

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 March 31, 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

(State or Other Jurisdiction of Incorporation or Organization)

25-1701361

(I.R.S. Employer Identification No.)

2858 De La Cruz Blvd.

Santa Clara, California

(Address of Principal Executive Offices)

95050

(Zip Code)

(408) 280-7900

(Registrant's Telephone Number, Including Area Code)

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

Non-accelerated filer

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.

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

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

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 32,428,712 shares of the Registrant's Common Stock outstanding as of May 3, 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)

	March 31, 2019	December 31, 2018
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 90,415	\$ 96,089
Accounts receivable, net of allowance for doubtful accounts of \$332 in 2019 and 2018	53,211	51,570
Prepaid expenses and other current assets	9,862	9,562
Total current assets	153,488	157,221
Property and equipment, net	35,936	35,681
Operating lease right-of-use assets, net	8,339	—
Goodwill	1,923	1,923
Intangible assets, net	4,812	5,064
Deferred tax assets	21,099	19,044
Other non-current assets	7,088	6,972
Total assets	<u>\$ 232,685</u>	<u>\$ 225,905</u>
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	\$ 2,522	\$ 2,454
Accrued compensation and related benefits	4,256	4,727
Accrued and other current liabilities	2,801	3,235
Operating lease liabilities – current portion	1,914	—
Deferred revenues – current portion	9,220	8,477
Billings in excess of recognized revenues	1,529	635
Total current liabilities	22,242	19,528
Long-term income taxes payable	3,898	3,751
Non-current operating lease liabilities	8,464	—
Other non-current liabilities	734	2,831
Total liabilities	35,338	26,110
Commitments and contingencies (Note 12)		
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 41,009 and 40,677, respectively; shares outstanding 32,346 and 32,382, respectively	5	5
Additional paid-in-capital	315,429	310,660
Treasury stock at cost, 8,663 and 8,295 shares, respectively	(83,616)	(79,142)
Accumulated deficit	(33,143)	(30,452)
Accumulated other comprehensive loss	(1,328)	(1,276)
Total stockholders' equity	197,347	199,795
Total liabilities and stockholders' equity	<u>\$ 232,685</u>	<u>\$ 225,905</u>

See accompanying Notes to Condensed Consolidated Financial Statements (unaudited)

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

	Three Months Ended March 31,	
	2019	2018
Revenues:		
Solutions	\$ 16,661	\$ 18,190
Gainshare performance incentives	3,880	6,547
Total revenues	<u>20,541</u>	<u>24,737</u>
Cost of Solutions		
Direct costs of Solutions	7,723	11,338
Amortization of acquired technology	144	144
Total cost of solutions	<u>7,867</u>	<u>11,482</u>
Gross profit	12,674	13,255
Operating expenses:		
Research and development	8,246	7,245
Selling, general and administrative	7,011	6,375
Amortization of other acquired intangible assets	108	109
Restructuring charges	92	—
Total operating expenses	<u>15,457</u>	<u>13,729</u>
Loss from operations	(2,783)	(474)
Interest and other income (expense), net	(6)	(331)
Loss before income taxes	(2,789)	(805)
Income tax benefit	(98)	(381)
Net loss	<u>\$ (2,691)</u>	<u>\$ (424)</u>
Net loss per share:		
Basic	\$ (0.08)	\$ (0.01)
Diluted	<u>\$ (0.08)</u>	<u>\$ (0.01)</u>
Weighted average common shares:		
Basic	<u>32,485</u>	<u>32,168</u>
Diluted	<u>32,485</u>	<u>32,168</u>
Net loss	\$ (2,691)	\$ (424)
Other comprehensive income (loss):		
Foreign currency translation adjustments, net of tax	(52)	525
Comprehensive income (loss)	<u>\$ (2,743)</u>	<u>\$ 101</u>

See accompanying Notes to Condensed Consolidated Financial Statements (unaudited)

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

	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 expense	-	-	3,469	-	-	-	-	3,469
Comprehensive loss	-	-	-	-	-	(2,691)	(52)	(2,743)
Balances, March 31, 2019	<u>32,346</u>	<u>\$ 5</u>	<u>\$ 315,429</u>	<u>8,663</u>	<u>\$(83,616)</u>	<u>\$ (33,143)</u>	<u>\$ (1,328)</u>	<u>\$ 197,347</u>

	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 expense	-	-	2,871	-	-	-	-	2,871
Comprehensive income (loss)	-	-	-	-	-	(424)	525	101
Balances, March 31, 2018	<u>31,964</u>	<u>\$ 5</u>	<u>\$ 301,867</u>	<u>8,062</u>	<u>\$(76,473)</u>	<u>\$ (23,160)</u>	<u>\$ (180)</u>	<u>\$ 202,059</u>

See accompanying Notes to Condensed Consolidated Financial Statements (unaudited)

