

Table 2 (Supplementary data). Inputs Data

Equipment code	Number of annual maintenance times	Number of annual working hours
1	10	2080
1	8	1568
1	15	2574
1	3	520
1	24	3120
2	12	2420
2	15	2634
2	4	615
2	8	1162
2	33	4220
3	8	1498
3	16	2674
3	3	490
3	7	1002
3	23	3020
4	9	1780
4	7	1308
4	15	2590
4	3	540
4	23	2920
5	8	1755
5	7	1398
5	14	2479
5	3	450
5	22	2904
6	8	1694
6	7	1291
6	14	2389
6	1	229
6	19	2490
7	7	1269
7	13	2178
7	2	380
7	6	892
7	17	2140
8	7	1409
8	13	2234
8	3	490
8	9	1259
8	14	1820

Table 3(Supplementary data). Outputs Data (Operational cost in Iraqi dinars) ID*10⁴

Equipment code	Fuel	Driver	Repair	Tire	Oils	Lubrication	Total Annual Cost (C _T)
1	1800	1200	1333	25	360	12	4730
1	1575	1050	1167	25	315	10.5	4117
1	2025	1350	1500	25	405	13.5	5294
1	900	600	667	25	180	6	2353
1	2700	1800	2300	25	540	18	7358
2	1320	1200	667	130	240	12	3569
2	1485	1350	750	130	270	13.5	3999
2	660	600	333	130	120	6	1849
2	990	900	500	130	180	9	2709
2	1980	1800	1400	130	360	18	5688
3	2100	1050	794	182	308	10.5	4444
3	2700	1350	1146	182	396	13.5	5788
3	1200	600	408	182	176	6	2572
3	1800	900	734	182	264	9	3889
3	3600	1800	2150	182	528	18	8278
4	840	800	400	260	216	8	2524
4	735	700	350	260	189	7	2241
4	945	900	450	260	243	9	2807
4	420	400	200	260	108	4	1392
4	1260	1200	900	260	324	12	3956
5	720	640	533	225	176	12	2306
5	630	560	467	225	154	10.5	2046
5	810	720	600	225	198	13.5	2567
5	36	320	267	225	88	6	1266
5	1080	960	1000	225	264	18	3547
6	480	600	133	100	48	12	1373
6	420	525	117	100	42	10.5	1214
6	540	675	150	100	54	13.5	1533
6	240	300	67	100	24	6	737
6	720	900	250	100	72	18	2060
7	630	525	233	300	52.5	10.5	1751
7	810	675	300	300	67.5	13.5	2166
7	360	300	133	300	30	6	1129
7	540	450	200	300	45	9	1544
7	1080	900	600	300	90	18	2988
8	1575	1050	350	320	182	10.5	3488
8	2025	1350	750	320	234	13.5	4693
8	900	600	200	320	104	6	2130
8	1350	900	300	320	156	9	3035
8	2700	1800	900	320	312	18	6050

Table 4 (Supplementary data). Data for Testing the ANN Model (Operational cost in Iraqi dinars) ID*10⁴

Equipment code	Number of annual maintenance times	Number of annual working hours	Total Annual Cost (C _T)
1	8	1092	3529
2	9	1659	3139
3	10	1985	5079
4	14	2000	1958
5	7	989	1786
6	6	892	1055
7	8	1750	1959
8	9	1960	3940

Table 5 (Supplementary data). Kawasaki shuffle 85 data cost (ID)

Equipment code	Annual increase rate	Number of annual working hours (WH)	Annual routine maintenance	Number of annual maintenance times (NMH)
3	1.00	1985	10	10
3	1.10	1498	7	8
3	1.21	2674	13	16
3	1.33	490	2	3
3	1.46	1002	5	7
3	1.61	3020	15	23
3	1.77	1778	9	15
3	1.95	1778	9	17
3	2.14	1778	9	18
3	2.36	1778	9	20
3	2.59	1778	9	22
3	2.85	1778	9	24
3	3.14	1778	9	27
3	3.45	1778	9	30
3	3.80	1778	9	32
3	4.18	1778	9	36
3	4.59	1778	9	39
3	5.05	1778	9	43
3	5.56	1778	9	48
3	6.12	1778	9	52

