

Share-Based Compensation

The following table shows a summary of share-based compensation expense included in the Consolidated Statements of Operations during the periods presented (in thousands):

	Fiscal Years		
	2019	2018	2017
Cost of revenue	\$ 2,936	\$ 3,869	\$ 3,189
Research and development	8,551	13,448	10,565
Selling, general and administrative	12,305	14,620	22,581
Total	\$ 23,792	\$ 31,937	\$ 36,335

Amounts presented above include share-based compensation expense of \$0.8 million for fiscal year 2017, which is recorded as discontinued operations related to employees of our Compute business.

As of September 27, 2019, the total unrecognized compensation costs related to outstanding stock options, restricted stock awards and units including awards with time-based, performance-based, and market-based vesting was \$47.0 million, which we expect to recognize over a weighted-average period of 2.9 years.

Stock Options

A summary of stock option activity for fiscal year 2019 is as follows (in thousands, except per share amounts and contractual term):

	Number of Shares	Weighted-Average Exercise Price per Share	Weighted-Average Remaining Contractual Term (in Years)	Aggregate Intrinsic Value
Options outstanding - September 28, 2018	1,408	\$ 32.05		
Granted	585	15.44		
Exercised	(119)	13.48		
Forfeited, canceled or expired	(1,497)	31.68		
Options outstanding - September 27, 2019	376	\$ 13.58	7.03	\$ 3,046
Options vested and expected to vest - September 27, 2019	376	\$ 13.58	7.03	\$ 3,046
Options exercisable - September 27, 2019	91	\$ 9.82	2.48	\$ 1,081

Aggregate intrinsic value represents the difference between our closing stock price on September 27, 2019, and the exercise price of outstanding, in-the-money options. The total intrinsic value of options exercised was \$0.7 million, \$0.9 million and \$8.9 million for fiscal years 2019, 2018 and 2017, respectively.

Stock Options with Time-based Vesting Criteria

In November 2017, we granted 10,924 incentive stock options and 69,076 non-qualified stock options with a total grant date fair value of \$17.55 per share, or \$1.4 million. These stock options were valued using a Black-Scholes model, using a volatility rate of 45.7%, a risk-free rate of 2.21%, a strike price of \$36.61 and an expected term of 6.5 years. Share-based compensation expense is recognized on a straight-line basis over the service period which approximated 4.5 years for these awards. These awards were included in the cancellation during the fiscal first quarter of 2019 as discussed in the section below.

Stock Options with Market-based Vesting Criteria

We grant NQs that are subject to vesting only upon the market price of our underlying public stock closing above a certain price target within seven years of the date of grant. Share-based compensation expense is recognized regardless of the number of awards that are earned based on the market condition and is recognized on a straight-line basis over the estimated service period of approximately three years. If the required service period is not met for these options, then the share-based compensation expense would be reversed. In the event that our common stock achieves the target price per share based on a 30-day trailing average prior to the end of the estimated service period, any remaining unamortized compensation cost will be recognized.

Stock options with market-based vesting criteria granted for fiscal years 2019, 2018 and 2017 were 585,000, 325,000 and 320,000, respectively, at weighted average grant date fair values of \$7.47, \$15.52 and \$13.18 per share, or total grant date fair value \$2.4 million, \$5.0 million and \$4.3 million, respectively.

These NQs with market-based vesting criteria were valued using a Monte Carlo simulation model. The weighted average Monte Carlo input assumptions used for calculating the fair value of these market-based stock options are as follows:

	Fiscal Years		
	2019	2018	2017
Risk-free interest rate	2.8%	2.3%	1.9%
Expected term (years)	3.9	3.4	7.0
Expected volatility	51.9%	45.8%	32.3%
Target price	\$53.87	\$98.99	\$67.39

During our fiscal first quarter of 2019, we canceled 1,122,500 performance-based stock options with a concurrent grant of 748,328 PRSUs for 13 employees, which was accounted for as a modification. The incremental compensation cost resulting from the modification was \$8.2 million, and was being recognized as share-based compensation expense over the requisite service period of three years for the new PRSU awards. As a result of subsequent actions that resulted in forfeitures, the remaining compensation expense associated with this modification as of September 27, 2019 is \$2.8 million.

Restricted Stock Awards and Units

A summary of restricted stock awards and units activity for fiscal year 2019 is as follows (in thousands):

	Number of Shares	Weighted-Average Grant Date Fair Value	Aggregate Intrinsic Value
Issued and unvested - September 28, 2018	1,872	\$ 34.15	\$ 38,452
Granted	2,977	18.18	
Vested	(673)	34.87	
Forfeited, canceled or expired	(1,563)	24.06	
Issued and unvested - September 27, 2019	2,613	21.81	\$ 56,649

As of September 27, 2019, the aggregate intrinsic value of expected to vest restricted stock units including time-based, performance-based, and market-based units was \$56.3 million for fiscal year 2019. The total fair value of restricted stock awards and units vested was \$11.7 million, \$19.7 million and \$51.2 million for the fiscal years 2019, 2018 and 2017, respectively. RSUs granted generally vest over a period of four years.

In addition to RSUs, we also issue PRSUs with specific performance vesting criteria. These PRSUs have both a service and performance-based vesting condition and awards are divided into three equal tranches and vest based on achieving certain adjusted earnings per share growth metrics. The service condition requires participants to be employed on May 15th of the following year once the performance condition has been met. Depending on the actual performance achieved, a participant may earn between 0% to 300% of the targeted shares for each tranche, which is determined based on a straight-line interpolation applied for the achievement between the specified performance ranges. As of September 27, 2019, the performance condition targets for awards with future service conditions had not been met. We granted 1,005,854 PRSUs during fiscal year 2019 and 745,047 were forfeited. The amount of incremental PRSU awards that could ultimately vest if all performance criteria are achieved would be 1,196,337 shares assuming a maximum of 300% of the targeted shares.

We granted 200,000 market-based RSUs during fiscal year 2019, at a weighted average grant date fair value of \$17.65 per share, and a total fair value of \$3.5 million. Recipients may earn between 0% and 150% of the target number of shares based on the Company's achievement of total shareholder return in comparison to a peer group of companies in the Nasdaq composite index over a period of approximately three years. The fair value of the awards was estimated using a Monte Carlo simulation and compensation expense is recognized ratably over the service period based on the grant date fair value of the awards of \$3.5 million subject to the market condition. The expected volatility of the Company's common stock was estimated based on the historical average volatility rate over the three-year period. The dividend yield assumption was based on historical and anticipated dividend payouts. The risk-free rate assumption was based on observed interest rates consistent with the three-year measurement period. The assumptions used to value the awards are as follows: