019, our working capital, defined as total current assets less total current liabilities, was $126.7 million, compared to $137.7 million as of December 31, 2018. Cash and cash equivalents were $86.8 million as of June 30, 2019, compared to $96.1 million as of December 31, 2018. As of June 30, 2019, and December 31, 2018, cash and cash equivalents held by our foreign subsidiaries were $5.3 million and $4.1 million, respectively. We believe that our existing cash resources and anticipated funds from operations will satisfy our cash requirements to fund our operating activities, capital expenditures and other obligations for the next twelve months.

	Six Months Ended June 30,		
	2019	**2018**	**$ Change**
(In thousands)			
Net cash flows provided by (used in):			
Operating activities	$ 4,966	$ 9,719	$ (4,753)
Investing activities	(6,664)	(4,810)	(1,854)
Financing activities	(7,556)	(5,201)	(2,355)
Effect of exchange rate changes on cash and cash equivalents	(18)	(59)	41
Net decrease in cash and cash equivalents	$ (9,272)	$ (351)	$ (8,921)

Net Cash Flows Provided by Operating Activities

Cash flow from operating activities during the six months ended June 30, 2019 mostly consisted of net loss, adjusted for certain non-cash items which primarily consisted of depreciation and amortization, share-based compensation expense and deferred tax assets. The $4.8 million decrease in cash flows from operating activities for the six months ended June 30, 2019, compared to the year-ago period, was driven primarily by (i) a $0.9 million increase in net loss, (ii) a decrease in non-cash adjustments to net loss by $0.1 million primarily due to an increase in deferred tax assets of $0.7 million, and an increase in stock-based compensation expense of $0.4 million, and (iii) a $3.8 million decrease in net change from operating assets and liabilities. The major contributors to the net change in operating assets and liabilities for the six months ended June 30, 2019 were as follows:

- Accounts receivable increased by $0.8 million for the six months ended June 30, 2019 compared to a decreased in accounts receivable by $4.5 million for the six months ended June 30, 2018 contributing to a higher net cash flows provided by operating activities in the year ago period. Our days of sales outstanding, or DSO, increased from 135 days at December 31, 2018 to 172 days at June 30, 2019, and includes three slow paying customers in Asia. Had it not been for these three customers, our DSO at June 30, 2019 would have been 105 days. One customer has received a contractual dispute notice from us demanding payment. Under the dispute notice, the Company's management agrees to meet to resolve the payment matter. If the dispute is not resolved, the matter would proceed to binding arbitration. We believe that we have honored the contract and would prevail in any arbitration. The customer represents 37 days of the DSO. Two other customers have administrative issues, which are being resolved. Accounts receivable balances from these customers when combined represent 67 days of DSO.

- Deferred revenue increased by $1.2 million primarily due to timing of billing and revenue recognition.

Net Cash Flows Used in Investing Activities

Net cash used in investing activities increased for the six months ended June 30, 2019 compared to the year-ago period. For the six months ended June 30, 2019, cash flows used in investing activities related to (i) a $4.1 million property and equipment purchased primarily related to the construction of our DFI solution and expansion of our research and development laboratory and clean room and (ii) a $2.7 million payment for a business acquisition. For the six months ended June 30, 2018, cash flows used in investing activities related to property and equipment purchased for the development of our DFI solution.

Net Cash Flows Used in Financing Activities

Net cash used in financing activities increased by $2.4 million for the six months ended June 30, 2019, compared to the year-ago period. For the six months ended June 30, 2019, net cash used in financing activities primarily consisted of $7.7 million in cash used to repurchase shares of our common stock and $1.5 million in cash payments for taxes related to net share settlement of equity awards, partially offset by $1.6 million of proceeds from our Employee Stock Purchase Plan and exercise of stock options. For the six months ended June 30, 2018, net cash used in financing activities consisted of $5.2 million in cash used to repurchase shares of our common stock, $1.4 million of cash payments for taxes related to net share settlement of equity awards, partially offset by $1.4 million of proceeds from our Employee Stock Purchase Plan and exercise of stock options.

Contractual Obligations

The following table summarizes our known contractual obligations (in thousands) as of June 30, 2019:

	Payments Due by Period						
Contractual Obligations	**2019 (remaining six months)**	**2020**	**2021**	**2022**	**2023**	**2024 and thereafter**	**Total**
Operating lease obligations(1)	$ 882	$ 1,862	$ 1,711	$ 1,526	$ 1,167	$ 3,673	$ 10,821
Purchase obligations(2)	8,147	2,274	555	8	–	–	10,984
Total(3)	$ 9,029	$ 4,136	$ 2,266	$ 1,534	$ 1,167	$ 3,673	$ 21,805

(1) Refer to Note 5 of "Notes to Condensed Consolidated Financial Statements (Unaudited)" (Item 1 of Part I of this Report) for further discussion.

(2) Purchase obligations consist of agreements to purchase goods and services entered in the ordinary course of business.