Table 6 (Supplementary data). Average salvage value for Kawasaki Shuffle 85

Number of Years	Ratio	Initial cost (IQD*10 ⁴)	Annual discount (IQD*10 ⁴)	Salvage value (IQD*10 ⁴)
0	0	19000	0	19000
1	0.05	19000	950	18050
2	0.05	19000	950	17100
3	0.05	19000	950	16150
4	0.05	19000	950	15200
5	0.05	19000	950	14250
6	0.05	19000	950	13300
7	0.05	19000	950	12350
8	0.05	19000	950	11400
9	0.05	19000	950	10450
10	0.05	19000	950	9500
11	0.05	19000	950	8550
12	0.05	19000	950	7600
13	0.05	19000	950	6650
14	0.05	19000	950	5700
15	0.05	19000	950	4750
16	0.05	19000	950	3800
17	0.05	19000	950	2850
18	0.05	19000	950	1900
19	0.05	19000	950	950
20	0.05	19000	950	0

Table 7 (Supplementary data). Time of replacement of different equipment

Equipment	Number of Years
Kawasaki Shuffle 85	11 Y - 19560 h
Komatsu 201 Excavator	12 Y - 21908 h
Komatsu dash5 excavator	13 Y - 27539 h 16 Y - 33894 h
Small Komatsu shuffle	10 Y - 18564 h
Dump Truck	9 Y - 14963 h
steel roller grooved	8 Y - 11980 h
Water Tanker	6 Y - 8609 h
Komatsu Grader	9 Y - 13758 h

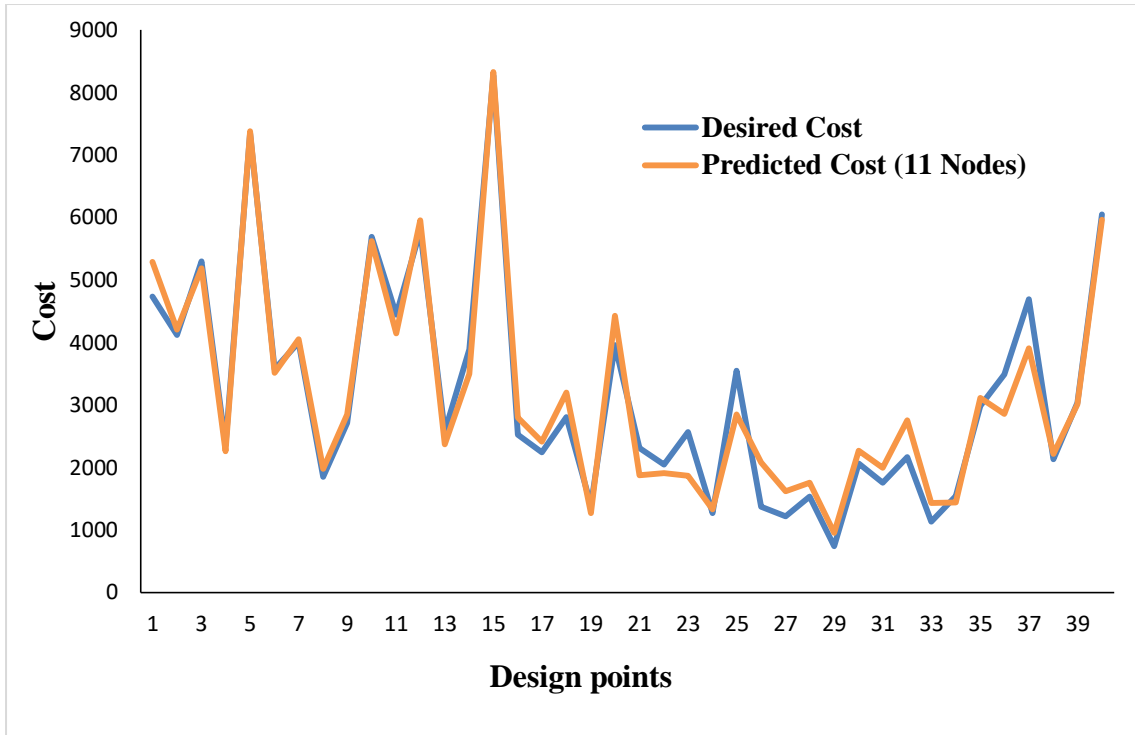


Figure 4 (Supplementary data). The best curve for future costs.