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

	Three Months Ended March 31,	
	2019	2018
Operating activities:		
Net loss	\$ (2,691)	\$ (424)
Adjustments to reconcile net loss to net cash provided by operating activities:		
Depreciation and amortization	1,292	1,261
Stock-based compensation expense	3,476	2,856
Amortization of acquired intangible assets	252	253
Deferred taxes	(2,054)	117
Loss on disposal of property and equipment	—	3
Unrealized loss (gain) on foreign currency forward contract	(2)	58
Changes in operating assets and liabilities:		
Accounts receivable	(1,641)	(80)
Prepaid expenses and other current assets	(297)	(2,183)
Other non-current assets	50	798
Accounts payable	198	497
Accrued compensation and related benefits	(472)	(1,278)
Accrued and other liabilities	415	(532)
Deferred revenues	429	1,906
Billings in excess of recognized revenues	894	—
Net cash provided by (used in) operating activities	<u>(151)</u>	<u>3,252</u>
Investing activities:		
Purchases of property and equipment	(2,357)	(2,447)
Net cash used in investing activities	<u>(2,357)</u>	<u>(2,447)</u>
Financing activities:		
Proceeds from exercise of stock options	518	39
Repurchases of common stock	(3,917)	(4,123)
Proceeds from employee stock purchase plan	782	1,007
Payments for taxes related to net share settlement of equity awards	(557)	(557)
Net cash used in financing activities	<u>(3,174)</u>	<u>(3,634)</u>
Effect of exchange rate changes on cash and cash equivalents	<u>8</u>	<u>84</u>
Net change in cash and cash equivalents	(5,674)	(2,745)
Cash and cash equivalents, beginning of period	96,089	101,267
Cash and cash equivalents, end of period	<u>\$ 90,415</u>	<u>\$ 98,522</u>
Supplemental disclosure of cash flow information:		
Cash paid during the period for taxes	<u>\$ 462</u>	<u>\$ 622</u>
Cash paid for amounts included in the measurement of operating lease liabilities	<u>\$ 276</u>	<u>\$ —</u>
Property and equipment received and accrued in accounts payable and accrued and other liabilities	<u>\$ 1,284</u>	<u>\$ 1,185</u>

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 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 generally accepted accounting principles in the United States (“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.

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 whether agreements contain leases, the classification of leases, and 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.

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The Company's lease portfolio consists primarily of real estate assets, which includes administrative and sales offices, and 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 are continued 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 represents 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 represents 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 4 for further information, including further discussion on the impact of adoption and changes in accounting policies relating to leases.

Income Statement – Reporting Comprehensive Income

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.

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 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. 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.

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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 collectibility 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 months ended March 31, 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 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.

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 significant 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, 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 (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

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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 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.

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:

	Three Months Ended March 31,	
	2019	2018
Licenses and Gainshare Performance Incentives	\$ 5,181	\$ 7,487
Support and Services	15,252	16,989
Other	108	261
Total	<u>\$ 20,541</u>	<u>\$ 24,737</u>

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 March 31,	
	2019	2018
Over time	75%	69%
Point-in-time	25%	31%
Total	<u>100%</u>	<u>100%</u>

International revenues accounted for approximately 55% of our total revenues for the three months ended March 31, 2019 as compared to 59% for the three months ended March 31, 2018. See Note 10. 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.

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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 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 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. The contract assets is included in prepaid expenses and other current assets in the condensed consolidated balance sheets. At March 31, 2019 and December 31, 2018, contract assets of \$3.5 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. 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 is 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 \$0.7 million and \$1.0 million, respectively, as of March 31, 2019 and December 31, 2018. Revenue recognized for the three months ended March 31, 2019 and 2018, that was included in the deferred revenue balance at the beginning of each reporting period was \$3.3 million and \$2.6 million, respectively.

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At March 31, 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 \$40.4 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 March 31, 2019 and 2018 from performance obligations satisfied (or partially satisfied) in previous periods was a decrease of \$0.5 million and an increase of \$0.5 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 March 31, 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 March 31, 2019 and 2018 was \$0.1 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 \$0.1 million and \$0.2 million as of March 31, 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.

3. BALANCE SHEET COMPONENTS

Accounts receivable

Account receivable include 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 \$19.4 million and \$22.2 million as of March 31, 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 \$5.1 million and \$5.3 million as of March 31, 2019, and December 31, 2018, respectively.

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Property and equipment

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

	March 31, 2019	December 31, 2018
Property and equipment, net:		
Computer equipment	\$ 10,645	\$ 10,536
Software	4,106	4,112
Furniture, fixtures and equipment	4,853	4,688
Leasehold improvements	5,020	5,474
Test equipment	15,110	14,697
Construction-in-progress	20,958	20,293
	<u>60,692</u>	<u>59,800</u>
Less: accumulated depreciation	(24,756)	(24,119)
Total	<u>\$ 35,936</u>	<u>\$ 35,681</u>

Test equipment includes DFI assets at customer sites that are contributing to DFI solution revenues. The construction-in-progress balance as of March 31, 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 March 31, 2019 and 2018.

Goodwill and Intangible Assets

As of March 31, 2019, and December 31, 2018, the carrying amount of goodwill was \$1.9 million.

