

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, 2021

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)

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

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

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

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

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

Large accelerated filer

Non-accelerated filer

Accelerated filer

Smaller reporting company

Emerging growth company

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

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

There were 36,929,776 shares of the Registrant's Common Stock outstanding as of April 30, 2021.

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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, 2021	December 31, 2020
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 74,287	\$ 30,315
Short-term investments	57,999	114,981
Accounts receivable, net of allowance for doubtful accounts of \$963 in 2021 and 2020	34,785	34,140
Prepaid expenses and other current assets	11,375	13,944
Total current assets	178,446	193,380
Property and equipment, net	38,147	39,242
Operating lease right-of-use assets, net	6,171	6,672
Goodwill	15,305	15,774
Intangible assets, net	23,724	24,573
Deferred tax assets, net	198	249
Other non-current assets	9,140	7,690
Total assets	\$ 271,131	\$ 287,580
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	\$ 967	\$ 4,399
Accrued compensation and related benefits	6,204	8,339
Accrued and other current liabilities	8,271	6,309
Operating lease liabilities – current portion	1,742	1,926
Deferred revenues – current portion	17,578	19,895
Billings in excess of recognized revenues	339	1,337
Total current liabilities	35,101	42,205
Long-term income taxes payable	2,911	2,956
Non-current operating lease liabilities	6,151	6,516
Other non-current liabilities	1,715	1,397
Total liabilities	45,878	53,074
Commitments and contingencies (Note 13)		
Stockholders' equity:		
Preferred stock, \$0.00015 par value, 5,000 shares authorized, no shares issued and outstanding	\$ —	\$ —
Common stock, \$0.00015 par value, 70,000 shares authorized; shares issued 46,804 and 46,400, respectively; shares outstanding 36,929 and 36,850, respectively	6	6
Additional paid-in-capital	412,031	407,173
Treasury stock at cost, 9,874 and 9,550 shares, respectively	(102,201)	(96,215)
Accumulated deficit	(83,830)	(76,233)
Accumulated other comprehensive loss	(753)	(225)
Total stockholders' equity	225,253	234,506
Total liabilities and stockholders' equity	\$ 271,131	\$ 287,580

See accompanying Notes to Condensed Consolidated Financial Statements (unaudited)

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

	Three Months Ended March 31,	
	2021	2020
Revenues:		
Analytics	\$ 19,393	\$ 13,248
Integrated Yield Ramp	4,807	7,910
Total revenues	<u>24,200</u>	<u>21,158</u>
Costs and Expenses:		
Costs of revenues	10,663	8,487
Research and development	10,841	8,590
Selling, general and administrative	9,464	7,895
Amortization of other acquired intangible assets	314	173
Interest and other expense (income), net	(441)	20
Loss before income taxes	<u>(6,641)</u>	<u>(4,007)</u>
Income tax expense (benefit)	956	(3,479)
Net loss	<u>\$ (7,597)</u>	<u>\$ (528)</u>
Other comprehensive loss:		
Foreign currency translation adjustments, net of tax	(530)	(166)
Change in unrealized losses related to available-for-sale debt securities, net of tax	2	—
Total other comprehensive loss	<u>(528)</u>	<u>(166)</u>
Comprehensive loss	<u>\$ (8,125)</u>	<u>\$ (694)</u>
Net loss per share, basic and diluted	<u>\$ (0.21)</u>	<u>\$ (0.02)</u>
Weighted average common shares used to calculate net loss per share, basic and diluted	<u>36,974</u>	<u>32,703</u>

See accompanying Notes to Condensed Consolidated Financial Statements (unaudited)

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

Three Months Ended March 31, 2021

	Common Stock		Additional Paid-In Capital	Treasury Stock		Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	Shares	Amount		Shares	Amount			
Balances, December 31, 2020	36,850	\$ 6	\$ 407,173	9,550	\$ (96,215)	\$ (76,233)	\$ (225)	\$ 234,506
Issuance of common stock in connection with employee stock purchase plan	100	—	921	—	—	—	—	921
Issuance of common stock in connection with exercise of options	81	—	568	—	—	—	—	568
Vesting of restricted stock units	149	—	—	—	—	—	—	—
Purchases of treasury stock in connection with tax withholdings on restricted stock grants	—	—	—	73	(1,463)	—	—	(1,463)
Repurchase of common stock	(251)	—	—	251	(4,523)	—	—	(4,523)
Stock-based compensation expense	—	—	3,369	—	—	—	—	3,369
Comprehensive loss	—	—	—	—	—	(7,597)	(528)	(8,125)
Balances, March 31, 2021	<u>36,929</u>	<u>\$ 6</u>	<u>\$ 412,031</u>	<u>9,874</u>	<u>\$ (102,201)</u>	<u>\$ (83,830)</u>	<u>\$ (753)</u>	<u>\$ 225,253</u>

Three Months Ended March 31, 2020

	Common Stock		Additional Paid-In Capital	Treasury Stock		Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	Shares	Amount		Shares	Amount			
Balances, December 31, 2019	32,503	\$ 5	\$ 325,197	9,294	\$ (91,695)	\$ (35,870)	\$ (1,480)	\$ 196,157
Issuance of common stock in connection with employee stock purchase plan	89	—	810	—	—	—	—	810
Issuance of common stock in connection with exercise of options	21	—	161	—	—	—	—	161
Vesting of restricted stock units	182	—	—	—	—	—	—	—
Purchases of treasury stock in connection with tax withholdings on restricted stock grants	—	—	—	93	(1,478)	—	—	(1,478)
Stock-based compensation expense	—	—	3,513	—	—	—	—	3,513
Comprehensive loss	—	—	—	—	—	(528)	(166)	(694)
Balances, March 31, 2020	<u>32,795</u>	<u>\$ 5</u>	<u>\$ 329,681</u>	<u>9,387</u>	<u>\$ (93,173)</u>	<u>\$ (36,398)</u>	<u>\$ (1,646)</u>	<u>\$ 198,469</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,	
	2021	2020
Cash flows from operating activities:		
Net loss	\$ (7,597)	\$ (528)
Adjustments to reconcile net loss to net cash provided by (used in) operating activities:		
Depreciation and amortization	1,718	1,667
Stock-based compensation expense	3,369	3,368
Amortization of acquired intangible assets	849	317
Amortization of costs capitalized to obtain revenue contracts	165	124
Reversal of allowance for doubtful accounts	—	(60)
Loss on disposal of property and equipment	5	—
Accretion of discount on short-term investments	(20)	—
Deferred taxes	55	45
Changes in operating assets and liabilities:		
Accounts receivable	(677)	3,348
Prepaid expenses and other current assets	2,839	(1,910)
Operating lease right-of-use assets	476	241
Other non-current assets	339	(1,906)
Accounts payable	(4,109)	163
Accrued compensation and related benefits	(2,059)	(271)
Accrued and other liabilities	(162)	(589)
Deferred revenues	(1,994)	972
Billings in excess of recognized revenues	(998)	679
Operating lease liabilities	(524)	(280)
Net cash provided by (used in) operating activities	(8,325)	5,380
Cash flows from investing activities:		
Proceeds from maturities of short-term investments	68,000	—
Purchases of short-term investments	(10,997)	—
Purchases of property and equipment	(586)	(2,068)
Net cash provided by (used in) investing activities	56,417	(2,068)
Cash flows from financing activities:		
Proceeds from exercise of stock options	568	161
Proceeds from employee stock purchase plan	921	810
Payments for taxes related to net share settlement of equity awards	(1,463)	(1,478)
Repurchases of common stock	(4,523)	—
Net cash used in financing activities	(4,497)	(507)
Effect of exchange rate changes on cash and cash equivalents	(104)	(25)
Net change in cash, cash equivalents, and restricted cash	43,491	2,780
Cash, cash equivalents, and restricted cash at beginning of period	33,815	97,605
Cash, cash equivalents, and restricted cash at end of period	\$ 77,306	\$ 100,385
Reconciliation of cash, cash equivalents, and restricted cash to the balance sheets:		
Cash and cash equivalents	\$ 74,287	\$ 100,385
Restricted cash	3,019	—
Total cash, cash equivalents, and restricted cash	\$ 77,306	\$ 100,385

Continued on next page.

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

	Three Months Ended March 31,	
	2021	2020
Supplemental disclosure of cash flow information:		
Cash paid during the period for taxes	\$ 530	\$ 968
Cash paid for amounts included in the measurement of operating lease liabilities	\$ 651	\$ 397
Supplemental disclosure of noncash information:		
Stock-based compensation capitalized as software development costs	\$ —	\$ 128
Property and equipment received and accrued in accounts payable and accrued and other liabilities	\$ 181	\$ 796
Release of restricted cash reducing goodwill due to the acquisition purchase price adjustment	\$ 469	\$ —

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, 2020.

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, 2020, 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, assumptions made in analysis of allowance for doubtful accounts, impairment of goodwill and long-lived assets, realization of deferred tax assets (DTAs), and accounting for lease obligations, stock-based compensation expense, and income taxes. Actual results could differ from those estimates.

The global COVID-19 pandemic has impacted the operations and purchasing decisions of companies worldwide. It also has created and may continue to create significant uncertainty in the global economy. The Company has undertaken measures to protect its employees, partners, customers, and vendors. In addition, the Company’s personnel worldwide are subject to various travel restrictions, which limit the ability of the Company to provide services to customers and its affiliates. The Company believes the lack of an ability to meet in person in most of 2020 through the first quarter of 2021 may have made it harder for us to sell complex or new technologies to new customers during 2020 and 2021. Once the Company can again begin to meet with customers in person, it may improve traction with new customers. To date, the Company has been able to provide uninterrupted access to its products and services due to its globally distributed workforce, many of whom are working remotely, and its pre-existing infrastructure that supports secure access to the Company’s internal systems. If, however, the COVID-19 pandemic, including spikes in different regions from time to time, has a substantial impact on the productivity of the Company’s employees, or supplies, or its partners’ or customers’ decision to use the Company’s products and services, the results of the Company’s operations and overall financial performance may be adversely impacted. The duration and extent of the impact from the COVID-19 pandemic depends on future developments that cannot be accurately predicted at this time. As of the date of issuance of the financial statements, the Company is not aware of any specific event or circumstance that would require updates to the Company’s estimates and judgments or revisions to the carrying value of its assets or liabilities. These estimates may change, as new events occur and additional information is obtained, and are recognized in the condensed consolidated financial statements as soon as they become known. Actual results could differ from those estimates and any such differences may be material to the financial statements.