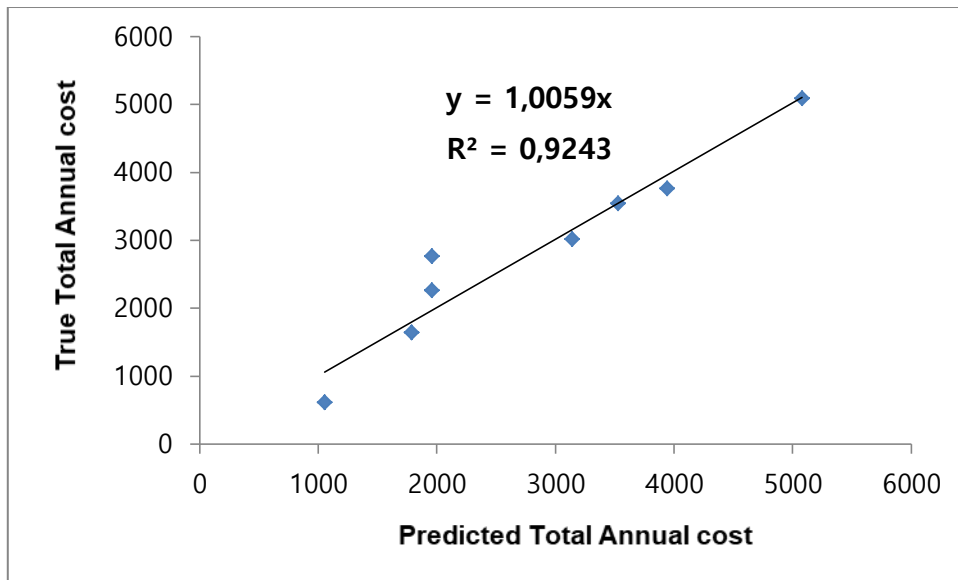


Figure 7 (Supplementary data). Linear Regression Analysis of the Correlation Between True Values and Predicted Outputs

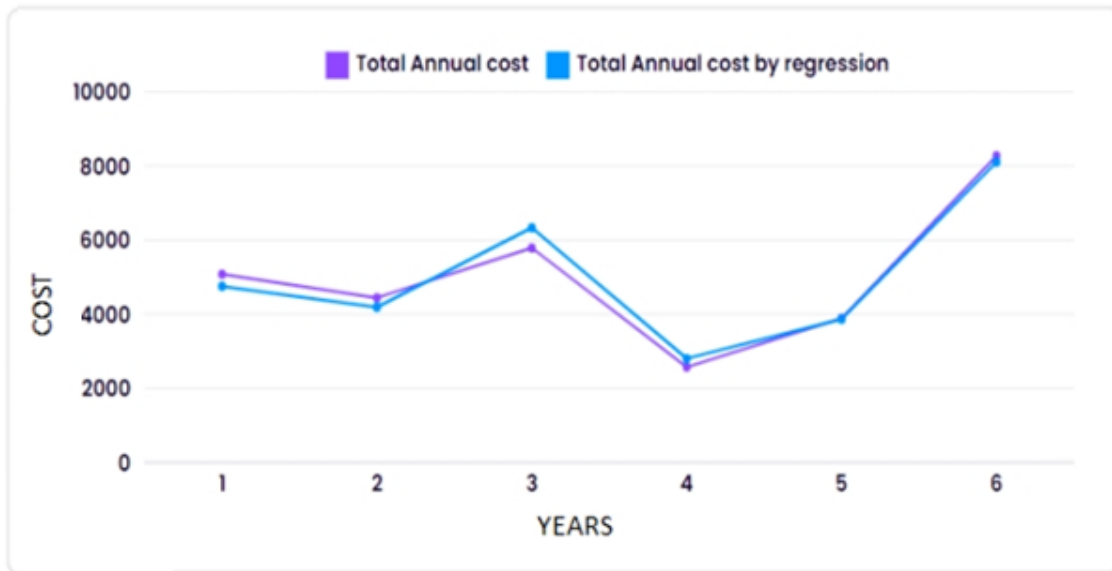


Figure 9 (Supplementary data). Comparison between the total annual cost collected from the private sector and the total annual cost calculated by the regression equation.