Intangible assets balance was \$4.8 million and \$5.1 million as of March 31, 2019 and December 31, 2018, respectively. Intangible assets as of March 31, 2019 and December 31, 2018 consist of the following (in thousands):

	Amortization Period (Years)	March 31, 2019			December 31, 2018		
		Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Acquired identifiable intangibles:							
Customer relationships	1 – 9	\$ 6,740	\$ (4,606)	\$ 2,134	\$ 6,740	\$ (4,514)	\$ 2,226
Developed technology	4 – 9	15,820	(13,548)	2,272	15,820	(13,404)	2,416
Tradenname	2 – 7	790	(654)	136	790	(648)	142
Patent	7 – 10	1,800	(1,530)	270	1,800	(1,520)	280
Total		<u>\$ 25,150</u>	<u>\$ (20,338)</u>	<u>\$ 4,812</u>	<u>\$ 25,150</u>	<u>\$ (20,086)</u>	<u>\$ 5,064</u>

The weighted average amortization period for acquired identifiable intangible assets was 5.7 years as of March 31, 2019. For both the three months ended March 31, 2019 and 2018, intangible asset amortization expense was \$0.3 million. The Company expects annual amortization of acquired identifiable intangible assets to be as follows (in thousands):

Year ending December 31,	Amount
2019 (remaining nine months)	\$ 757
2020	1,009
2021	832
2022	626
2023	626
2024 and thereafter	962
Total future amortization expense	<u>\$ 4,812</u>

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 months ended March 31, 2019, there were no indicators of impairment related to the Company's intangible assets.

4. 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 March 31, 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 March 31, 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 for the three months ended March 31, 2019 and 2018, amounted to \$0.5 million and \$0.6 million, respectively. Operating lease cost includes short-term leases and variable lease costs, which are immaterial.

Maturity of operating lease liabilities as of March 31, 2019, are as follows (in thousands):

Year ending December 31,	Amount ^(a)
2019 (remaining nine months)	\$ 1,381
2020	1,870
2021	1,719
2022	1,536
2023	1,417
2024 and thereafter	4,750
Total future minimum lease payments	\$ 12,673
Less: Interest ^(b)	(2,295)
Present value of operating lease liabilities ^(c)	\$ 10,378

^(a) As of March 31, 2019, amounts include a lease arrangement that commenced on April 1, 2019, with a renewal option that is reasonably certain to be exercised. The total operating lease liability recognized pertaining to the lease arrangement was approximately \$1.9 million, of which \$0.9 million pertains to the renewal period.

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

^(c) Includes the current portion of operating lease liabilities of \$1.9 million as of March 31, 2019.

As of March 31, 2019, the weighted average remaining lease term under operating ROU leases was 7.8 years.

As of March 31, 2019, the weighted average discount rate for operating lease liabilities was approximately 5.3%.

No new Operating lease ROU asset was obtained in exchange of operating lease liabilities during the three months ended March 31, 2019.

5. 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 months ended March 31, 2019, the Company repurchased approximately 314,000 shares at an average price of \$12.46 per share, for \$3.9 million under the 2018 program. During the three months ended March 31, 2018, the Company repurchased approximately 338,000 shares at an average price of \$12.19 per share, for \$4.1 million under the 2016 program. Under the 2018 program, as of March 31, 2019, \$21.1 million of the Company's common stock remained available for future repurchases.

6. EMPLOYEE BENEFIT PLANS

On March 31, 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:

	Three Months Ended March 31,	
	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 March 31, 2019 and 2018, a total of approximately 88,000 and 108,000 shares, respectively, were issued at a weighted-average purchase price of \$8.93 and \$9.29 per share, respectively. As of March 31, 2019, there was \$1.3 million of unrecognized compensation cost related to the Purchase Plan. That cost is expected to be recognized over a weighted average period of 1.83 years. As of March 31, 2019, 5.2 million shares were available for future issuance under the Purchase Plan.

[Table of Contents](#)**Stock Incentive Plans**

On November 16, 2011, the Company's stockholders approved the 2011 Stock Incentive Plan (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 9,050,000 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.

On April 26, 2019, the Company's Board of Directors amended the 2011 Plan, subject to stockholder approval, to increase the number of shares reserved for awards under it to a total of 10,300,00 shares, which is an increase of an additional 1,250,000 shares.

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 March 31, 2019, 9.6 million shares of common stock were reserved to cover stock-based awards under the 2011 Plan, of which 2.9 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 March 31, 2019. As of March 31, 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 March 31,	
	2019	2018
Expected life (in years)	4.46	4.43
Volatility	45.26%	42.22%
Risk-free interest rate	2.55%	2.52%
Expected dividend	—	—
Weighted average fair value per share of options granted during the period	\$ 4.51	\$ 4.28

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 March 31,	
	2019	2018
Cost of solutions	\$ 860	\$ 1,014
Research and development	1,718	879
Selling, general and administrative	898	963
Stock-based compensation expenses	<u>\$ 3,476</u>	<u>\$ 2,856</u>

The stock-based compensation expense for the three months ended March 31, 2019, and 2018 in the table above includes expense related to cash-settled stock appreciation rights ("SARs") granted to certain employees which totaled to an expense of \$7,000, and a credit of \$15,000, respectively. The Company accounted for these awards as liability and the amount was included in accrued compensation and related benefits.

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Additional information with respect to options under the Stock Plans during the three months ended March 31, 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 \$4.51 per share)	30	\$ 11.19		
Exercised	(87)	\$ 5.98		
Canceled	(3)	\$ 14.41		
Expired	(10)	\$ 16.70		
Outstanding, March 31, 2019	<u>957</u>	\$ 10.05	<u>4.62</u>	\$ 3,191
Vested and expected to vest, March 31, 2019	<u>936</u>	\$ 9.99	<u>4.52</u>	\$ 3,167
Exercisable, March 31, 2019	<u>713</u>	\$ 9.03	<u>3.17</u>	\$ 2,932

The aggregate intrinsic value in the table above represents the total intrinsic value based on the Company's closing stock price of \$12.35 per share as of March 31, 2019. The total intrinsic value of options exercised during the three months ended March 31, 2019, was \$0.4 million.

As of March 31, 2019, there was \$1.0 million of total unrecognized compensation cost related to unvested stock options. That cost is expected to be recognized over a weighted average period of 3.0 years. The total fair value of shares vested during the three months ended March 31, 2019, was \$0.1 million.

Nonvested restricted stock units activity during the three months ended March 31, 2019, was as follows:

	Shares (in thousands)	Weighted Average Grant Date Fair Value Per Share
Nonvested, January 1, 2019	1,835	\$ 11.93
Granted	155	\$ 12.26
Vested	(158)	\$ 13.62
Forfeited	(41)	\$ 12.72
Nonvested, March 31, 2019	<u>1,791</u>	\$ 11.80

As of March 31, 2019, there was \$16.2 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 2.6 years. Restricted stock units do not have rights to dividends prior to vesting.

7. 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 March 31, 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 is not expected to be significant.

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The following table summarizes the activities of restructuring liabilities under this plan for the three months ended March 31, 2019 (in thousands):

	Three Months Ended March 31, 2019
Beginning balance	\$ 244
Restructuring charges	92
Cash payments	(245)
Ending balance	<u>\$ 91</u>

Cash payments for the remaining restructuring liabilities as of March 31, 2019 are expected to be made in the remaining nine months of fiscal 2019.

8. INCOME TAXES

Income tax benefit decreased \$0.3 million for the three months ended March 31, 2019, to a \$0.1 million income tax benefit as compared to an income tax benefit of \$0.4 million for the three months ended March 31, 2018. The Company's effective tax rate benefit was 4% and 47% for the three months ended March 31, 2019 and 2018, respectively. The Company's effective tax rate benefit decreased in the three months ended March 31, 2019, as compared to the same period in 2018, primarily due to unfavorable 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 March 31, 2019, was \$13.8 million, of which \$8.1 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 March 31, 2019, the Company has recorded unrecognized tax benefits of \$3.2 million, including interest and penalties of \$0.8 million, as long-term taxes payable in its condensed consolidated balance sheet. The remaining \$11.4 million has been recorded net of our deferred tax assets, of which \$5.7 million is subject to a full valuation allowance.

The valuation allowance was approximately \$10.4 million and \$9.8 million as of March 31, 2019, and December 31, 2018, respectively, which was related to California R&D tax credits and California net operating losses related to our acquisition of Synticity that we currently do not believe are more likely than not to be ultimately 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, we are 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 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.

9. NET LOSS PER SHARE

Basic net loss per share is computed by dividing net income 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 March 31,	
	2019	2018
Numerator:		
Net loss	\$ (2,691)	\$ (424)
Denominator:		
Basic weighted-average shares outstanding	32,485	32,168
Effect of dilutive options and restricted stock	—	—
Diluted weighted average shares outstanding	32,485	32,168
Net loss per share - Basic	\$ (0.08)	\$ (0.01)
Net loss per share - Diluted	\$ (0.08)	\$ (0.01)

For the periods ended March 31, 2019 and 2018, because 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 March 31,	
	2019	2018
Outstanding options	622	655
Nonvested restricted stock units	748	961
Employee Stock Purchase Plan	379	32
Total	1,749	1,648

10. 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 an individual customer in excess of 10% of total revenues as follows:

Customer	Three Months Ended March 31,	
	2019	2018
A	36%	38%

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

Customer	March 31, 2019	December 31, 2018
A	35%	35%
B	23%	21%

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

	Three Months Ended March 31,			
	2019		2018	
	Revenues	Percentage of Revenues	Revenues	Percentage of Revenues
United States	\$ 9,315	45%	\$ 10,083	41%
China	2,983	15	5,182	21
Taiwan	1,755	9	2,135	9
Germany	1,085	5	1,544	6
Rest of the world	5,403	26	5,793	23
Total revenue	\$ 20,541	100%	\$ 24,737	100%

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

	March 31, 2019 ⁽¹⁾	December 31, 2018 ⁽²⁾
United States	\$ 41,579	\$ 35,173
Rest of the world	2,696	508
Total long-lived assets, net	\$ 44,275	\$ 35,681

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

11. 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.

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The following table represents the Company's assets measured at fair value on a recurring basis as of March 31, 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	\$ 27,218	\$ 27,218	\$ —	\$ —

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 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 March 31, 2019 and 2018, the Company recognized a realized loss of \$0.3 million and a realized gain of \$0.2 million on the contracts, respectively, which was recorded in other income (expense), net in the Company's condensed consolidated statements of operations and comprehensive income (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 it is not actively traded and the valuation inputs are based on quoted prices and market observable data of similar instruments. As of March 31, 2019, the Company had one outstanding forward contract with a notional amount of \$8.2 million and recorded \$53,000 other current liability associated with this 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.

12. 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 March 31, 2019, total outstanding purchase obligations were \$8.2 million, which are primarily due within the next 12 months.

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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 March 31, 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’ 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 either suspended 7nm development or forecasted a later start of mass production. 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.

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.

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The interest in Industry 4.0 (i.e., the fourth industrial revolution or the digital transformation of manufacturing technologies) is another trend that will 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 are 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 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 March 31, 2019, were as follows:

- Total revenues were \$20.5 million, which was a decrease of \$4.2 million, or 17%, compared to the year-ago period. Solutions revenue was \$16.7 million, which was a decrease of \$1.5 million, or 8%, 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 strong business activity. Gainshare performance incentives revenue was \$3.9 million, a decrease of \$2.7 million, or 41%, compared to the year-ago period. The decrease was primarily due to lower Gainshare performance incentives revenue from 28nm and 14nm technology nodes.
- Gross margin for the three months ended March 31, 2019 was 62%, compared to 54% for the year-ago period. During the three months ended March 31, 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, 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 March 31, 2019, compared to the year-ago period, primarily due to (i) a \$2.7 million decrease in personnel-related cost driven by (i) 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 bonus for fiscal 2019, (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. These increases in gross margin were partially offset by a \$2.7 million decrease in Gainshare performance incentives.

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- Net loss was \$2.7 million, compared to net loss of \$0.4 million for the year-ago period. The increase in net loss was primarily attributable to 17% lower revenues, and a lower tax benefit mainly driven by the changes in forecasted income/loss between fiscal 2019 and 2018, and lower excess tax benefit for employee stock compensation compared to the year-ago period, partially offset by a \$1.9 million decrease in cost of solutions and operating expenses related to a decrease in personnel-related costs driven by lower headcount, decrease in equipment, travel and subcontractor expenses, and foreign exchange loss.
- Net loss per basic and diluted share was \$(0.08) for the three months ended March 31, 2019, which was an increase in net loss of \$0.07 per basic and diluted share, compared to net loss per basic and diluted share of \$(0.01), for the year-ago period.
- Cash, cash equivalents and investments decreased \$5.7 million to \$90.4 million at March 31, 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 DFI solution, new office headquarters and expansion of our research and development laboratory and clean room, and cash used in financing activities primarily due to repurchases of our common stock.

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 three months ended March 31, 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

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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 Design-for-Inspection (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 significant portion of our 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, 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 (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 are not anticipated. 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 consolidated statements of operations and comprehensive income (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 Months Ended March 31, 2019 and 2018

Revenues

(Dollars in thousands)	Three Months Ended March 31,		\$ Change	% Change
	2019	2018		
Solutions	\$ 16,661	\$ 18,190	\$ (1,529)	(8%)
Gainshare performance incentives	3,880	6,547	(2,667)	(41%)
Total revenues	\$ 20,541	\$ 24,737	\$ (4,196)	(17%)
<i>Solutions revenue as a percentage of total revenues</i>	81%	74%		
<i>Gainshare performance incentives as a percentage of total revenues</i>	19%	26%		

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 \$1.5 million for the three months ended March 31, 2019, compared to the year-ago period, 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 strong business activity. 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 decreased by \$2.7 million for the three months ended March 31, 2019, compared to the year-ago period, due primarily to lower Gainshare performance incentives revenues from 28nm and 14nm technology nodes. 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

(Dollars in thousands)	Three Months Ended March 31,		\$ Change	% Change
	2019	2018		
Solutions	\$ 8,794	\$ 6,708	\$ 2,086	31%
Gainshare performance incentives	3,880	6,547	(2,667)	(41%)
Gross profit	\$ 12,674	\$ 13,255	\$ (581)	(4%)
<i>Gross margin - Solutions revenue</i>	53%	37%		
<i>Gross margin - Gainshare performance incentives</i>	100%	100%		
<i>Gross margin - Total Company</i>	62%	54%		

Gross margin increased for the three months ended March 31, 2019 compared to the year-ago period, due primarily to recognition of Solutions revenue of \$3.3 million from a customer contract amendment, 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 March 31, 2019, compared to the year-ago period, primarily due to (i) a \$2.7 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 bonus for fiscal 2019, (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. These increases in gross margin were partially offset by a \$2.7 million decrease in Gainshare performance incentives.

Research and Development

(Dollars in thousands)	Three Months Ended March 31,		\$ Change	% Change
	2019	2018		
Research and development	\$ 8,246	\$ 7,245	\$ 1,001	14%
<i>As a percentage of total revenues</i>	40%	29%		

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 increased for the three months ended March 31, 2019, compared to the year-ago period, primarily due to a \$1.2 million increase in personnel-related cost driven by an increase in stock based compensation expense of \$0.8 million, higher payroll expenses charged due to shifting of more resources from our yield ramp business to research and development activities, a \$0.2 million increase in facilities expense, partially offset by a \$0.4 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

(Dollars in thousands)	Three Months Ended March 31,		\$ Change	% Change
	2019	2018		
Selling, general and administrative	\$ 7,011	\$ 6,375	\$ 636	10%
<i>As a percentage of total revenues</i>	34%	26%		

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 March 31, 2019, compared to the year-ago period, primarily due to (i) \$0.7 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, (ii) partially offset by a \$0.2 million decrease in professional fees due to lower audit fees.