(3) The contractual obligation table above excludes liabilities for uncertain tax positions of $3.0 million, which are not practicable to assign to any particular years, due to the inherent uncertainty of the tax positions. See Note 9 of "Notes to Condensed Consolidated Financial Statements (Unaudited)" (Item 1 of Part I of this Report) for further discussion.

Item 3. Quantitative and Qualitative Disclosures about Market Risk

We are exposed to three primary types of market risks: credit risk and counterparty risk, foreign currency exchange rate risk and interest rate risk. The following discusses our exposure to market risk related to changes in interest rates and foreign currency exchange rates. We do not currently own any equity investments, nor do we expect to own any in the foreseeable future. This discussion contains forward-looking statements that are subject to risks and uncertainties. Actual results could vary materially as a result of a number of factors.

Interest Rate Risk. As of June 30, 2019, we had cash and cash equivalents of $86.8 million. Cash and cash equivalents consisted of cash and highly liquid money market instruments. We would not expect our operating results or cash flows to be affected to any significant degree by the effect of a sudden change in market interest on our portfolio. A hypothetical increase in market interest rates of 100 basis points from the market rates in effect at June 30, 2019, would cause the fair value of these investments to decrease by an immaterial amount, which would not have significantly impacted our financial position or results of operations.

Foreign Currency and Exchange Risk. Certain of our payables for our international offices are denominated in the local currency, including the Euro, Yen and RMB. Therefore, a portion of our operating expenditures is subject to foreign currency risks. We enter into foreign currency forward contracts to reduce the exposure to foreign currency exchange rate fluctuations on certain foreign currency denominated monetary assets and liabilities. We do not use foreign currency forward contracts for speculative or trading purposes. We record these forward contracts at fair value. The counterparty to these foreign currency forward contracts is a large global financial institution that we believe is creditworthy, and therefore, we believe the credit risk of counterparty non-performance is not significant. The change in fair value of these contracts is recorded into earnings as a component of other income (expense), net and offsets the change in fair value of foreign currency denominated monetary assets and liabilities, which is also recorded in other income (expense), net. As of June 30, 2019, we had no outstanding forward contracts. Subsequent to the end of second quarter of 2019, we entered into one outstanding forward contract with a notional amount of $8.3 million. The foreign currency exchange rate movement of plus-or-minus 10% will result in the change in fair value of this contract of plus-or-minus $0.8 million.

Off-Balance Sheet Arrangements

We do not have any off-balance sheet arrangements, investments in special purpose entities or undisclosed borrowings or debt.

Item 4. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our principal executive officer and principal financial and accounting officer, evaluated the effectiveness of our “disclosure controls and procedures” as defined in Exchange Act Rules 13a-15(e) and 15d-15(e) as of June 30, 2019, in connection with the filing of this Quarterly Report on Form 10-Q. Based on that evaluation as of June 30, 2019, our principal executive officer and principal financial and accounting officer 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 is recorded, processed, summarized and reported within the time periods specified in rules and forms of the SEC and accumulated and communicated to our management as appropriate to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There were no changes in the Company's internal control over financial reporting during the three months ended June 30, 2019, that have materially affected, or are reasonably likely to materially affect, the Company’s internal control over financial reporting.

PART II — OTHER INFORMATION

Item 1. Legal Proceedings

From time to time, we are subject to various claims and legal proceedings that arise in the ordinary course of business. We accrue for losses related to litigation when a potential loss is probable and the loss can be reasonably estimated in accordance with FASB requirements. During the reported period, we were not a party to any material legal proceedings, thus no loss was probable and no amount was accrued at June 30, 2019.

Item 1A. Risk Factors

Item 1A, “Risk Factors,” on pages 13 through 19 of the Company’s Annual Report on Form 10-K for the year ended December 31, 2018, provides information on the significant risks associated with our business. Except as set forth below, there have been no subsequent material changes to these risks.

We have a limited number of customers with significant past due receivable balances, and our failure to collect a significant portion of such balances could adversely affect our cash, require us to write-off receivables or increase our bad debt allowance, and lose future business with these customers.

We recognized revenue from a limited number of customers in 2017, 2018 and 2019 for services and deliverables that were performed and invoiced but remain largely unpaid. Our accounts receivable balance, net of allowances, was $52.4 million and $51.6 million as of June 30, 2019 and December 31, 2018, respectively. Days sales outstanding in accounts receivable (“DSO”) at the end of the second quarter of fiscal 2019 was 172 days. Two customers accounted for 56% of our gross accounts receivable as of December 31, 2018 and 2017, and one customer accounted for 37% and 40% of our revenues for 2018 and 2017, respectively. The allowance for doubtful accounts was $0.3 million and $0.4 million as of December 31, 2018 and 2017, respectively. We generally do not require collateral or other security to support accounts receivable. Despite the financial ability of these customers to pay and on-going services by PDF under valid contracts, customers may delay payments or make claims regarding our performance or the validity of the contracts in an attempt to negotiate reductions or to credit such balances against future work to be performed by us. Our allowances for potential credit losses, if any, could be insufficient, and we may need to adjust our allowance for doubtful accounts from current estimates or write-off receivables depending on such claims in the future. Any adjustments could be material to our consolidated financial statements and cash flows and, if, contrary to our judgment, it is later determined that an allowance should have been recorded earlier, we may be required to restate prior periods. Moreover, if we are forced to pursue legal remedies to collect receivables, our business relationship and future business with these customers could suffer.