Recent Accounting Standards

Accounting Standards Adopted

In December 2019, the Financial Accounting Standards Board (“FASB”) issued Accounting Standard Update (“ASU”) No. 2019-12, Income Taxes (Topic 740), Simplifying the Accounting for Income Taxes, related to simplifying the accounting for income taxes. The guidance eliminates certain exceptions from ASC 740 related to the approach for intraperiod tax allocation, the methodology for calculating income taxes in an interim period and the recognition of deferred tax liabilities for outside basis differences. The guidance also clarifies and simplifies other aspects of the accounting for income taxes. The guidance is effective for the Company beginning in the first quarter of 2021 on a prospective basis. The Company adopted this standard on January 1, 2021, and it did not have a material impact on the Company’s condensed consolidated financial statements or the related disclosures.

In January 2020, the FASB issued ASU No. 2020-01-Investments-Equity Securities (Topic 321), Investments-Equity Method and Joint Ventures (Topic 323), and Derivatives and Hedging (Topic 815)-Clarifying the Interactions between Topic 321, Topic 323, and Topic 815. This ASU clarifies the interaction between accounting standards related to equity securities (ASC 321), equity method investments (ASC 323), and certain derivatives (ASC 815). The amendments in this ASU are effective for fiscal years beginning after December 15, 2020. The Company adopted this standard on January 1, 2021, and it did not have a material impact on the Company’s condensed consolidated financial statements or the related disclosures.

Accounting Standards Not Yet Adopted

In June 2016, the FASB issued ASU No. 2016-13, Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments (ASU 2016-13), which requires measurement and recognition of expected credit losses for financial assets held at the reporting date based on internal information, external information, or a combination of both relating to past events, current conditions, and reasonable and supportable forecasts. ASU No. 2016-13 replaces the existing incurred loss impairment model with a forward-looking expected credit loss model, which will result in earlier recognition of credit losses. Subsequent to the issuance of ASU No. 2016-13, the FASB issued ASU No. 2018-19, Codification Improvements to Topic 326, Financial Instruments – Credit Losses, ASU No. 2019-04, Codification Improvements to Topic 326, Financial Instruments – Credit Losses, Topic 815, Derivatives and Hedging, and Topic 825, Financial Instrument, ASU No. 2019-05, Financial Instruments – Credit Losses (Topic 326) Targeted Transition Relief, ASU No. 2016-13, ASU No. 2019-10 Financial Instruments-Credit Losses (Topic 326), Derivatives and Hedging (Topic 815), and Leases (Topic 842), and ASU No. 2019-11 Codification Improvements to Topic 326, Financial Instruments-Credit Losses. The subsequent ASUs do not change the core principle of the guidance in ASU No. 2016-13. Instead, these amendments are intended to clarify and improve operability of certain topics included within ASU No. 2016-13.

Additionally, ASU No. 2019-10 defers the effective date for the adoption of the new standard on credit losses for public filers that are considered small reporting companies (“SRC”) as defined by the SEC to fiscal years beginning after December 15, 2022, including interim periods within those fiscal years, which will be fiscal 2023 for the Company if it continues to be classified as a SRC. In February 2020, the FASB issued ASU 2020-02, which provides guidance regarding methodologies, documentation, and internal controls related to expected credit losses. The subsequent amendments will have the same effective date and transition requirements as ASU No. 2016-13. Early adoption is permitted. Topic 326 requires a modified retrospective approach by recording a cumulative-effect adjustment to retained earnings as of the beginning of the period of adoption. While the Company is currently evaluating the impact of Topic 326, the Company does not expect the adoption of this ASU to have a material impact on its condensed consolidated financial statements or the related disclosure.

In August 2020, the FASB issued ASU No. 2020-06, Debt – Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging – Contracts in Entity’s Own Equity (Subtopic 815-20): Accounting for Convertible Instruments and Contracts in an Entity’s Own Equity, which is intended to simplify the accounting for certain financial instruments with characteristics of liabilities and equity, including convertible instruments and contracts on an entity’s own equity. The guidance allows for either full retrospective adoption or modified retrospective adoption. Additionally, the ASU will require entities to use the “if-converted” method when calculating diluted earnings per share for convertible instruments. The ASU will be effective for annual reporting periods beginning after December 15, 2023 for SRCs and interim periods within those annual periods. Early adoption is permitted. The Company does not anticipate that the adoption of this ASU will have a significant impact on its condensed consolidated financial statements or the related disclosures.

Management has reviewed other recently issued accounting pronouncements issued or proposed by the FASB, and does not believe any of these accounting pronouncements has had or will have a material impact on the condensed consolidated financial statements.

2. REVENUE FROM CONTRACTS WITH CUSTOMERS

The Company derives revenue from two sources: Analytics revenue and Integrated Yield Ramp revenue.

The Company recognizes revenue in accordance with FASB Accounting Standard Codification (“ASC”) Topic 606, *Revenue from Contracts with Customers*, and its related amendments (collectively known as “ASC 606”). ASC 606 outlines a single comprehensive model to use in accounting for revenue arising from contracts with customers. Revenue is recognized when control of products or services is transferred to customers, in an amount that reflects the consideration the Company expects to be entitled to in exchange for those promised products or services.

The Company determines revenue recognition through the following five steps:

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

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

Contracts with multiple performance obligations

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 on a relative basis using standalone selling price.

Analytics Revenue

Analytics revenue is derived from the following primary offerings: licenses and services for standalone Software (which is primarily Exensio and Cimatrix products), SaaS (which is primarily Exensio products), and DFI™ and CV® systems that do not include performance incentives based on customers' yield achievement.

Revenue from standalone Software is recognized depending on whether the license is perpetual or time-based. Perpetual (one-time charge) license software is recognized at the time of the inception of the arrangement when control transfers to the customers, if the software license is considered as a separate performance obligation from the services offered by the Company. Revenue from post-contract support is recognized over the contract term on a straight-line basis, because we are providing (i) support and (ii) unspecified software updates on a when-and-if available basis over the contract term. Revenue from time-based-licensed software is allocated to each performance obligation and is recognized either at a point in time or over time as follows. The license component is recognized at the time when control transfers to customers, with the post-contract support component recognized ratably over the committed term of the contract. For contracts with any combination of licenses, support, and other services, distinct performance obligations are accounted for separately. For contracts with multiple performance obligations, we allocate the transaction price of the contract to each performance obligation on a relative basis using standalone selling price (or SSP) attributed to each performance obligation.

Revenue from SaaS arrangements, which allow for the use of a cloud-based software product or service over a contractually determined period of time without the customer having to take possession of software, is accounted for as a subscription and is recognized as revenue ratably, on a straight-line basis, over the subscription period beginning on the date the service is first made available to customers. For contracts with any combination of SaaS and related services, distinct performance obligations are accounted for separately. For contracts with multiple performance obligations, we allocate the transaction price of the contract to each performance obligation on a relative basis using SSP attributed to each performance obligation.

Revenue from DFI™ and CV® systems that do not include performance incentives based on customers' yield achievement is recognized primarily as services are performed. Where there are distinct performance obligations, the Company allocates revenue to all deliverables based on their SSPs. For these contracts with multiple performance obligations, the Company allocates the transaction price of the contract to each performance obligation on a relative basis using SSP attributed to each performance obligation. Where there are not discrete performance obligations, historically, revenue is primarily 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. The estimation of percentage of completion method is complex and subject to many variables that require significant judgement. Please refer to "Significant Judgements" section of this Note for further discussion.

Integrated Yield Ramp Revenue

Integrated Yield Ramp revenue is derived from the Company's fixed-fee engagements that include performance incentives based on customers' yield achievement (which consists primarily of Gainshare royalties) typically based on customer's wafer shipments, pertaining to these fixed-price contracts, which royalties are variable.

Revenue under these project-based contracts, which are delivered over a specific period of time, typically for a fixed fee component paid on a set schedule, is recognized as services are performed using a percentage of completion method based on costs or labor-inputs, whichever is the most appropriate measure of the progress towards completion of the contract. Where there are distinct performance obligations, the Company allocates revenue to all deliverables based on their SSPs and allocates the transaction price of the contract to each performance obligation on a relative basis using SSP. Similar to the services provided in connection with DFI™ and CV® systems that are contributing to Analytics revenue, due to the nature of the work performed in these arrangements, the estimation of percentage of completion method is complex and subject to many variables that require significant judgement. Please refer to "Significant Judgments" section of this Note for further discussion.

The Gainshare royalty contained in IYR contracts is a variable fee related to continued usage of the Company's intellectual property after the fixed-fee service period ends, based on a customer's yield achievement. Revenue derived from Gainshare is contingent upon the Company's customers reaching certain defined production yield levels. Gainshare royalty periods are generally subsequent to the delivery of all contractual services and performance obligations. The Company records Gainshare as a usage-based royalty derived from customers' usage of intellectual property and records it in the same period in which the usage occurs.

Disaggregation of Revenue

The Company disaggregates revenue from contracts with customers into the timing of the transfer of goods and services and the geographical regions. 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 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,	
	2021	2020
Over time	50%	58%
Point-in-time	50%	42%
Total	100%	100%

International revenues accounted for approximately 65% of our total revenues during the three months ended March 31, 2021 compared to 59% of our total revenues during the three months ended March 31, 2020. See Note 11, *Customer and Geographic Information*.

Significant Judgments

Judgments and estimates are required under ASC 606. Due to the complexity of certain contracts, the actual revenue recognition treatment required under ASC 606 for the Company's arrangements may be dependent on contract-specific terms and may vary in some instances.

For revenue under project-based contracts for fixed-price 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 software and provide services, including professional services, technical support services, and rights to unspecified updates to a customer. Determining whether 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 software 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 license the software or sell the service separately, the Company determines the SSP using information that may include market conditions and other observable inputs.

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

Contract Balances

The Company performs its obligations under a contract with a customer by licensing software or providing 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 software or services transferred to a customer 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 service contracts when the revenue recognized exceeds the amount billed to the customer. The contract assets are generally classified as current and are recorded on a net basis with deferred revenue (i.e. contract liabilities) at the contract level. At March 31, 2021 and December 31, 2020, contract assets of \$0.4 million and \$3.7 million, respectively, are included in prepaid expenses and other current assets in the Condensed Consolidated Balance Sheets. The Company did not record any asset impairment charges related to contract assets for the periods presented.

Deferred revenues consist substantially of amounts invoiced in advance of revenue recognition and are recognized as the revenue recognition criteria are met. Deferred revenues that will be recognized during the succeeding twelve-month period are recorded as current deferred revenues and the remaining portion is recorded in the other non-current liabilities in the Condensed Consolidated Balance Sheets. At March 31, 2021 and December 31, 2020, the non-current portion of deferred revenues included in non-current liabilities was \$1.6 million and \$1.2 million, respectively. Revenue recognized during the three months ended March 31, 2021 and 2020, that was included in the deferred revenues and billings in excess of recognized revenues balances at the beginning of each reporting period was \$6.3 million and \$4.6 million, respectively.

At March 31, 2021, 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 \$114.2 million. Given the applicable contract terms with customers, the majority of this amount is expected to be recognized as revenue over the next two years, with the remainder in the following three years. This amount does not include insignificant contracts to which the customer is not committed, nor significant 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 of 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.

The adjustment to revenue recognized in the three months ended March 31, 2021 and 2020 from performance obligations satisfied (or partially satisfied) in previous periods were increases of \$0.3 million and \$0.7 million, respectively. These amounts primarily represent changes in estimated percentage-of-completion based contracts and changes in actual versus estimated Gainshare royalty.

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. Amortization expense related to these capitalized costs is recognized over the period associated with the revenue from which the cost was incurred. Total capitalized direct sales commission costs included in prepaid expenses and other current assets in the accompanying Condensed Consolidated Balance Sheets as of March 31, 2021 and December 31, 2020 was \$0.8 million. Total capitalized direct sales commission costs included in other non-current assets in the accompanying Condensed Consolidated Balance Sheets as of March 31, 2021 and December 31, 2020 were \$1.1 million and \$0.9 million, respectively. Amortization of these assets during the three months ended March 31, 2021 and 2020 were \$0.2 million and \$0.1 million, respectively. 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 customer of the services to which the asset relates and recorded as a component of cost of revenues. The Company also incurs certain direct costs to provide 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. At the end of the reporting period, the Company evaluates its deferred costs for their probable recoverability. The deferred costs balance included in prepaid expenses and other current assets and in other non-current assets in the accompanying Condensed Consolidated Balance Sheets was immaterial as of as of March 31, 2021 and December 31, 2020. The Company recognizes impairment of deferred costs when it has determined that the costs no longer have future benefits and are no longer recoverable. There was no impairment loss in relation to the costs capitalized for the periods presented.

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 during the three months ended March 31, 2021 and 2020.

3. STRATEGIC PARTNERSHIP AGREEMENT WITH ADVANTEST AND RELATED PARTY TRANSACTIONS

On July 29, 2020, the Company entered into a long-term strategic partnership with Advantest Corporation through its wholly-owned subsidiary, Advantest America, Inc. (collectively referred to herein as “Advantest”) that included the following agreements.

- A Securities Purchase Agreement for the purchase by Advantest of an aggregate of 3,306,924 shares of the Company’s common stock for aggregate gross proceeds of \$65.2 million and a related Stockholder Agreement.
- An Amendment #1 to that certain Software License and Related Services Agreement, dated as of March 25, 2020, for an exclusive commercial arrangement in which the Company and Advantest will collaborate on, and the Company will initially host, develop and maintain, an Advantest-specific cloud layer on the Exensio platform. Analytics revenue recognized from Advantest under this agreement during the three months ended March 31, 2021 was \$2.6 million. Accounts receivable from Advantest, comprised of billed and unbilled accounts receivable, related to this agreement amounted to \$0.1 million, and deferred revenue amounted to \$2.2 million as of March 31, 2021.
- An Amended and Restated Master Development Agreement with Advantest, pursuant to which the Company and Advantest agreed to collaborate on extensions to or combinations of both of their existing technology and new technology to address mutual customers’ needs through one or more development phases subject to certain conditions as set forth therein. Costs and expenses incurred related to this agreement have not been significant for the three months ended March 31, 2021.
- A Master Commercial Terms and Support Services Agreement for the commercialization and support of integrated products of the Company and Advantest that are the outcome of the above development agreement. No costs and expenses were incurred related to the Commercial Agreement with Advantest during the three months ended March 31, 2021.

There was no occurrence of any termination events under these agreements as of the issuance of these condensed consolidated financial statements.

The Company carries out transactions with Advantest on arm’s length commercial customary terms. For more information about these agreements with Advantest, see Note 3, *Strategic Partnership Agreement with Advantest and Related Party Transactions*, of Part II, Item 8. “Financial Statements and Supplementary Data” of the Company’s Annual Report on Form 10-K for the year ended December 31, 2020.

4. BUSINESS COMBINATION

On December 1, 2020 (the “Acquisition Date”), the Company acquired all the stock of Cimatrix Incorporated (“Cimatrix”). Total payment made for this acquisition in 2020 amounted to \$28.6 million, net of cash acquired, and was funded from the available cash of the Company. In 2020, the Company held back \$3.5 million of the purchase price (the “Holdback Amount”) to satisfy adjustments and claims for indemnity arising out of breaches of certain representations, warranties and covenants, and certain other enumerated items in the merger agreement. During the three months ended March 31, 2021, the Company recorded a measurement period adjustment as described below which reduced the Holdback Amount to \$3.0 million. This reduction was released from the restricted cash on the Company’s Consolidated Condensed Balance Sheet. The Holdback Amount, as adjusted, is expected to be paid to the participating equity holders on approximately the twelve-month anniversary of the Acquisition Date. The Holdback Amount is recorded under “Accrued and other current liabilities” account in the Condensed Consolidated Balance Sheets.

The Company is required to maintain cash specifically designated to pay for the Holdback Amount, which the Company has classified as restricted cash. Restricted cash amounted to \$3.0 million and \$3.5 million as of March 31, 2021 and December 31, 2020, respectively, and is included in the “Prepaid expenses and other current assets” account in the Company’s Consolidated Condensed Balance Sheet.

The Company is still finalizing the allocation of the purchase price to the individual assets acquired. Accordingly, the estimates set forth below are preliminary and are subject to change during the measurement period, which is not to exceed one year from the acquisition date. During the measurement period, the Company records adjustments to the assets acquired and liabilities assumed, with the corresponding offset to goodwill. Upon the conclusion of the measurement period, any subsequent adjustments are recorded to earnings. During the three months ended March 31, 2021, the Company recorded a measurement period adjustment to the estimated fair values initially recorded in 2020, which resulted in a reduction in Holdback Amount of \$0.5 million with a corresponding change to goodwill. The measurement period adjustment did not have an impact on the Company’s Condensed Consolidated Statements of Comprehensive Loss during the three months ended March 31, 2021. As of March 31, 2021, the allocation of the purchase price for this acquisition is as follows (in thousands, except amortization period):

	Amount	Amortization Period (Years)
Assets		
Fair value of tangible assets (including cash of \$5,900)	\$ 8,403	
Fair value of intangible assets:		
Developed technology	12,541	8
In-process R&D	3,635	N/A
Customer relationships	1,967	10
Noncompetition agreements	848	3
Tradenames and trademarks	808	10
Goodwill	13,012	N/A
Total assets acquired	\$ 41,214	
Liabilities		
Accounts payable and accrued expenses	\$ 1,437	
Deferred revenue	391	
Operating lease liabilities	132	
Deferred tax liabilities	1,743	
Total liabilities assumed	\$ 3,703	
Total purchase price allocation	\$ 37,511	

Pursuant to the merger agreement, the Company will also pay approximately \$1.4 million to certain employees, subject to their continued employment with Cimatrix or the Company, at various scheduled payout dates through the second quarter of 2024. This amount will be recognized as compensation expense over the period as services are rendered. As of March 31, 2021, estimated remaining total cash payout is approximately \$1.0 million. The accrued compensation balance included under “Accrued compensation and related benefits” account in the Condensed Consolidated Balance Sheet was \$0.2 million and \$0.3 million as of March 31, 2021 and December 31, 2020, respectively.

Transaction expenses related to the acquisition of Cimatrix amounted to \$1.6 million in 2020. These costs consist of professional fees and administrative costs and were expensed as incurred in the Company’s Consolidated Statement of Comprehensive Loss. Transaction costs incurred during the three months ended March 31, 2021 were immaterial.

The financial results of the acquisition of Cimatrix were considered immaterial for purposes of unaudited pro forma financial disclosures.

5. BALANCE SHEET COMPONENTS

Accounts receivable

Accounts receivable include amounts that are unbilled at the end of the period that are expected to be billed and collected within a 12-month period. Unbilled accounts receivable, included in accounts receivable, totaled \$10.5 million and \$7.2 million as of March 31, 2021, and December 31, 2020, 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 \$1.8 million and \$2.0 million as of March 31, 2021, and December 31, 2020, respectively.

Property and equipment

Property and equipment, net consist of the following (in thousands):

	March 31, 2021	December 31, 2020
Computer equipment	\$ 11,595	\$ 11,585
Software	5,435	5,451
Furniture, fixtures and equipment	2,501	2,507
Leasehold improvements	6,255	6,255
Laboratory and other equipment	3,571	3,451
Test equipment	25,977	26,010
Construction-in-progress	20,699	20,278
	76,033	75,537
Less: accumulated depreciation and amortization	(37,886)	(36,295)
Total	\$ 38,147	\$ 39,242

Test equipment includes DFI™ assets at customer sites that are contributing to DFI™ revenues. The construction-in-progress balance related to construction of DFI™ assets totaled \$19.3 million and \$18.9 million as of March 31, 2021 and December 31, 2020, respectively. Depreciation and amortization expense during the three months ended March 31, 2021 and 2020 was \$1.7 million for each period.

Goodwill and Intangible Assets, Net

The change in the carrying amount of goodwill during the three months ended March 31, 2021 was as follows (in thousands):

	March 31, 2021
Balance at beginning of period	\$ 15,774
Measurement period acquisition adjustment ⁽¹⁾	(469)
Balance at end of period	<u>\$ 15,305</u>

(1) Goodwill adjustment was recorded within the measurement period with a corresponding reduction in the Holdback Amount. See Note 4, *Business Combination*.