Amortization of Other Acquired Intangible Assets

(Dollars in thousands)	Three Months Ended March 31,		\$ Change	% Change
	2019	2018		
Amortization of other acquired intangible assets	\$ 108	\$ 109	\$ (1)	(1%)

Amortization of other acquired intangible assets consists of amortization of intangibles acquired as a result of certain business combination.

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Restructuring charges

(Dollars in thousands)	Three Months Ended March 31,		\$ Change	% Change
	2019	2018		
Restructuring charges	\$ 92	\$ —	\$ 92	100%

Restructuring charges for the three months ended March 31, 2019, were primarily related to employee separation charges incurred as part of the Company's restructuring plan announced on September 27, 2018, to reduce expenses and align its operations with evolving business needs.

See Note 7, Restructuring Charges, in Notes to Condensed Consolidated Financial Statements in Item 1 of Part I of this Report for more information regarding this restructuring plan.

Interest and Other Income (Expense), Net

(Dollars in thousands)	Three Months Ended March 31,		\$ Change	% Change
	2019	2018		
Interest and other income (expense), net	\$ (6)	\$ (331)	\$ (325)	(98%)

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 March 31, 2019, compared to the year-ago period primarily due to net favorable fluctuations in foreign exchange rates.

Income Tax Benefit

(Dollars in thousands)	Three Months Ended March 31,		\$ Change	% Change
	2019	2018		
Income tax benefit	\$ (98)	\$ (381)	\$ (283)	(74%)

Income tax benefit decreased \$0.3 million for the three months ended March 31, 2019, compared to the year-ago period, primarily due to the changes in forecasted income/loss between fiscal 2019 and 2018, and lower excess tax benefit for employee stock compensation compared to the year-ago period.

Liquidity and Capital Resources

As of March 31, 2019, our working capital, defined as total current assets less total current liabilities, was \$131.2 million, compared to \$137.7 million as of December 31, 2018. Cash and cash equivalents were \$90.4 million as of March 31, 2019, compared to \$96.1 million as of December 31, 2018. As of March 31, 2019, and December 31, 2018, cash and cash equivalents held by our foreign subsidiaries were \$3.0 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.

(In thousands)	Three Months Ended March 31,		\$ Change
	2019	2018	
Net cash flows provided by (used in):			
Operating activities	\$ (151)	\$ 3,252	\$ (3,403)
Investing activities	(2,357)	(2,447)	90
Financing activities	(3,174)	(3,634)	460
Effect of exchange rate changes on cash and cash equivalents	8	84	(76)
Net decrease in cash and cash equivalents	\$ (5,674)	\$ (2,745)	\$ (2,929)

Net Cash Flows Provided by (Used in) Operating Activities

Cash flow from operating activities during the three months ended March 31, 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 \$3.4 million decrease in cash flows from operating activities for the three months ended March 31, 2019, compared to the year-ago period, was driven primarily by a \$2.3 million increase in net loss, a decrease in non-cash adjustments to net loss by \$1.6 million primarily due to an increase in deferred tax assets of \$2.2 million, and an increase in stock-based compensation expense of \$0.6 million, partially offset by a \$0.4 million decrease in net change from operating assets and liabilities. The major contributors to the net change in operating assets and liabilities for the three months ended March 31, 2019 were as follows:

- Accounts receivable increased by \$1.6 million primarily due to slower payments from a few customers despite a decrease in revenues. Days of sales outstanding, or DSO, increased primarily due to slower payments by certain customers in Asia. We have not incurred any significant write-offs of accounts receivable during the three months ended March 31, 2019 and in fiscal year 2018.
- Billings in excess of recognized revenues increased by \$0.9 million primarily due to timing of billing and revenue recognition.

Net Cash Flows Used in Investing Activities

Net cash used in investing activities was flat for the three months ended March 31, 2019 compared for the year-ago period. For the three months ended March 31, 2019 and 2018, cash flows used in investing activities related to property and equipment purchased for the development our DFI solution, new office headquarters and expansion of our research and development laboratory and clean room.

Net Cash Flows Used in Financing Activities

Net cash used in financing activities decreased by \$0.5 million for the three months ended March 31, 2019, compared to the year-ago period. For the three months ended March 31, 2019, net cash used in financing activities primarily consisted of \$3.9 million cash used to repurchase shares of our common stock and \$0.6 million cash payments for taxes related to net share settlement of equity awards, partially offset by \$1.3 million of proceeds from our Employee Stock Purchase Plan and exercise of stock options. For the three months ended March 31, 2018, net cash used in financing activities of \$3.6 million, consisted of \$4.1 million repurchases of common stock, \$0.6 million of cash payments for taxes related to net share settlement of equity awards, partially offset by \$1.0 million of proceeds from our Employee Stock Purchase Plan and exercise of stock options.

