The following table summarizes the changes in the carrying amount of goodwill during the fiscal years ended January 31, 2019 and 2018:

	January 31, 2019	January 31, 2018
Goodwill, beginning of the year	$ 1,769.4	$ 1,710.3
Less: accumulated impairment losses, beginning of the year	(149.2)	(149.2)
Additions arising from acquisitions during the year	866.9	—
Effect of foreign currency translation, measurement period adjustments, and other (1)	(36.3)	59.1
Goodwill, end of the year	$ 2,450.8	$ 1,620.2

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(1)   Purchase accounting adjustments reflect revisions made to the Company's preliminary determination of estimated fair value of assets and liabilities assumed during fiscal 2019 and 2018.

Impairment of Long-Lived Assets

At least annually or more frequently as circumstances dictate, Autodesk reviews its long-lived assets for impairment whenever impairment indicators exist. Autodesk continually monitors events and changes in circumstances that could indicate the carrying amounts of its long-lived assets may not be recoverable. When such events or changes in circumstances occur, Autodesk assesses recoverability of these assets. Recoverability is measured by comparison of the carrying amounts of the assets to the future undiscounted cash flow the assets are expected to generate. If the long-lived assets are considered to be impaired, the impairment to be recognized is equal to the amount by which the carrying value of the assets exceeds its fair market value. Autodesk did not recognize any material impairments of long-lived assets during the fiscal years ended January 31, 2019, 2018, and 2017, respectively.

In addition to the recoverability assessments, Autodesk routinely reviews the remaining estimated useful lives of its long-lived assets. Any reduction in the useful life assumption will result in increased depreciation and amortization expense in the quarter when such determinations are made, as well as in subsequent quarters.

Deferred Tax Assets

Deferred tax assets arise primarily from tax credits, net operating losses, and timing differences for reserves, accrued liabilities, stock options, deferred revenue, purchased technologies, and capitalized intangibles, partially offset by U.S. deferred tax liabilities on acquired intangibles, and valuation allowances against U.S. and foreign deferred tax assets. Autodesk performed a quarterly assessment of the recoverability of these net deferred tax assets and believes it will generate sufficient future taxable income in appropriate tax jurisdictions to realize the net deferred tax assets. They are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to reverse. Valuation allowances are established when necessary to reduce gross deferred tax assets to the amount that is "more likely than not" to be realized.

Stock-based Compensation Expense

The following table summarizes stock-based compensation expense for fiscal 2019, 2018, and 2017, respectively, as follows:

	Fiscal Year Ended January 31,		
	2019	2018	2017
Cost of subscription and maintenance revenue	$ 13.2	$ 11.9	$ 8.6
Cost of other revenue	4.3	4.0	5.5
Marketing and sales	109.4	107.3	94.1
Research and development	82.6	82.9	81.3
General and administrative	40.0	55.3	32.3
Stock-based compensation expense related to stock awards and Employee Qualified Stock Purchase Plan ("ESPP") purchases	249.5	261.4	221.8
Tax benefit	(2.6)	(2.6)	(2.6)
Stock-based compensation expense related to stock awards and ESPP purchases, net	$ 246.9	$ 258.8	$ 219.2

Autodesk determines the grant date fair value of its share-based payment awards using a Black-Scholes Merton ("BSM") option pricing model or the quoted stock price on the date of grant, unless the awards are subject to market conditions, in which case Autodesk uses a binomial-lattice model (e.g., Monte Carlo simulation model). The Monte Carlo simulation model utilizes multiple input variables to estimate the probability that market conditions will be achieved. Autodesk uses the following assumptions to estimate the fair value of stock-based awards:

	Fiscal Year Ended January 31, 2019			Fiscal Year Ended January 31, 2018		Fiscal Year Ended January 31, 2017	
	Stock Option Plans	Performance Stock Unit	ESPP	Performance Stock Unit	ESPP	Performance Stock Unit	ESPP
Range of expected volatilities	37 - 42%	36%	33 - 38%	32%	31 - 34%	38 - 39%	30 - 40%
Range of expected lives (in years)	0.5 - 3.8	N/A	0.5 - 2.0	N/A	0.5 - 2.0	N/A	0.5 - 2.0
Expected dividends	—%	—%	—%	—%	—%	—%	—%
Range of risk-free interest rates	2.3 - 2.7%	2.0%	1.9 - 2.8%	1.0 - 1.2%	0.9 - 1.4%	0.6 - 0.7%	0.5 - 0.9%

Autodesk estimates expected volatility for stock-based awards based on the average of the following two measures: (1) a measure of historical volatility in the trading market for the Company's common stock, and (2) the implied volatility of traded forward call options to purchase shares of the Company's common stock. The expected volatility for performance stock units subject to market conditions includes the expected volatility of Autodesk's peer companies within the S&P Computer Software Select Index or S&P North American Technology Software Index with a market capitalization over $2.00 billion, depending on the award type.

Autodesk estimates the expected life of stock-based awards using both exercise behavior and post-vesting termination behavior as well as consideration of outstanding options. The range of expected lives of ESPP awards are based upon the four, six-month exercise periods within a 24-month offering period.

Autodesk did not pay cash dividends in fiscal 2019, 2018, or 2017 and does not anticipate paying any cash dividends in the foreseeable future. Consequently, an expected dividend yield of zero is used in the BSM option pricing model and the Monte Carlo simulation model.

The risk-free interest rate used in the BSM option pricing model and the Monte Carlo simulation model for stock-based awards is the historical yield on U.S. Treasury securities with equivalent remaining lives.

Autodesk recognizes expense only for the stock-based awards that ultimately vest. Autodesk accounts for forfeitures of stock-based awards as those forfeitures occur.

Advertising Expenses

Advertising costs are expensed as incurred. Total advertising expenses incurred were $37.5 million in fiscal 2019, $31.1 million in fiscal 2018, and $33.6 million in fiscal 2017.

Net Loss Per Share

Basic net loss per share is computed based on the weighted average number of shares of common stock outstanding for the period, excluding stock options and restricted stock. Diluted net loss per share is computed based upon the weighted average shares of common shares outstanding for the period and potentially dilutive common shares, including the effect of stock options and restricted stock units under the treasury stock method.

Defined Benefit Pension Plans

The funded status of Autodesk's defined benefit pension plans is recognized in the Consolidated Balance Sheets. The funded status is measured as the difference between the fair value of plan assets and the projected benefit obligation for the fiscal years presented. The projected benefit obligation represents the actuarial present value of benefits expected to be paid upon retirement based on employee services already rendered and estimated future compensation levels. The fair value of plan