There were no impairments to goodwill during the three months ended March 31, 2021.

Intangible assets, net, consisted of the following (in thousands):

	Amortization Period (Years)	March 31, 2021			December 31, 2020		
		Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Acquired identifiable intangibles:							
Customer relationships	1 – 10	\$ 9,407	\$ (5,558)	\$ 3,849	\$ 9,407	\$ (5,398)	\$ 4,009
Developed technology	4 – 9	30,000	(15,570)	14,430	30,000	(14,987)	15,013
Tradename and trademarks	2 – 10	1,598	(732)	866	1,598	(706)	892
Patent	7 – 10	1,800	(1,610)	190	1,800	(1,600)	200
Noncompetition agreements	3	848	(94)	754	848	(24)	824
In-process R&D	*	3,635	—	3,635	3,635	—	3,635
Total		<u>\$ 47,288</u>	<u>\$ (23,564)</u>	<u>\$ 23,724</u>	<u>\$ 47,288</u>	<u>\$ (22,715)</u>	<u>\$ 24,573</u>

* Non-amortizing intangible asset

The Company expects annual amortization of acquired identifiable intangible assets to be as follows (in thousands):

Year Ending December 31,	Amount
2021 (remaining nine months)	\$ 2,372
2022	3,013
2023	2,990
2024	2,592
2025	2,427
2026 and thereafter	6,695
Total future amortization expense	<u>\$ 20,089</u>

Intangible assets are amortized over their useful lives unless these lives are determined to be indefinite. The weighted average amortization period for acquired identifiable intangible assets was 6.1 years as of March 31, 2021. Intangible asset amortization expense during the three months ended March 31, 2021 and 2020 was \$0.8 million and \$0.3 million, respectively, and included under "Cost of revenues" and "Amortization of other intangible assets" account in the Condensed Consolidated Statements of Comprehensive Loss. 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, 2021, there were no indicators of impairment related to the Company's intangible assets.

6. LEASES

The Company leases administrative and sales offices and certain equipment under non-cancellable 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 dates through 2028. The Company had no leases that were classified as a financing lease as of March 31, 2021 and December 31, 2020.

Lease expense was comprised of the following (in thousands):

	Three Months Ended March 31,	
	2021	2020
Operating lease expense	\$ 485	\$ 455
Short-term lease and variable lease expense (1)	174	147
Total lease expense	\$ 659	\$ 602

(1) Leases with an initial term of 12 months or less are not recorded on the balance sheets, and the Company recognizes lease expense for these leases on a straight-line basis over the lease term. Variable lease expense for the periods presented primarily included common area maintenance charges.

Supplemental balance sheet information related to operating leases was as follows:

	March 31,	December 31,
	2021	2020
Weighted average remaining lease term under operating ROU leases (in years)	6.3	6.4
Weighted average discount rate for operating lease liabilities	5.24%	5.24%
Operating lease ROU assets obtained (in thousands)	\$ —	\$ 286

Maturities of operating lease liabilities as of March 31, 2021 were as follows (in thousands):

Year Ending December 31,	Amount (1)
2021 (remaining nine months)	\$ 1,453
2022	1,699
2023	1,385
2024	1,074
2025	1,089
2026 and thereafter	2,703
Total future minimum lease payments	\$ 9,403
Less: Interest (2)	(1,510)
Present value of future minimum lease payments under operating lease liabilities (3)	\$ 7,893

(1) As of March 31, 2021, the total operating lease liability includes approximately \$1.1 million related to an option to extend a lease term that is reasonably certain to be exercised.

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

(3) Includes the current portion of operating lease liabilities of \$1.7 million as of March 31, 2021.

7. STOCKHOLDERS' EQUITY

Issuance of Common Stock

On July 30, 2020, the Company issued 3,306,924 shares of common stock, at a purchase price of \$19.7085 per share, for aggregate gross proceeds of \$65.2 million pursuant to a Securities Purchase Agreement with Advantest dated July 29, 2020. Issuance costs related to this private placement aggregated \$0.1 million.

Stock Repurchase Program

On May 28, 2020, the Company's 2018 stock repurchase program (the "2018 Program") that was originally adopted on May 29, 2018, expired. Through May 28, 2020, approximately 786,000 shares had been repurchased at an average price of \$12.43 per share, for a total price of \$9.8 million under the 2018 Program.

On June 4, 2020, the Company's Board of Directors adopted a new stock repurchase program (the "2020 Program") to repurchase up to \$25.0 million of the Company's common stock both on the open market and in privately negotiated transactions, including through Rule 10b5-1 plans, over the next two years. During the three months ended March 31, 2021, 251,212 shares were repurchased under the 2020 Program at an average price of \$18.01 per share for an aggregate total price of \$4.5 million.

8. EMPLOYEE BENEFIT PLANS

On March 31, 2021, 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 provided for twenty-four-month offering periods with four six-month purchase periods in each offering period. The Company's proposal at its annual meeting of stockholders in 2020 to extend the 2010 Purchase Plan through June 22, 2030 was not approved by the Company's stockholders and consequently, the Purchase Plan expired on May 17, 2020. After the Purchase Plan expired, no new offering periods will commence under the Purchase Plan; however, existing offering periods will continue until they expire in accordance with their terms, and participation in such offering periods will continue through the applicable expiration date. The final offering period under the Purchase Plan is expected to expire on January 31, 2022.

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,	
	2021	2020
Expected life (in years)	1.25	1.25
Volatility	34.25%	34.25%
Risk-free interest rate	1.43%	1.43%
Expected dividend	—	—
Weighted average fair value of purchase rights granted during the period	\$ 4.83	\$ 4.83

During the three months ended March 31, 2021 and 2020, a total of approximately 99,674 and 89,000 shares, respectively issued under the Purchase Plan, were issued at a weighted-average purchase price of \$9.24 per share and \$9.02 per share, respectively. As of March 31, 2021, there was \$0.1 million of unrecognized compensation cost related to the Purchase Plan. That cost is expected to be recognized over a weighted average period of 0.7 year.

Stock Incentive Plans

On November 16, 2011, the Company's stockholders initially approved the 2011 Stock Incentive Plan, which has been amended and restated and approved by the Company's stockholders a number of times since then (as amended, the "2011 Plan"). Under the 2011 Plan, the Company may award stock options, stock appreciation rights ("SARs"), 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 11,550,000 shares, plus up to 3,500,000 shares previously issued under the 2001 Stock Plan adopted by the Company in 2001, which expired in 2011 (the "2001 Plan") that are either (i) forfeited or (ii) repurchased by the Company or are 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 SARs, the aggregate number of shares reserved under the 2011 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.

Stock options granted under the 2001 Plan 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 Plan, awards made under the 2001 Plan that are currently outstanding remain subject to the terms of each such plan.

As of March 31, 2021, 12.1 million shares of common stock were reserved to cover stock-based awards under the 2011 Plan, of which 4.2 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 the adoption of the 2011 Plan through March 31, 2021. As of March 31, 2021, there were no outstanding awards that had been granted outside of the 2011 or 2001 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. There were no stock options granted during the three months ended March 31, 2021. The fair value of stock options granted during the three months ended March 31, 2020, was estimated as of the grant-date using the following assumptions:

	Three Months Ended March 31, 2020
Expected life (in years)	4.45
Volatility	38.77%
Risk-free interest rate	0.88%
Expected dividend	—
Weighted average fair value per share of options granted during the period	\$ 5.21

Stock-Based Compensation

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,	
	2021	2020
Costs of revenues	\$ 652	\$ 909
Research and development	1,588	1,455
Selling, general and administrative	1,129	1,004
Stock-based compensation expenses (1)	<u>\$ 3,369</u>	<u>\$ 3,368</u>

(1) The stock-based compensation expense during the three months ended March 31, 2020 includes immaterial expense or credit adjustments related to cash-settled SARs granted to certain employees. The Company accounted for these awards as liability awards and the amount was included in accrued compensation and related benefits. All remaining outstanding SARs were fully exercised in the third quarter of 2020.

Stock-based compensation expense that was recorded as capitalized software development costs under property and equipment, net, was nil and \$0.1 million during the three months ended March 31, 2021 and 2020, respectively.

Additional information with respect to options under the Stock Plans during the three months ended March 31, 2021, is 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, 2021	456	\$ 10.95		
Granted	—	—		
Exercised	(81)	6.97		
Canceled	—	—		
Expired	—	—		
Outstanding, March 31, 2021	<u>375</u>	<u>\$ 11.81</u>	<u>3.41</u>	<u>\$ 2,309</u>
Vested and expected to vest, March 31, 2021	<u>369</u>	<u>\$ 11.76</u>	<u>3.33</u>	<u>\$ 2,293</u>
Exercisable, March 31, 2021	<u>307</u>	<u>\$ 11.14</u>	<u>2.30</u>	<u>\$ 2,104</u>

The aggregate intrinsic value in the table above represents the total intrinsic value based on the Company's closing stock price of \$17.78 per share as of March 31, 2021. The total intrinsic value of options exercised during the three months ended March 31, 2021, was \$1.0 million.

As of March 31, 2021, there was \$0.3 million of total unrecognized compensation expense related to unvested stock options, which is expected to be recognized over a weighted average period of 2.4 years. The total fair value of shares vested during the three months ended March 31, 2021, was \$39 thousand.

Non-vested restricted stock unit activity during the three months ended March 31, 2021 was as follows:

	Shares (in thousands)	Weighted Average Grant Date Fair Value Per Share
Non-vested, January 1, 2021	1,747	\$ 16.33
Granted	141	\$ 19.84
Vested	(223)	\$ 17.32
Forfeited	(23)	\$ 15.88
Non-vested, March 31, 2021	<u>1,642</u>	<u>\$ 16.51</u>

As of March 31, 2021, there was \$21.2 million of total unrecognized compensation cost related to non-vested restricted stock units. That cost is expected to be recognized over a weighted average period of 2.4 years. Restricted stock units do not have rights to dividends prior to vesting.

9. INCOME TAXES

Income tax benefit decreased \$4.4 million for the three months ended March 31, 2021, to a \$1.0 million income tax expense as compared to an income tax benefit of \$3.5 million for the three months ended March 31, 2020. The Company's effective tax rate benefit was (14%) and 86% for the three months ended March 31, 2021 and 2020, respectively. The Company's effective tax rate benefit decreased in the three months ended March 31, 2021, as compared to the same period in 2020, primarily due to a full valuation allowance against U.S. net deferred tax assets as well as a one-time benefits in the first quarter of 2020 pursuant to the provisions of the Coronavirus Aid, Relief, and Economic Security Act ("CARES Act") passed on March 27, 2020.

The Company's total amount of unrecognized tax benefits, excluding interest and penalties, as of March 31, 2021, was \$14.5 million, of which \$2.2 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, 2020, was \$14.3 million, of which \$2.2 million, if recognized, would affect the Company's effective tax rate. As of March 31, 2021, the Company has recorded unrecognized tax benefits of \$3.0 million, including interest and penalties of \$0.8 million, as long-term taxes payable in its Condensed Consolidated Balance Sheet. The remaining \$12.3 million has been recorded net of our DTAs which is subject to a full valuation allowance.

The valuation allowance was approximately \$41.9 million as of March 31, 2021, and December 31, 2020, which was related to U.S. net federal and state DTAs.

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. For U.S. federal and California income tax purposes, the statute of limitations currently remains open for the tax years ending 2017 to present and 2016 to present, respectively. In addition, due to NOL carryback claims, the tax years 2013 through 2015 may be subject to federal examination and all of the net operating loss and research and development credit carryforwards that may be utilized in future years may be subject to federal and state examination. The Company is not subject to income tax examinations in any other of its major foreign subsidiaries' jurisdictions.

On March 11, 2021, the American Rescue Plan Act of 2021 ("American Rescue Plan") was signed into law to provide additional relief in connection with the ongoing COVID-19 pandemic. The American Rescue Plan includes, among other things, provisions relating to Paycheck Protection Program (PPP) loan expansion, defined pension contributions, excessive employee remuneration, and the repeal of the election to allocate interest expense on a worldwide basis. Under ASC 740, the effects of new legislation are recognized upon enactment. Accordingly, the American Rescue Plan is effective beginning in the quarter that includes March 11, 2021. Such provisions did not have a material impact on the Company's condensed consolidated financial statements.

10. NET LOSS PER SHARE

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

	Three Months Ended March 31,	
	2021	2020
Numerator:		
Net loss	\$ (7,597)	\$ (528)
Denominator:		
Basic weighted-average shares outstanding	36,974	32,703
Effect of dilutive options and restricted stock units	—	—
Diluted weighted-average shares outstanding	36,974	32,703
Net loss per share, basic and diluted	\$ (0.21)	\$ (0.02)

For the three months ended March 31, 2021 and 2020, 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 were 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,	
	2021	2020
Outstanding options	224	400
Non-vested restricted stock units	1,107	716
Employee Stock Purchase Plan	10	100
Total	1,341	1,216

11. CUSTOMER AND GEOGRAPHIC INFORMATION

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

The Company's chief operating decision maker, the chief executive officer, reviews discrete financial information presented on a consolidated basis for purposes of regularly making operating decisions, allocation of resources, and assessing financial performance. Accordingly, the Company considers itself to be in one operating and reporting segment, specifically the provision of services for differentiated data and analytics solutions to the semiconductor and electronics industries.

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

Customer	Three Months Ended March 31,	
	2021	2020
A	13%	26%
B	11%	*%

* represents less than 10%

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

Customer	March 31,	December 31,
	2021	2020
A	*%	16%
B	11%	11%

* represents less than 10%

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

	Three Months Ended March 31,			
	2021		2020	
	Revenues	Percentage of Revenues	Revenues	Percentage of Revenues
United States	\$ 8,556	35%	\$ 8,617	41%
Japan	3,578	15	1,207	6
Taiwan	2,052	8	2,668	12
China	1,739	7	2,959	14
Rest of the world	8,275	35	5,707	27
Total revenue	<u>\$ 24,200</u>	<u>100%</u>	<u>\$ 21,158</u>	<u>100%</u>

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

	March 31,	December 31,
	2021	2020
United States	\$ 42,417	\$ 43,663
Rest of the world	1,901	2,251
Total long-lived assets, net	<u>\$ 44,318</u>	<u>\$ 45,914</u>

12. FAIR VALUE MEASUREMENTS

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

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

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

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

The following table represents the Company's assets measured at fair value on a recurring basis as of March 31, 2021 and December 31, 2020, and the basis for those measurements (in thousands):

	Fair Value Measurements Using			
	March 31, 2021	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets				
Cash equivalents				
Money market mutual funds	\$ 63,017	\$ 63,017	\$ —	\$ —
Short-term investments (available-for-sale debt securities)				
U.S. Treasury bills	57,999	57,999	—	—
Total	\$ 121,016	\$ 121,016	\$ —	\$ —

	Fair Value Measurements Using			
	December 31, 2020	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets				
Cash equivalents				
Money market mutual funds	\$ 18,012	\$ 18,012	\$ —	\$ —
Short-term investments (available-for-sale debt securities)				
U.S. Treasury bills	114,981	114,981	—	—
Total	\$ 132,993	\$ 132,993	\$ —	\$ —

As of March 31, 2021 and December 31, 2020, the amortized cost of the Company's cash equivalents and short-term investments approximated their fair value due to their short-term maturities, and there have been no events or changes in circumstances that would have had a significant effect on the fair value of these securities in the periods presented. There were no material realized or unrealized gains or losses, either individually or in the aggregate.

From time to time, 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 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 expense (income), net, and offsets the change in fair value of the foreign currency denominated assets and liabilities, which is also recorded in other expense (income), net in the Company's Condensed Consolidated Statements of Comprehensive Loss. For the three months ended March 31, 2021, there was no realized gain or loss from foreign currency forward contracts. For the three months ended March 31, 2020, the Company recognized a realized loss of \$0.3 million from foreign currency forward contracts.

The Company carries these derivatives financial instruments on its Condensed Consolidated Balance Sheets at their fair values. The Company's foreign currency forward contracts are classified as Level 2 because they are not actively traded and the valuation inputs are based on quoted prices and market observable data of similar instruments. As of March 31, 2021 and December 31, 2020, the Company had no outstanding forward contracts.

13. COMMITMENTS AND CONTINGENCIES

Strategic Partnership with Advantest — See Note 4, *Business Combination*, for the discussion about the Company's commitments under the strategic partnership with Advantest.

Operating Leases — Refer to Note 6, *Leases*, for the discussion about the Company's lease commitments.

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, 2021, total outstanding purchase obligations were \$10.6 million, the majority of which due within the next 24 months.

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

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

Legal Proceedings — 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, 2021, the Company was not party to any material legal proceedings, thus no loss was probable and no amount was accrued.

On May 6, 2020, the Company initiated an arbitration proceeding with the Hong Kong International Arbitration Center against SMIC New Technology Research & Development (Shanghai) Corporation (“SMIC”) due to SMIC’s failure to pay fees due to PDF under a series of contracts. The Company seeks to recover the unpaid fees, a declaration requiring SMIC to pay fees under the contracts in the future, and costs associated with bringing the arbitration proceeding. The arbitration is on-going.

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, prospects, or the time required of our executive management for, and expenses related to, as well as the success of the our strategic growth opportunities and partnerships, including our partnership with Advantest Corporation, possible actions taken by us or our subsidiaries, and the continuing impact of the COVID-19 pandemic on our business, 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, 2020, filed with the Securities and Exchange Commission on March 11, 2021. All references to “we”, “us”, “our”, “PDF”, “PDF Solutions” or “the Company” refer to PDF Solutions, Inc.

Overview

We provide comprehensive data solutions designed to empower organizations across the semiconductor ecosystem to improve the yield and quality of their products and operational efficiency for increased profitability. We derive revenues from two sources: Analytics and Integrated Yield Ramp. Our offerings include proprietary software, physical intellectual property (or IP) for Integrated Circuits (or IC) designs, electrical measurement hardware tools, and professional services. We primarily monetize our offerings through license fees, contract revenue for professional services, and increasingly recently, time-based fees for software as a service (or SaaS). In some cases, especially on our historical integrated yield ramp (or IYR) engagements, we also receive a value-based royalty that we call Gainshare. Our products, services, and solutions have been sold to integrated device manufacturers (or IDMs), fabless semiconductor companies, foundries, equipment manufacturers, electronics manufacturing suppliers (or EMS), original device manufacturers (or ODMs), out-sourced semiconductor assembly and test (or OSATs), and system houses.

Industry Trend

The COVID-19 pandemic has significantly affected how we and our customers are operating our businesses. For example, most U.S. states and countries worldwide imposed in 2020, and may continue to impose from time-to-time for the foreseeable future, restrictions on the physical movement of people to limit the spread of COVID-19, including travel restrictions and stay-at-home orders. As a result, from January to April 2020, our Shanghai office was temporarily shut down and our local employees were restricted from traveling to customer sites or visiting our other offices. Several other impacted locations were temporarily closed partially or fully in 2020, with minimal staffing only for essential activities including, for example, supporting essential businesses with our U.S. clean room facility. By the third quarter of 2020, our offices in Canada, France, Korea, and Japan had generally reopened with some restrictions returning temporarily at the end of 2020. We are closely monitoring the COVID-19 situation and are currently planning to reopen our corporate headquarters in the United States and other offices with a focus on our employees’ safety. In addition, our personnel worldwide continue to be subject to various country-to-country travel restrictions, which limits the ability of some employees to travel to other offices or customer sites. We believe the lack of an ability to meet in person during most of 2020 and the first quarter of 2021 may have made it harder for us to sell complex or new technologies to such customers during these periods. If we can again begin to meet with customers in person, we may improve traction with these customers. To date, we have been able to provide uninterrupted access to our products and services due to our globally distributed workforce, many of whom were working remotely prior to the pandemic, and our pre-existing infrastructure, which supports secure access to our internal systems. The total duration and full extent of the impact from the COVID-19 pandemic depends on future developments that cannot be accurately predicted at this time, such as the ultimate severity and transmission rate of the virus and variants, the extent and effectiveness of containment actions and vaccinations, and the impact of these and other factors on our employees, customers, partners, and suppliers.

Certain other trends may affect our Analytics revenue specifically. In particular, the confluence of Industry 4.0 (i.e. the fourth industrial revolution, or the automation and data exchange in manufacturing technologies and processes) and cloud computing (i.e. the on-demand availability of computing resources and data storage without direct active management by the user) is driving increased innovation in semiconductor and electronics manufacturing and analytics, as well as in the organization of IT networks and computing at semiconductor and electronics companies across the ecosystem. First, the ubiquity of wireless connectivity and sensor technology enables any manufacturing company to augment its factories and visualize its entire production line. In parallel, the cost per terabyte of data storage has continually decreased year to year. The combination of these two trends means that more data is collected and stored than ever before. Further, semiconductor companies are striving to analyze these very large data sets in real-time to make rapid decisions that measurably improve manufacturing efficiency and quality. In parallel, the traditional practice of on-site data storage, even for highly sensitive data, is changing. The ability to cost-effectively and securely store, analyze, and retrieve massive quantities of data from the cloud versus on-premise enables data to be utilized across a much broader population of users, frequently resulting in greater demands on analytics programs. The combination of these latter two trends means that cloud-based, analytic programs that effectively manage identity management, physical security, and data protection are increasingly in demand for insights and efficiencies across the organizations of these companies. We believe that all these trends will continue for the next few years, and the challenges involved in adopting Industry 4.0 and secure cloud computing will create opportunities for our combination of advanced analytics capabilities, proven and established supporting infrastructure, and professional services to configure our products to meet customers' specialized needs.

Other business trends may continue to affect our Integrated Yield Ramp revenue specifically. The logic foundry market at the leading edge nodes, such as 10nm and 7nm, underwent significant change over the past few years. The leading foundry continues to dominate market share as other foundries either started later than originally forecast in some cases. This trend will likely continue to negatively impact our Integrated Yield Ramp business on these nodes. We expect most logic foundries to invest in derivatives of older process nodes, such as 28nm and 14nm, 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. In order for these trends to provide opportunities for us to increase our business leveraging electrical characterization, Chinese semiconductor manufacturers will need to increase their production volumes on advanced technology nodes and continue to engage foreign suppliers, subject to compliance with changing U.S. export restrictions. As a result of these market developments, we have chosen to focus our resources and investments in products, services, and solutions for analytics.

There are other business trends that may affect our business opportunities generally. For instance, 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 continue to fuel 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 continue to create a need for our products and services that address yield loss across the IC product life cycle.

Early decisions by the Biden U.S. Presidential Administration confirm continuity of a bipartisan consensus in the U.S. government favoring increased confrontation of China in trade practices and economic matters, national security, and human rights. The Biden Administration views technology as a domain of strategic competition in which the U.S. and allies must stay ahead of China. The Administration has reaffirmed the U.S. government consensus identifying semiconductor, artificial intelligence, and 5G technologies, and protection of U.S. supply chains, as priority efforts. It appears that the Administration may now augment ongoing U.S. efforts by enlisting the cooperation of allied countries in both advanced development and protection against P.R.C. use of U.S. and allied advances. The prior U.S. presidential administration expanded and intensified export controls and sanctions, including addition of many P.R.C. companies to the U.S. Export Administration Regulations (EAR) Entity List. These listings restrict supply to designees of items that are subject to the EAR. After an internal evaluation, we determined that a large percentage of our software products are not of U.S. origin and are, thus, not subject to the EAR. Our standard operations include development, distribution processes, software download sites, and professional service centers and processes located in various geographies around the world to better serve our customers. Some customers have nonetheless expressed concerns to us that continued action by the U.S. government could potentially interrupt their ability to make use of our products or services. The continuing tension between the U.S. and P.R.C. governments in trade and security matters or the perception of that tension could lead to disruptions or reductions in international trade, deter or prevent purchasing activity of customers, and negatively impact us in our China sales and financial results.

Our Strategic Partnership with Advantest

On July 29, 2020, we entered into a strategic partnership with Advantest Corporation through its wholly-owned subsidiary, Advantest America, Inc., (collectively, “Advantest”) that includes: (i) a significant agreement for our assistance in development of cloud-based applications for Advantest tools that leverage our Exensio software analytics platform; (ii) a commercial agreement providing for the license to third parties of solutions that result from the development work that combine Advantest’s testing applications and our Exensio platform; (iii) a 5-year cloud-based subscription for our Exensio analytics platform and related services; and (iv) the purchase of 3,306,924 shares of our common stock, for aggregate gross proceeds of \$65.2 million. Concurrent with the share purchase, Advantest Corporation also entered into multi-year voting and lock-up agreements.

We entered into this partnership to expand test and measurement solutions throughout the semiconductor value chain. We believe that the combination of our Exensio platform with Advantest’s advanced testing equipment will provide Advantest tool users with the ability to connect, test, measure, and analyze manufacturing data generated by the tools at any point in the semiconductor value chain, helping customers increase yield and reduce testing costs. Further, we believe collaboration with Advantest’s technology, direct connection to its customer relationships, and the breadth of its global footprint will enable us to both accelerate our technology roadmap and customer adoption of our AI-driven data analytics solutions across the supply chain.

Cimetrix Acquisition

On December 1, 2020, we completed the acquisition of Cimetrix Incorporated. The combination of Cimetrix connectivity products with our Exensio platform, which leverages machine learning, is intended to enable IC, assembly, and equipment manufacturer customers to extract more intelligence from their tools, not just data, to build more reliable chips and systems at lower manufacturing costs. For further information about this acquisition, see Note 4, *Business Combination*, to our Condensed Consolidated Financial Statements of this Quarterly Report on Form 10-Q.

Financial Highlights

Financial highlights for the three months ended March 31, 2021, are as follows:

- Total revenues were \$24.2 million, an increase of \$3.0 million, or 14.4%, compared to the three months ended March 31, 2020. Analytics revenue was \$19.4 million, which was an increase of \$6.1 million, compared to the three months ended March 31, 2020. The increase in Analytics revenue was primarily driven by increased revenue from our analytics and connectivity products. Integrated Yield Ramp revenue decreased \$3.1 million compared to year-ago period primarily due to lower hours worked on fixed fees engagements and decreased Gainshare royalty from the 14nm and 28nm technology nodes.
- Costs of revenues increased \$2.2 million, compared to the three months ended March 31, 2020, primarily due to increases in personnel-related costs due to higher headcount resulting from the acquisition of Cimetrix, cloud-delivery related costs, amortization of other acquired intangible assets, and software maintenance expense, partially offset by decreases in direct costs due mainly to hardware expense, shipping costs and the timing of deferral of contract costs, and decreased travel expenses resulting from reduced business travel as a result of the global COVID-19 pandemic.
- Net loss was \$7.6 million, compared to \$0.5 million for the three months ended March 31, 2020. The increase in net loss was primarily attributable to increases in costs of revenues, operating expenses related primarily to our research and development, sales and marketing activities, general and administrative expenses related to subcontractor costs, legal fees, and accounting and related fees, and income tax expense, partially offset by increases in total revenues and interest and other expense (income), net.
- Cash, cash equivalents and short-term investments decreased \$13.0 million to \$132.3 million at March 31, 2021, from \$145.3 million at December 31, 2020, primarily due to cash used in our operating activities, the purchase of property and equipment, and the repurchases of common stock.

Critical Accounting Policies and Estimates

See Note 1, *Summary of Significant Accounting Policy*, to our Condensed Consolidated Financial Statements 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, 2020.

There were no material changes during the three months ended March 31, 2021 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 year ended December 31, 2020.

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, valuation of long-lived assets including goodwill and intangible assets, and the realization of deferred tax assets. Actual amounts may differ from such estimates under different assumptions or conditions.

Revenue Recognition

We derive revenue from two sources: Analytics and Integrated Yield Ramp.

Analytics Revenue

Analytics revenue is derived from the following primary offerings: licenses and services for standalone Software (which consists primarily of Exensio and Cimatrix products), SaaS (which consists primarily of Exensio products), and DFI™ and CV® systems that do not include performance incentives based on customers' yield achievement.

Revenue from standalone Software is recognized depending on whether the license is perpetual or time-based. Perpetual (one-time charge) license software is recognized at the time of the inception of the arrangement when control transfers to the customers, if the software license is distinct from the services offered by us. Revenue from post-contract support is recognized over the contract term on a straight-line basis, because we are providing (i) support and (ii) unspecified software updates on a when-and-if available basis over the contract term. Revenue from time-based-licensed software is allocated to each performance obligation and is recognized either at a point in time or over time as follows. The license component is recognized at the time when control transfers to customers, with the post-contract support component recognized ratably over the committed term of the contract. For contracts with any combination of licenses, support, and other services, distinct performance obligations are accounted for separately. For contracts with multiple performance obligations, we allocate the transaction price of the contract to each performance obligation on a relative basis using standalone selling price (or SSP) attributed to each performance obligation.

Revenue from SaaS arrangements, which allow for the use of a cloud-based software product or service over a contractually determined period of time without taking possession of software, is accounted for as subscriptions and is recognized as revenue ratably, on a straight-line basis, over the subscription period beginning on the date the service is first made available to customers.

Revenue from DFI™ and CV® systems that do not include performance incentives based on customers' yield achievement is recognized primarily as services are performed. Where there are distinct performance obligations, we allocate revenue to all deliverables based on their SSPs. For these contracts with multiple performance obligations, we allocate the transaction price of the contract to each performance obligation on a relative basis using SSP attributed to each performance obligation. Where there are not discrete performance obligations, historically, revenue is primarily 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. The estimation of percentage of completion method is complex and subject to many variables that require significant judgement.

Integrated Yield Ramp Revenue

Integrated Yield Ramp revenue is derived from our yield ramp engagements, which include Gainshare or other performance incentives based on customers' yield achievement.

Revenue under these project-based contracts, which are delivered over a specific period of time typically for a fixed fee component paid on a set schedule, is recognized as services are performed using a percentage of completion method based on costs or labor-inputs, whichever is the most appropriate measure of the progress towards completion of the contract. Where there are distinct performance obligations, we allocate revenue to all deliverables based on their SSPs and allocate the transaction price of the contract to each performance obligation on a relative basis using SSP. Similar to the services provided in connection with DFI™ and CV® systems that are contributing to Analytics revenue, due to the nature of the work performed in these arrangements, the estimation of percentage of completion method is complex and subject to many variables that require significant judgement.

The Gainshare royalty contained in yield ramp contracts is a variable fee related to continued usage of our IP after the fixed-fee service period ends, based on the customers' yield achievement. Revenue derived from Gainshare is contingent upon our customers reaching certain defined production yield levels. Gainshare royalty periods are generally subsequent to the delivery of all contractual services and performance obligations. We record Gainshare as a usage-based royalty derived from customers' usage of intellectual property and record it in the same period in which the usage occurs.

Income Taxes

We are required to assess whether it is "more-likely-than-not" that we will realize our deferred tax assets. If we believe that they are not likely to be fully realizable before the expiration dates applicable to such assets, then to the extent we believe that recovery is not likely, we must establish a valuation allowance. Based on all available evidence, both positive and negative, we determined a full valuation allowance was appropriate for our federal and state net deferred tax assets (or DTAs) in the fourth quarter of 2020, primarily driven by an increased cumulative loss incurred over the 12-quarter period ended December 31, 2020, near term forecasted book losses, and the likelihood that we will not utilize tax attributes before they begin to expire at the end of 2022. The valuation allowance was approximately \$41.9 million as of as of March 31, 2021 and December 31, 2020. We will continue to evaluate the need for a valuation allowance and may change our conclusion in a future period based on changes in facts (e.g., 12-quarter cumulative profit, significant new revenue, etc.). If we conclude that we are more likely than not to utilize some or all of our U.S. DTAs, we will release some or all of our valuation allowance and our tax provision will decrease in the period in which we make such a determination.

We evaluate our DTAs for realizability considering both positive and negative evidence, including our historical financial performance, projections of future taxable income, future reversals of existing taxable temporary differences, tax planning strategies and any carryback availability. In evaluating the need for a valuation allowance, we estimate future taxable income based on management approved business plans. This process involves significant management judgment about assumptions that are subject to change from period to period based on changes in tax laws or variances between future projected operating performance and actual results. Changes in the net DTAs, less offsetting valuation allowance, in a period are recorded through the income tax provision and could have a material impact on the Condensed Consolidated Statements of Comprehensive Loss.

Our income tax calculations are based on application of applicable U.S. federal, state, or foreign tax law. Our tax filings, however, are subject to audit by the respective tax authorities. Accordingly, we recognize tax liabilities based upon our 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 than the amounts originally accrued, the increases or decreases are recorded as income tax expense or benefit in the Condensed Consolidated Statements of Comprehensive Loss. At March 31, 2021, no deferred taxes have been provided on undistributed earnings from our international subsidiaries. We intend to reinvest the earnings of our non-U.S. subsidiaries in those operations indefinitely. As such, we have not provided for any foreign withholding taxes on the earnings of foreign subsidiaries as of March 31, 2021. The earnings of our foreign subsidiaries are taxable in the U.S. in the year earned under the Global Intangible Low-Taxed Income rules implemented under 2017 Tax Cuts and Jobs Act.

Valuation of Long-lived Assets including Goodwill and Intangible Assets

We record goodwill when the purchase consideration of an acquisition exceeds the fair value of the net tangible and identified intangible assets as of the date of acquisition. We have one operating segment and one operating unit. We perform an annual impairment assessment of goodwill during the fourth quarter of each calendar year or more frequently, if required to determine if any events or circumstances exist, such as an adverse change in business climate or a decline in the overall industry demand, that would indicate that it would more likely than not reduce the fair value of a reporting unit below its carrying amount, including goodwill. If events or circumstances do not indicate that the fair value of a reporting unit is below its carrying amount, then goodwill is not considered to be impaired and no further testing is required. If the carrying amount exceeds its fair value, an impairment loss would be recognized equal to the amount of excess, limited to the amount of total goodwill. There was no goodwill impairment for the three months ended March 31, 2021.

Our long-lived assets, excluding goodwill, consist of property and equipment and intangible assets. We periodically review our long-lived assets for impairment. For assets to be held and used, we initiate our review whenever events or changes in circumstances indicate that the carrying amount of a long-lived asset group may not be recoverable. Recoverability of an asset group is measured by comparison of its carrying amount to the expected future undiscounted cash flows that the asset group is expected to generate. If it is determined that an asset group is not recoverable, an impairment loss is recorded in the amount by which the carrying amount of the asset group exceeds its fair value. There was no impairment of long-lived assets for the three months ended March 31, 2021.

Recent Accounting Pronouncements and Accounting Changes

See Note 1, *Summary of Significant Accounting Policy*, to our Condensed Consolidated Financial Statements 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, 2021 and 2020****Revenues, Costs of Revenues, and Gross Margin**

	Three Months Ended March 31,		Change	
	2021	2020	\$	%
(Dollars in thousands)				
Revenues:				
Analytics	\$ 19,393	\$ 13,248	\$ 6,145	46%
Integrated Yield Ramp	4,807	7,910	(3,103)	(39)%
Total revenues	\$ 24,200	\$ 21,158	\$ 3,042	14%
Costs of revenues	10,663	8,487	2,176	26%
Gross profit	\$ 13,537	\$ 12,671	\$ 866	7%
<i>Gross margin</i>	56%	60%		
<i>Analytics revenue as a percentage of total revenues</i>	80%	63%		
<i>Integrated Yield Ramp revenue as a percentage of total revenues</i>	20%	37%		

Analytics Revenue

Analytics revenue increased \$6.1 million for the three months ended March 31, 2021, compared to the three months ended March 31, 2020. The increase in Analytics revenue was primarily driven by a \$8.2 million increase in revenue from our analytics and connectivity products, offset by a \$2.1 million decrease in revenue from Characterization products and services due to lower hours worked across multiple contracts and customers.

Integrated Yield Ramp Revenue

Integrated Yield Ramp revenue decreased \$3.1 million for the three months ended March 31, 2021, compared to the three months ended March 31, 2020, due primarily to lower hours worked on fixed fees engagements and decreases in Gainshare royalty from the 14nm and 28nm technology nodes.

Our Integrated Yield Ramp revenue may continue to fluctuate from period to period primarily due to the contribution of Gainshare royalty, which 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 contracts containing Gainshare.

Our Analytics and Integrated Yield Ramp revenues may fluctuate in the future and are dependent on a number of factors, including the semiconductor industry's continued acceptance of our products, services and 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.

Costs of Revenues

Costs of revenues consist of costs incurred to provide and support our services, costs recognized in connection with licensing our software, and amortization of acquired technology. Services costs consist of material, employee compensation and related benefits, overhead costs, travel and allocated facilities-related costs. Software license costs consist of costs associated with licensing third-party software used by us in providing services to our customers in solution engagements, or sold in conjunction with our software products.

The increase in costs of revenues of \$2.2 million for the three months ended March 31, 2021, compared to the three months ended March 31, 2020, was primarily due to (i) a \$1.9 million increase in personnel-related costs due to higher headcount as a result of the Cimetrix acquisition, higher benefit costs, and merit increases, (ii) a \$0.5 million increase in cloud-delivery and software royalty and licenses expense, and (iii) a \$0.4 million increase in amortization of other acquired intangibles assets, partially offset by (i) a \$0.4 million decrease in other direct costs due mainly to hardware expense, shipping costs and the timing of deferral of contract costs, and (ii) a \$0.2 million decrease in travel expenses resulting from reduced business travel due to the global COVID-19 pandemic.

Gross Margin

Gross margin for the three months ended March 31, 2021 was 56% compared to 60% for the year-ago period. The lower gross margin during the three months ended March 31, 2021, was primarily due to lower Integrated Yield Ramp revenue from Gainshare royalty and an increase in cost of revenues.

Operating Expenses:**Research and Development**

(Dollars in thousands)	Three Months Ended March 31,		Change	
	2021	2020	\$	%
Research and development	\$ 10,841	\$ 8,590	\$ 2,251	26%
<i>As a percentage of total revenues</i>	45%	41%		

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, 2021, compared to the year-ago period, primarily due to (i) a \$1.8 million increase in personnel-related costs due to higher headcount as a result of the Cimatrix acquisition, higher benefit costs, merit increases and higher stock-based compensation, (ii) a \$0.6 million increase in subcontractor expenses primarily related to our DFI™, Exensio solutions and Data Connectivity and Equipment Control Software, and (iii) a \$0.1 million increase in cloud-services related costs, partially offset by (i) a \$0.2 million decrease in software maintenance expense and (ii) a \$0.1 million decrease in travel expenses resulting from reduced business travel due to the global COVID-19 pandemic.

We anticipate our expenses in research and development will fluctuate in absolute dollars from period to period due to the timing of product development projects.

Selling, General and Administrative

(Dollars in thousands)	Three Months Ended March 31,		Change	
	2021	2020	\$	%
Selling, general and administrative	\$ 9,464	\$ 7,895	\$ 1,569	20%
<i>As a percentage of total revenues</i>	39%	37%		

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, 2021, compared to the year-ago period, primarily due to (i) a \$0.9 million increase in personnel-related costs due to higher headcount as a result of the Cimatrix acquisition, higher benefit costs, merit increases and higher stock-based compensation, (ii) a \$0.4 million increase in facilities and IT related costs including rent and depreciation expense, (iii) a \$0.3 million increase in subcontractor expenses, (iv) a \$0.2 million increase in legal fees, primarily related to fees for legal services for the arbitration proceeding over a disputed customer contract, and (v) a \$0.2 million increase in accounting and related fees, partially offset by (i) a \$0.3 million decrease in general legal expenses, and (ii) a \$0.1 million decrease in travel expenses.

We anticipate our selling, general and administrative expenses will fluctuate in absolute dollars from period to period as a result of cost control initiatives and to support our selling efforts in the future.

Amortization of Other Acquired Intangible Assets

(Dollars in thousands)	Three Months Ended March 31,		Change	
	2021	2020	\$	%
Amortization of other acquired intangible assets	\$ 314	\$ 173	\$ 141	82%

Amortization of other acquired intangible assets consists of amortization of intangibles acquired as a result of certain business combinations. The increase in amortization of other acquired intangible assets for the three months ended March 31, 2021, compared to the year-ago period, was primarily related to amortization of other acquired intangible assets related to the Cimetrix acquisition.

Interest and Other Expense (Income), Net

(Dollars in thousands)	Three Months Ended March 31,		Change	
	2021	2020	\$	%
Interest and other expense (income), net	\$ (441)	\$ 20	\$ (461)	2,305%

Interest and other expense (income), net, primarily consists of interest income, gains and losses from foreign currency forward contracts, and foreign currency transaction exchange gains and losses.

Interest and other expense (income), net increased for the three months ended March 31, 2021, compared to the year-ago period, primarily due to a higher net favorable fluctuations in foreign exchange rates, a decrease in loss related to foreign currency forward contracts, partially offset by a decrease in interest income due to lower interest rates.

Income Tax Expense (Benefit)

(Dollars in thousands)	Three Months Ended March 31,		Change	
	2021	2020	\$	%
Income tax expense (benefit)	\$ 956	\$ (3,479)	\$ 4,435	(127)%

Income tax expense increased for the three months ended March 31, 2021, compared to the year-ago period, primarily due to a full valuation allowance against U.S. net deferred tax assets recorded in the fourth quarter of 2020 and one-time benefits recorded in the first quarter of 2020, pursuant to the provisions of the Coronavirus Aid, Relief, and Economic Security Act ("CARES Act") passed on March 27, 2020.

Liquidity and Capital Resources

As of March 31, 2021, our working capital, defined as total current assets less total current liabilities, was \$143.3 million, compared to \$151.2 million as of December 31, 2020. Total cash and cash equivalents, and short-term investments were \$132.3 million as of March 31, 2021, compared to cash and cash equivalents of \$145.3 million as of December 31, 2020. As of March 31, 2021, and December 31, 2020, cash and cash equivalents held by our foreign subsidiaries were \$6.4 million and \$4.0 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 at least the next twelve months.

There has been no significant impact in respect to Liquidity and Capital Resources from the global COVID-19 pandemic.

Cimetrix Acquisition

On December 1, 2020, the Company completed the acquisition of Cimetrix Incorporated with a total payment made in 2020 of \$28.6 million, net of cash acquired. In 2020, the Company held back \$3.5 million of the purchase price (the “Holdback Amount”) to satisfy adjustments to the closing balance sheet and claims for indemnity arising out of breaches of certain representations, warranties and covenants, and certain other enumerated items in the merger agreement. During the three months ended March 31, 2021, the Company recorded a measurement period adjustment which reduced the Holdback Amount to \$3.0 million. The Holdback Amount, as adjusted, is expected to be paid to the participating equity holders in December 2021. See Note 4, *Business Combination* to our Condensed Consolidated Financial Statements of this Quarterly Report on Form 10-Q for further discussion.

Repurchase of Company's Common Stock

On June 4, 2020, the Company’s Board of Directors adopted a new stock repurchase program (the “2020 Program”) to repurchase up to \$25.0 million of the Company’s common stock both on the open market and in privately negotiated transactions, including through Rule 10b5-1 plans, over the next two years. During the three months ended March 31, 2021, 251,212 shares were repurchased at an average price of \$18.01 per share, for a total price of \$4.5 million under the 2020 Program.

Cash Flow Data

The following table summarizes our cash flows for the periods presented (in thousands):

	Three Months Ended March 31,		\$ Change
	2021	2020	
(In thousands)			
Net cash flows provided by (used in):			
Operating activities	\$ (8,325)	\$ 5,380	\$ (13,705)
Investing activities	56,417	(2,068)	58,485
Financing activities	(4,497)	(507)	(3,990)
Effect of exchange rate changes on cash and cash equivalents	(104)	(25)	(79)
Net increase in cash and cash equivalents	<u>\$ 43,491</u>	<u>\$ 2,780</u>	<u>\$ 40,711</u>

Net Cash Flows Provided by (Used in) Operating Activities

Cash flow used in operating activities during the three months ended March 31, 2021 were 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, and net change in operating assets and liabilities. The \$13.7 million decrease in cash flows from operating activities for the three months ended March 31, 2021, compared to the year-ago period, was driven primarily by a \$6.8 million decrease in net change from operating assets and liabilities, and a \$7.1 million increase in net loss, partially offset by a \$0.7 million increase in non-cash adjustments to net loss, which was primarily due to an increase in amortization of acquired intangible assets of \$0.5 million. The major contributors to the net change in operating assets and liabilities for the three months ended March 31, 2021 were as follows:

- Prepaid expense and other current assets decreased by \$2.8 million, primarily due to timing of billing of contract assets related to our fixed-price service contracts.
- Accounts payable decreased by \$4.1 million, primarily due to the timing of payments of invoices.
- Accrued compensation and related benefits decreased by \$2.1 million, primarily due to the timing of payments of accrued bonuses and accrued payroll taxes; and,
- Billings in excess of recognized revenues and deferred revenues decreased by a total of \$3.0 million, primarily due to timing of billing and revenue recognition.

Net Cash Flows Provided by (Used in) Investing Activities

Cash provided by investing activities increased by \$58.5 million for the three months ended March 31, 2021 compared to the year-ago period. For the three months ended March 31, 2021, cash provided by investing activities primarily related to proceeds from maturities of short-term investments of \$68.0 million, offset by purchases of short-term investments of \$11.0 million and property and equipment of \$0.6 million. For the three months ended March 31, 2020, cash flows used in investing activities related to a \$2.1 million property and equipment purchased primarily related to the construction of our DFI™ solution and expansion of our research and development laboratory and clean room.

Net Cash Flows Used in Financing Activities

Net cash used in financing activities increased by \$4.0 million for the three months ended March 31, 2021 compared to the year-ago period. For the three months ended March 31, 2021, net cash used in financing activities primarily consisted of \$4.5 million for the repurchase of shares of our common stock and \$1.5 million in cash payments for taxes related to net share settlement of equity awards, partially offset by \$1.5 million of proceeds from our 2001 Employee Stock Purchase Plan (as amended and now expired, the "Purchase Plan") and exercise of stock options. For the three months ended March 31, 2020, net cash used in financing activities primarily consisted of \$1.5 million in cash payments for taxes related to net share settlement of equity awards, partially offset by \$1.0 million of proceeds from our Purchase Plan and exercise of stock options.

Related Party Transactions

Refer to Note 3, *Strategic Partnership Agreement with Advantest and Related Party Transactions*, to our Condensed Consolidated Financial Statements of this Quarterly Report on Form 10-Q, for a discussion on related party transactions between the Company and Advantest.

Off-Balance Sheet Agreements

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

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 and Credit Risk. As of March 31, 2021, we had cash, cash equivalents and short-term investments of \$132.3 million. Cash and cash equivalents consisted of cash and highly liquid money market instruments, and short-term investments consisted of U.S. Treasury bills. 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, 2021, 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.

At March 31, 2021 and periodically throughout the year, we have maintained cash balances in various operating accounts in excess of federally insured limits. We limit the amount of credit exposure with any one financial institution by evaluating the creditworthiness of the financial institutions with which we invest.

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. From time to time, 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 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, 2021, we had no outstanding forward contracts.

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, 2021, in connection with the filing of this Quarterly Report on Form 10-Q. Based on that evaluation as of March 31, 2021, 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, 2021, 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, 2021.

On May 6, 2020, we initiated an arbitration proceeding with the Hong Kong International Arbitration Center against SMIC New Technology Research & Development (Shanghai) Corporation (“SMIC”) due to SMIC’s failure to pay fees due to PDF under a series of contracts. We seek to recover the unpaid fees, a declaration requiring SMIC to pay fees under the contracts in the future, and costs associated with bringing the arbitration proceeding. The arbitration is on-going.

Item 1A. Risk Factors

As of the date of this Quarterly Report on Form 10-Q, there have been no material changes from the risk factors disclosed in our Annual Report on Form 10-K for the year ended December 31, 2020, filed with the Securities and Exchange Commission on March 11, 2021. Any of such factors could result in a significant or material adverse effect on our result of operations or financial conditions. Additional risk factors not presently known to us or that we currently deem immaterial may also impair our business or results of operations. We may disclose changes to such factors or disclose additional factors from time to time in our future filings with the SEC.

Item 2. Unregistered Sales of Equity Securities and Use of Proceeds**Repurchase of Shares of Company Equity Securities**

On June 4, 2020, the Company's Board of Directors adopted a stock repurchase program (the "2020 Program") to repurchase up to \$25.0 million of the Company's common stock both on the open market and in privately negotiated transactions, including through Rule 10b5-1 plans, over the next two years.

The table below sets forth the information with respect to purchases made under the 2020 Program 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, 2021. Under the 2020 Program, \$20.5 million of common stock remained available for future repurchases.

Period	Total Number of Shares Purchased (in thousands)	Average Price Paid Per Share	Total Number of Shares Purchased as Part of Publicly Announced Programs (in thousands)	Approximate Dollar Value of Shares that May Yet Be Purchased Under Programs (in thousands)
January 1, 2021 through January 31, 2021	—	\$ —	—	\$ 25,000
February 1, 2021 through February 28, 2021	69	\$ 18.18	69	\$ 23,747
March 1, 2021 through March 31, 2021	182	\$ 17.94	182	\$ 20,477
Total	251	\$ 18.01	251	

Item 3. Defaults Upon Senior Securities

None.

Item 4. Mine Safety Disclosures

None.

Item 5. Other Information

None.

Item 6. Exhibits

Exhibit Number	Description
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	The following financial statements from the Company’s Quarterly Report on Form 10-Q for the quarter ended March 31, 2021, formatted in Inline XBRL: (i) Condensed Consolidated Balance Sheets, (ii) Condensed Consolidated Statements of Comprehensive Loss, (iii) Condensed Consolidated Statements of Stockholders’ Equity, (iv) Condensed Consolidated Statements of Cash Flows and (v) Notes to Condensed Consolidated Financial Statements, tagged as blocks of text and including detailed tags.†
104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101).†

† 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 6, 2021

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

Date: May 6, 2021

By: /s/ ADNAN RAZA
Adnan Raza
Executive Vice President, Finance and Chief Financial
Officer
(principal financial and accounting officer)

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 6, 2021

CERTIFICATIONS

I, Adnan Raza, 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/ Adnan Raza
Adnan Raza
*Executive Vice President, Finance
and Chief Financial Officer
(principal financial and accounting officer)*

Date: May 6, 2021

**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, 2021, as filed with the Securities and Exchange Commission on May 6, 2021 (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 6, 2021

**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, 2021, as filed with the Securities and Exchange Commission on May 6, 2021 (the "Report"), I, Adnan Raza, 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/ Adnan Raza
Adnan Raza
Executive Vice President, Finance
and Chief Financial Officer
(principal financial and accounting officer)

Date: May 6, 2021