Off-Balance Sheet Agreements

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

Contractual Obligations

The following table summarizes our known contractual obligations (in thousands) as of March 31, 2019:

Contractual Obligations	Payments Due by Period						Total
	2019 (remaining nine months)	2020	2021	2022	2023	2024 and thereafter	
Operating lease obligations(1)	\$ 1,381	\$ 1,870	\$ 1,719	\$ 1,536	\$ 1,175	\$ 3,673	\$ 11,354
Purchase obligations(2)	7,149	678	401	8	4	—	8,240
Total(3)	<u>\$ 8,530</u>	<u>\$ 2,548</u>	<u>\$ 2,120</u>	<u>\$ 1,544</u>	<u>\$ 1,179</u>	<u>\$ 3,673</u>	<u>\$ 19,594</u>

- (1) Refer to Note 4, Leases of the Notes to Condensed Consolidated Financial Statements (Item 1 of Part I of this Report)
- (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 \$3.2 million, which are not practicable to assign to any particular years, due to the inherent uncertainty of the tax positions. See Note 8 of “Notes to Condensed Consolidated Financial Statements” 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 March 31, 2019, we had cash and cash equivalents of \$90.4 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 March 31, 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 March 31, 2019, we had one outstanding forward contract with a notional amount of \$8.2 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.

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 March 31, 2019, in connection with the filing of this Quarterly Report on Form 10-Q. Based on that evaluation as of March 31, 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 March 31, 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 March 31, 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. There have been no subsequent material changes to these risks.

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 March 31, 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)
January 1, 2019 through January 31, 2019	—	\$ —	—	\$ 25,000
February 1, 2019 through February 28, 2019	—	\$ —	—	\$ 25,000
March 1, 2019 through March 31, 2019	314	\$ 12.46	314	\$ 21,084
Total	314	\$ 12.46	314	

- (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. Under the 2018 program, \$21.1 million of common stock remained available for future repurchases.

Item 3. Defaults Upon Senior Securities

None.

Item 4. Mine Safety Disclosures

None.

Item 5. Other Information

As disclosed in the Form 8-K filed October 29, 2018, the Company entered into a revised employment offer with Comelis Hartgring. Pursuant to the revised employment offer, Mr. Hartgring ceased to be an executive officer as of November 1, 2018.

In addition, on April 26, 2019, the Board of Directors approved a new reporting structure for the Company effective January 1, 2019. As a result, Kwang-Hyun Kim ceased to be an executive officer on December 31, 2018, but continues as Vice President, Business Development, PDF Solutions Semiconductor Technology Korea Limited.

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Item 6. Exhibits

Exhibit Number	Description
3.01	Amended and Restated Bylaws of PDF Solutions, Inc., effective January 28, 2019 (incorporated herein by reference to Exhibit 3.1 to registrant's Current Report on Form 8-K, filed January 28, 2019). *
3.02	Amended and Restated Bylaws of PDF Solutions, Inc., effective April 26, 2019 (incorporated herein by reference to Exhibit 3.1 to registrant's Current Report on Form 8-K, filed May 1, 2019). *
10.01	Offer letter to Cornelis D. Hartgring from PDF Solutions, Inc. dated October 26, 2018. *†
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.†

* 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: May 7, 2019

By: /s/ JOHN K. KIBARIAN

John K. Kibarian
President and Chief Executive Officer
(principal executive officer)

Date: May 7, 2019

By: /s/ CHRISTINE A. RUSSELL

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



PDF Solutions, Inc.
2858 De La Cruz Blvd.
Santa Clara, California 95050 USA

VIA EMAIL: cees.hartgring@pdf.com

Cornelis D. Hartgring

October 26, 2018

Re: Revised Employment Terms- Part Time Status

Dear Cees,

On behalf of PDF Solutions, Inc., (“PDF” of the “Company”), I am pleased to accommodate your request for a change in your employment status to part time. Your previous offer terms are superseded by the terms outlined in this offer letter. Your title will remain that of Vice President of Client Services and Sales, however, for clarification, this position is no longer an executive officer role and any policies you generate or help generate are to be reviewed/approved by the CEO, CFO, or VP, Products & Services. This offer of part time employment with PDF is conditioned upon your acceptance, in writing, of the terms and conditions as enumerated below.

