

### **Case Example 10:**

#### **Three years of Maintenance, Enhancement, and Support**

Software Risk Master does not stop with development estimates. It also predicts three years of software maintenance (bug repairs), customer support, and enhancements.

For large applications above 10,000 function points these maintenance tasks often cost more than original development. Maintenance costs are driven by numbers of customers and numbers of latent bugs released in the software. As one might expect, software with thousands of users and thousands of bugs are very expensive to maintain, and customer support costs are high as well.

<b>Example 10: How Software Risk Master (SRM) Evaluates 3 Years of Maintenance and Enhancements</b>					
<b>Java Language for all 4 Cases</b>					
<b>100, 1000, 10,000, 100,000 function point samples</b>					
<b>\$7,500 per month for all 4 Cases (maintenance costs lower than development)</b>					
<b>Iterative development for all 4 Cases</b>					
<b>132 effective work hours per month for all 4 Cases</b>					
<b>Maintenance is more complex than development</b>					
<b>2017 is the 30th anniversary of IFPUG function point metrics</b>					
	<b>100</b>	<b>1000</b>	<b>10,000</b>	<b>100,000</b>	
	<b>Function Points</b>	<b>Function Points</b>	<b>Function Points</b>	<b>Function Points</b>	
	<b>Personal app</b>	<b>Internal app</b>	<b>Commercial app</b>	<b>Commercial app</b>	
<b>Maintenance locations</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>5</b>	<b>Large companies have multiple maintenance sites</b>
<b>Customer initial installation sites</b>	<b>1</b>	<b>3</b>	<b>50</b>	<b>10,000</b>	<b>Commercial apps have thousands of client sites</b>
<b>Number of initial application users</b>	<b>10</b>	<b>250</b>	<b>25,000</b>	<b>1,000,000</b>	<b>Support costs driven by users</b>

Year of first release	2018	2018	2018	2018	
Year 1 (2018)					
<b>Bug reports (valid)</b>	<b>15</b>	<b>180</b>	<b>2,520</b>	<b>40,320</b>	
<b>Bug reports (invalid)</b>	<b>5</b>	<b>65</b>	<b>845</b>	<b>10,985</b>	<b>Invalid bugs are often user errors or hardware problems</b>
<b>Bug reports (TOTAL)</b>	<b>20</b>	<b>245</b>	<b>3,365</b>	<b>51,305</b>	
Help requests	25	275	3,025	33,275	
Incident reports	20	210	2,205	23,153	<b>Incidents are reports of issues that need examination</b>
Installation sites	1	3	50	10,000	
Users	10	250	25,000	1,000,000	
<b>Maintenance Cost (bug repairs)</b>	<b>\$13,000</b>	<b>\$165,375</b>	<b>\$2,439,625</b>	<b>\$37,196,125</b>	
<b>Customer support Cost</b>	<b>\$3,545</b>	<b>\$87,985</b>	<b>\$6,255,230</b>	<b>\$200,056,428</b>	<b>Support costs go up with clients</b>
<b>Enhancement Cost</b>	<b>\$6,000</b>	<b>\$68,000</b>	<b>\$720,000</b>	<b>\$11,200,000</b>	
<b>Total Cost for 2018</b>	<b>\$22,545</b>	<b>\$321,360</b>	<b>\$9,414,855</b>	<b>\$248,452,553</b>	
Year 2 (2019)					
<b>Bug reports (valid)</b>	<b>11</b>	<b>132</b>	<b>1,848</b>	<b>29,568</b>	

					<b>Invalid bugs need analysis too</b>
<b>Bug reports (invalid)</b>	<b>4</b>	<b>52</b>	<b>676</b>	<b>8,788</b>	
<b>Bug reports (TOTAL)</b>	<b>15</b>	<b>184</b>	<b>2,524</b>	<b>38,356</b>	
					<b>Help requests drive up support costs</b>
Help requests	20	220	2,420	26,620	
Incident reports	25	263	2,756	28,941	
Installation sites	1	3	55	13,000	
Users	15	300	27,000	1,035,000.00	
<b>Maintenance Cost (bug repairs)</b>	<b>\$9,750</b>	<b>\$119,600</b>	<b>\$1,640,600</b>	<b>\$24,931,400</b>	
					<b>Support costs go up with users</b>
<b>Customer support Cost</b>	<b>\$5,295</b>	<b>\$105,483</b>	<b>\$9,455,176</b>	<b>\$362,305,561</b>	
<b>Enhancement Cost</b>	<b>\$6,600</b>	<b>\$74,800</b>	<b>\$792,000</b>	<b>\$12,320,000</b>	
<b>Total Cost for 2019</b>	<b>\$21,645</b>	<b>\$299,883</b>	<b>\$11,887,776</b>	<b>\$399,556,961</b>	
Year 3 (2020)					
<b>Bug reports (valid)</b>	<b>6</b>	<b>72</b>	<b>864</b>	<b>10,368</b>	
<b>Bug reports (invalid)</b>	<b>3</b>	<b>39</b>	<b>507</b>	<b>6,591</b>	
<b>Bug reports (TOTAL)</b>	<b>9</b>	<b>111</b>	<b>1,371</b>	<b>16,959</b>	
Help requests	25	275	3,025	33,275	
Incident reports	30	315	3,308	34,729	
<b>Installation sites</b>	<b>1</b>	<b>3</b>	<b>60</b>	<b>14,000</b>	
<b>Users</b>	<b>20</b>	<b>350</b>	<b>28,000</b>	<b>1,071,225.00</b>	
<b>Maintenance Cost (bug repairs)</b>	<b>\$5,850</b>	<b>\$72,150</b>	<b>\$891,150</b>	<b>\$11,023,350</b>	

<b>Customer support Cost</b>	<b>\$7,055</b>	<b>\$123,090</b>	<b>\$9,806,333</b>	<b>\$374,996,754</b>	
<b>Enhancement Cost</b>	<b>\$6,930</b>	<b>\$78,540</b>	<b>\$831,600</b>	<b>\$12,936,000</b>	
<b>Total Cost for 2020</b>	<b>\$19,835</b>	<b>\$273,780</b>	<b>\$11,529,083</b>	<b>\$398,956,104</b>	
Three Year Totals					
<b>Bug reports (valid)</b>	<b>32</b>	<b>384</b>	<b>5,232</b>	<b>80,256</b>	
<b>Bug reports (invalid)</b>	<b>12</b>	<b>156</b>	<b>2,028</b>	<b>26,364</b>	
<b>Bug reports (TOTAL)</b>	<b>44</b>	<b>540</b>	<b>7,260</b>	<b>106,620</b>	
Help requests	<b>70</b>	<b>770</b>	<b>8,470</b>	<b>93,170</b>	
Incident reports	<b>75</b>	<b>788</b>	<b>8,269</b>	<b>86,822</b>	
<b>3-year bug reports per function point</b>	<b>0.44</b>	<b>0.54</b>	<b>0.73</b>	<b>1.07</b>	<b>Bugs increase with application size</b>
Installation sites	1	3	60	14,000	
Users	20	350	28,000	1,071,225.00	
<b>Maintenance Cost (bug repairs)</b>	<b>\$28,600</b>	<b>\$357,125</b>	<b>\$4,971,375</b>	<b>\$73,150,875</b>	
<b>Customer support Cost</b>	<b>\$15,895</b>	<b>\$316,558</b>	<b>\$25,516,739</b>	<b>\$937,358,742</b>	<b>&gt; 1,000,000 users have high support costs</b>
<b>Enhancement Cost</b>	<b>\$19,530</b>	<b>\$221,340</b>	<b>\$2,343,600</b>	<b>\$36,456,000</b>	
<b>Total Cost for 3 years</b>	<b>\$64,025</b>	<b>\$895,023</b>	<b>\$32,831,714</b>	<b>\$1,046,965,617</b>	
<b>3-year Maintenance cost per function point</b>	<b>\$286.00</b>	<b>\$357.13</b>	<b>\$497.14</b>	<b>\$731.51</b>	

<b>3-year customer support cost per function point</b>	<b>\$158.95</b>	<b>\$316.56</b>	<b>\$2,551.67</b>	<b>\$9,373.59</b>	<b>&gt; 1,000,000 users have high support costs</b>
<b>3-year enhancement cost per function point</b>	<b>\$195.30</b>	<b>\$221.34</b>	<b>\$234.36</b>	<b>\$364.56</b>	
<b>3-year Total cost per function point</b>	<b>\$640.25</b>	<b>\$895.02</b>	<b>\$3,283.17</b>	<b>\$10,469.66</b>	
<b>3-year total cost per user</b>	<b>\$3,201.25</b>	<b>\$2,557.21</b>	<b>\$1,172.56</b>	<b>\$977.35</b>	<b>&gt; 1,000,000 users have economies of scale</b>
		<b>END OF EXAMPLE</b>			