Item 2. Unregistered Sales of Equity Securities and Use of Proceeds

The table below sets forth the information with respect to purchases made by or on behalf of the Company or any “affiliated purchaser” (as the term is defined in Rule 10b-18(a)(3) under the Exchange Act) of our common stock during the three months ended June 30, 2019 (in thousands except per share amounts):

ISSUER PURCHASES OF EQUITY SECURITIES

Period	Total Number of Shares Purchased (in thousands) (1)	Average Price Paid Per Share	Total Number of Shares Purchased as Part of Publicly Announced Programs (in thousands) (1)	Approximate Dollar Value of Shares that May Yet Be Purchased Under Programs (in thousands) (1)
April 1, 2019 through April 30, 2019	—	$ —	—	$ 21,084
May 1, 2019 through May 31, 2019	145	$ 12.61	145	$ 19,255
June 1, 2019 through June 30, 2019	155	$ 12.66	155	$ 17,293
Total	300	$ 12.63	300	

(1) On May 29, 2018, the Board of Directors adopted a new 2018 program to repurchase up to $25.0 million of common stock both on the open market and in privately negotiated transactions, from time to time, over the next two years. See Note 6 of “Notes to Condensed Consolidated Financial Statements (Unaudited)” (Item 1 of Part I of this Report) for further information regarding our stock repurchase program.

Item 3. Defaults Upon Senior Securities

None.

Item 4. Mine Safety Disclosures

None.

Item 5. Other Information

None.

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Item 6. Exhibits

Exhibit Number	Description
3.1	Amended and Restated Bylaws of PDF Solutions, Inc. effective April 26, 2019, filed as Exhibit 3.1 to the Company's Form 8-K filed on May 1, 2019, and incorporated herein by reference.
10.1	PDF Solutions, Inc.'s Fifth Amended and Restated 2011 Stock Incentive Plan, filed as Appendix A to the Company's Proxy Statement filed on April 30, 2019, and incorporated herein by reference.*
31.01	Certification of the principal executive officer pursuant to Exchange Act Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.†
31.02	Certification of the principal financial and accounting officer pursuant to Exchange Act Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.†
32.01	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.**
32.02	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.**
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.†

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* Indicates management contract or compensatory plan or arrangement.
† Filed herewith.
** Furnished, and not filed.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

PDF SOLUTIONS, INC.

Date: August 6, 2019	By: /s/ JOHN K. KIBARIAN John K. Kibarian President and Chief Executive Officer (principal executive officer)
Date: August 6, 2019	By: /s/ CHRISTINE A. RUSSELL Christine A. Russell Executive Vice President, Finance and Chief Financial Officer (principal financial and accounting officer)

Exhibit 31.01

CERTIFICATIONS

I, John K. Kibarian, certify that:

1. I have reviewed this quarterly report on Form 10-Q of PDF Solutions, 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 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.

By: */s/* John K. Kibarian
John K. Kibarian
President and Chief Executive Officer
(principal executive officer)

Date: August 6, 2019

Exhibit 31.02

CERTIFICATIONS

I, Christine A. Russell, certify that:

1. I have reviewed this quarterly report on Form 10-Q of PDF Solutions, 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 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.

By: /s/ Christine A. Russell
Christine A. Russell
Executive Vice President, Finance and Chief Financial Officer
(principal financial and accounting officer)

Date: August 6, 2019

Exhibit 32.01

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

In connection with the Quarterly Report of PDF Solutions, Inc. (the “Company”) on Form 10-Q for the quarter ended June 30, 2019, as filed with the Securities and Exchange Commission on August 6, 2019 (the “Report”), I, John K. Kibarian, President and Chief Executive Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to my knowledge:

(1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and result of operations of the Company.

By: */s/* John K. Kibarian
John K. Kibarian
President and Chief Executive Officer
(principal executive officer)

Date: August 6, 2019

Exhibit 32.02

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

In connection with the Quarterly Report of PDF Solutions, Inc. (the "Company") on Form 10-Q for the quarter ended June 30, 2019 as filed with the Securities and Exchange Commission on August 6, 2019 (the "Report"), I, Christine A. Russell, Executive Vice President, Finance and Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to my knowledge:

(1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and result of operations of the Company.

By: /s/ Christine A. Russell
Christine A. Russell
Executive Vice President, Finance and Chief Financial Officer
(principal financial and accounting officer)

Date: August 6, 2019