1. **Part time work hours.** Commencing on November 1, 2018, your part time work hours will be 30 hours per week.
 2. **Compensation.** Based on your part time status, you shall be paid a base salary of One Hundred Thirty-seven Thousand Five Hundred U.S. dollars (**\$137,500**) per annum, paid to you semimonthly at the rate of **\$5,729.17** per payroll period. Your salary shall be paid in accordance with the Company's standard payroll policies (subject to applicable withholding taxes as required by law).
 3. **Bonus.** You shall be eligible to participate in a Company-sponsored incentive bonus plans that may (from time to time and at the sole discretion and option of the Company) be made available to PDF employees on a company wide basis, unless otherwise determined by the PDF Compensation Committee. The structure of such plans and the amount of any bonus awarded under such plans shall be in alignment with the objectives of the official Company annual business plan for any year in question.
 4. **Stock Options and RSUs.** You will continue to be eligible to participate in the company’s stock options and RSU program. The options will be non-qualified stock options. These equity awards will be subject to the terms of the Company’s 2011 Stock Plan (as amended and restated) and the execution of the applicable Stock Option Agreement entered into between you and the Company, which terms shall also govern these awards.
 5. **General Duties.** During the term of your employment, you agree that at all times and to the best of your ability you will loyally and conscientiously perform all of the duties and obligations required of you in your job and by the Company. You further agree that you will not render commercial or professional services of any nature to any person or organization, whether or not for compensation, without the prior written consent of the Company, and that you will not directly or indirectly engage in or participate in any business that is competitive in any manner with the business of the Company. You also agree to comply with any and all policies of the Company as in effect from time to time.
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6. **Benefits.** As a 30 hours per week part time employee, you can continue to participate in the Company's regular health insurance program and other benefits as established by the Company for its employees from time to time.
 7. **Confidential Information and Invention Assignment Agreement.** Your executed Company's Confidential Information and Invention Assignment Agreement (the "**Confidentiality Agreement**") remains in effect, a copy of which is filed in PDF's Human Resources Department.
 8. **Arbitration.** Any dispute, claim or controversy between you as Employee and PDF Solutions as Employer arising out of or relating to (i) our employment relationship or any of the events or circumstances leading up to your employment with PDF Solutions including, without limitation, your interview process and all negotiations relating to your employment with PDF Solutions and the execution of this agreement; and/or (ii) this agreement or any of its provisions, or the breach, termination, enforcement, interpretation or validity thereof, shall be subject to and resolved exclusively by arbitration before a single arbitrator in accordance with the National Rules for the Resolution of Employment Disputes, also called the "Employment Arbitration Rules and Mediation Procedures"(the "Rules") of the American Arbitration Association (the "AAA"), a copy of which can be found as of the date of this letter at the following internet website: <https://www.adr.org/sites/default/files/Commercial%20Rules.pdf>. Such Rules of the AAA in effect at the time of your accepting this offer of employment and entering this agreement by that acceptance are to be used, provided that they remain applicable and do not contravene applicable law at the time of any actual arbitration. The single arbitrator will be selected by the AAA pursuant to its Rules. The decision of the arbitrator and any arbitration award shall be final, binding, non-appealable and conclusive on and as to the parties thereto. No recourse may be made to any court except solely to enforce a final award in a court of competent jurisdiction. California law, without regard to conflict of law principles or the choice of law provisions of other states, applies to this agreement to arbitrate, as well as exclusively to all other matters regarding your employment or arising respecting it at any time, except to the extent that the Federal Arbitration Act (FAA) and federal law regarding arbitration is applicable, in which case as to those issues, federal law governs. In this regard, it is acknowledged that the employee's employment is specifically understood to "involve commerce" and that the FAA governs and applies in those circumstances. The provisions of this offer letter, specifically including the agreement to arbitrate, are the product of arm's length negotiations with you and they are agreed to and are entered after due consideration and voluntarily with the intention to be bound by them, including the agreement to arbitrate, and it is agreed and acknowledged that this is an individually negotiated agreement and plan, not an employer-promulgated plan, and that you have been given the opportunity to have this agreement, including the provision for arbitration, reviewed prior to our signing by counsel of your own choice and at your sole expense.
-

9. **At-Will Employment and Other Conditions.** Your employment will be at-will, meaning that you or PDF may terminate the employment relationship at any time, with or without cause, with or without notice (“At-Will”).
10. **Severability; Electronic Signature.** If any provision of this offer is determined to be invalid or unenforceable, the remainder shall be unaffected and shall be enforceable. This offer may be executed by one or both parties electronically, and in counterparts, each of which shall be deemed an original and all of which together shall be deemed one and the same original agreement.

We are all delighted to be able to extend you this offer and accommodate your request. Should you have any additional questions, please reach out to me at 408-938-4462 or by email at the address listed below. To indicate your acceptance of this offer, please sign and date this letter in the space provided below and return a scanned copy by email to pamela.fong@pdf.com.

Sincerely,

PDF SOLUTIONS, INC.

/s/ Pamela Fong

Pamela Fong
Vice President of Human Resources

ACKNOWLEDGMENTS & ACCEPTANCE

I accept this employment offer with the understanding that it is not a contract for a fixed term or specified period of time. I understand that my employment is voluntary, (“**At Will**”), and can be terminated either by me or by the company at any time, with or without notice and with or without cause. The provisions stated above supersede all prior representations or agreements, whether written or oral. This offer letter may not be modified or amended except by a written agreement, signed by the Company and me.

THE FOREGOING TERMS AND CONDITIONS ARE HEREBY AGREED TO AND ACCEPTED:

Signed: /s/ Cornelis Hartgring

Name: Cornelis Hartgring

Date: 10/26/2018

Effective Date: 11/1/18

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: May 7, 2019

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: May 7, 2019

**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 March 31, 2019, as filed with the Securities and Exchange Commission on May 7, 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: May 7, 2019

**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 March 31, 2019 as filed with the Securities and Exchange Commission on May 7, 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: May 7, 2019