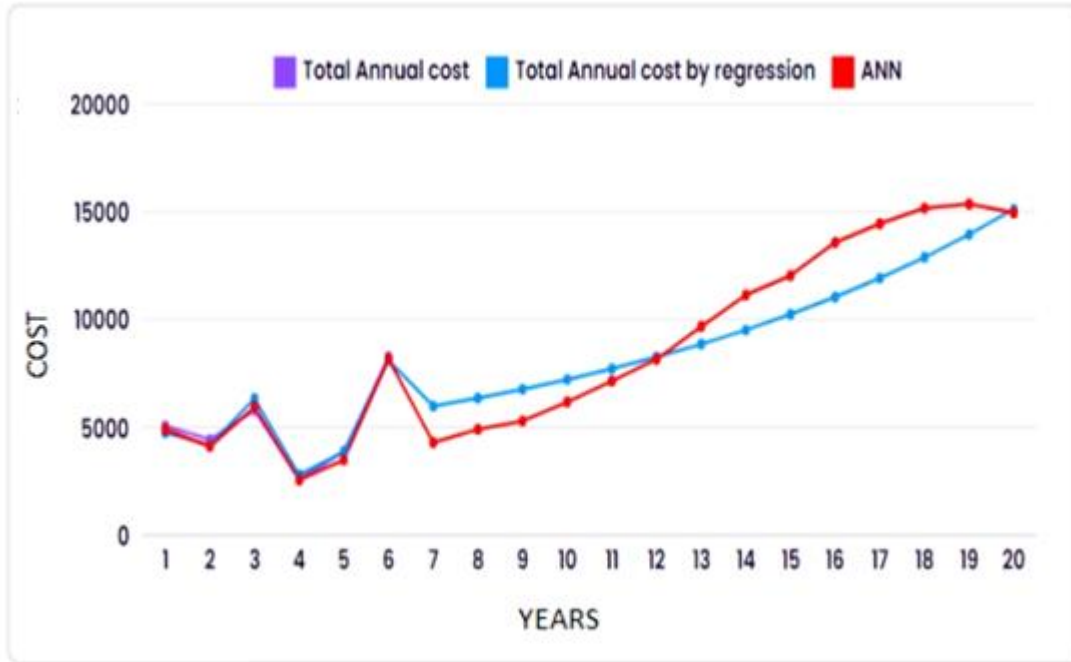


Figure 10 (Supplementary data). Comparison between the total annual cost predicted by ANN and the total annual cost calculated by the regression equation.

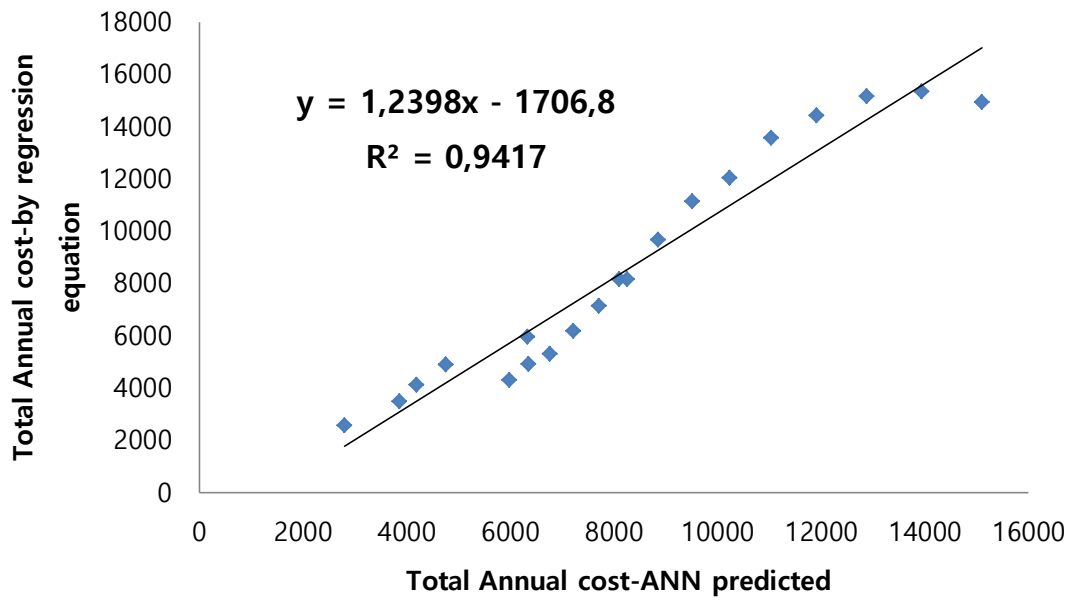


Figure 11 (Supplementary data). Linear Regression Analysis of the Correlation between Values obtained by regression equation and ANN Outputs

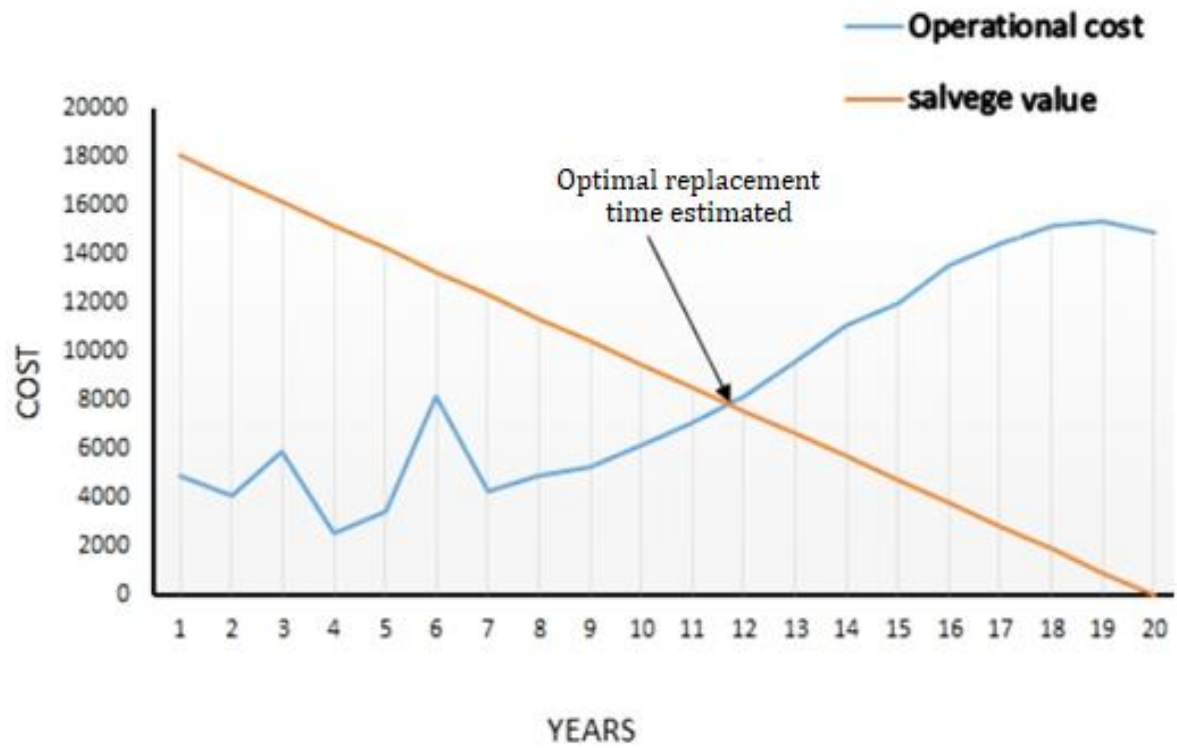


Figure 12 (Supplementary data). The optimal time of Kawasaki Shuffle 85 replacement