# TRIZ Contradiction Matrix

| Improving Parameter ↓ / Worsening Parameter → | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Weight of moving object | | all | 15 8 29 34 | all | 29 17 38 34 | all | 29 2 40 28 | all | 2 8 15 38 | 8 10 18 37 | 10 36 37 40 | 10 14 35 40 | 1 35 19 39 | 28 27 18 40 | 5 34 31 35 | all | 6 29 4 38 | 19 1 32 | 35 12 34 31 | all | 12 36 18 31 | 6 2 34 19 | 5 35 3 31 | 10 24 35 | 10 35 20 28 | 3 26 18 31 | 1 3 11 27 | 28 27 35 26 | 28 35 26 18 | 22 21 18 27 | 22 35 31 39 | 27 28 1 36 | 35 3 2 24 | 2 27 28 11 | 29 5 15 8 | 26 30 36 34 | 28 29 26 32 | 26 35 18 19 | 35 3 24 37 |
| 2 Weight of stationary object | all | | all | 10 1 29 35 | all | 35 30 13 2 | all | 5 35 14 2 | all | 8 10 19 35 | 13 29 10 18 | 13 10 29 14 | 26 39 1 40 | 28 2 10 27 | all | 2 27 19 6 | 28 19 32 22 | 19 32 35 | | 18 19 28 1 | 15 19 18 22 | 18 19 28 15 | 5 8 13 30 | 10 15 35 | 10 20 35 26 | 19 6 18 26 | 10 28 8 3 | 18 26 28 | 10 1 35 17 | 2 19 22 37 | 35 22 1 39 | 28 1 9 | 6 13 1 32 | 2 27 28 11 | 19 15 29 | 1 10 26 39 | 25 28 17 15 | 2 26 35 | 1 28 15 35 |
| 3 Length of moving object | 8 15 29 34 | all | | all | 15 17 4 | all | 7 17 4 35 | | 13 4 8 | 17 10 4 | 1 8 35 | 1 8 10 29 | 1 8 15 34 | 8 35 29 34 | 19 | all | 10 15 19 | 32 | 8 35 24 | all | 1 35 | 7 2 35 39 | 4 29 23 10 | 1 24 | 15 2 29 | 29 35 | 10 14 29 40 | 28 32 4 | 10 28 29 37 | 1 15 17 24 | 17 15 | 1 29 17 | 15 29 35 4 | 1 28 10 | 14 15 1 16 | 1 19 26 24 | 35 1 26 24 | 17 24 26 16 | 14 4 28 29 |
| 4 Length of stationary object | all | 35 28 40 29 | all | | all | 17 7 10 40 | all | 35 8 2 14 | all | 28 10 | 1 14 35 | 13 14 15 7 | 39 37 35 | 15 14 28 26 | all | 1 10 35 | 3 35 38 18 | 3 25 | all | all | 12 8 | 6 28 | 10 28 24 35 | 24 26 | 30 29 14 | all | 15 29 28 | 32 28 3 | 2 32 10 | 1 18 | all | 15 17 27 | 2 25 | 3 | 1 35 | 1 26 | 26 | | 30 14 7 26 |
| 5 Area of moving object | 2 17 29 4 | 14 15 18 4 | all | | | all | 7 14 17 4 | all | 29 30 4 34 | 19 30 35 2 | 10 15 36 28 | 5 34 29 4 | 11 2 13 39 | 3 15 40 14 | 6 3 | all | 2 15 16 | 15 32 19 13 | 19 32 | all | 19 10 32 18 | 15 17 30 26 | 10 35 2 39 | 30 26 | 26 4 | 29 30 6 13 | 29 9 | 26 28 32 3 | 2 32 | 22 33 28 1 | 17 2 18 39 | 13 1 26 24 | 15 17 13 16 | 15 13 10 1 | 15 30 | 14 1 13 | 2 36 26 18 | 14 30 28 23 | 10 26 34 2 |
| 6 Area of stationary object | all | 30 2 14 18 | all | 26 7 9 39 | all | | all | all | all | 1 18 35 36 | 10 15 36 37 | all | 2 38 | 40 | all | 2 10 19 30 | 35 39 38 | all | all | all | 17 32 | 17 7 30 | 10 14 18 39 | 30 16 | 10 35 4 18 | 2 18 40 4 | 32 35 40 4 | 26 28 32 3 | 2 29 18 36 | 27 2 39 35 | 22 1 40 | 40 16 | 16 4 | 16 | 15 16 | 1 18 36 | 2 35 30 18 | 23 | 10 15 17 7 |
| 7 Volume of moving object | 2 26 29 40 | all | 1 7 4 35 | all | 1 7 4 17 | all | | all | 29 4 38 34 | 15 35 36 37 | 6 35 36 37 | 1 15 29 4 | 28 10 1 39 | 9 14 15 7 | 6 35 4 | all | 34 39 10 18 | 2 13 10 | 35 | all- | 35 6 13 18 | 7 15 13 16 | 36 39 34 10 | 2 22 | 2 6 34 10 | 29 30 7 | 14 1 40 11 | 25 26 28 | 25 28 2 16 | 22 21 27 35 | 17 2 40 1 | 29 1 40 | 15 13 30 12 | 10 | 15 29 | 26 1 | 29 26 4 | 35 34 16 24 | 10 6 2 34 |
| 8 Volume of stationary object | all | 35 10 19 14 | 19 14 | 35 8 2 14 | all | all | all | | all | 2 18 37 | 24 35 | 7 2 35 | 34 28 35 40 | 9 14 17 15 | all | 35 34 38 | 35 6 4 | all | all | all | 30 6 | all | 10 39 35 34 | all | 35 16 32 18 | 35 3 | 2 35 16 | | all | 35 10 25 | 34 39 19 27 | 30 18 35 4 | 35 | all | | 1 31 | 2 17 26 | | 35 37 10 2 |
| 9 Speed | 2 28 13 38 | | 13 14 8 | all | 29 30 34 | all | 7 29 34 | all | | 13 28 15 19 | 6 18 38 40 | 35 15 18 34 | 28 33 1 18 | 8 3 26 14 | 3 19 35 5 | all | 28 30 36 2 | 10 13 19 | 8 15 35 38 | all | 19 35 38 2 | 14 20 19 35 | 10 13 28 38 | 13 26 | all | 10 19 29 38 | 11 35 27 28 | 28 32 1 24 | 10 28 32 25 | 1 28 35 23 | 2 24 35 21 | 35 13 8 1 | 32 28 13 12 | 34 2 28 27 | 15 10 26 | 10 28 4 34 | 3 34 27 16 | 10 18 | all |
| 10 Force (intensity) | 8 1 37 18 | 18 13 1 28 | 17 19 9 36 | 28 10 | 19 10 15 | 1 18 36 37 | 15 9 12 37 | 2 36 18 37 | 13 28 15 12 | | 18 21 11 | 10 35 40 34 | 35 10 21 | 35 10 14 27 | 19 2 | all | 35 10 21 | all | 19 17 10 | 1 16 36 37 | 19 35 18 37 | 14 15 | 8 35 40 5 | all | 10 37 36 | 14 29 18 36 | 3 35 13 21 | 35 10 23 24 | 28 29 37 36 | 1 35 40 18 | 13 3 36 24 | 15 37 18 1 | 1 28 3 25 | 15 1 11 | 15 17 18 20 | 26 35 10 18 | 36 37 10 19 | 2 35 | 3 28 35 37 |
| 11 Stress or pressure | 10 36 37 40 | 13 29 10 18 | 35 10 36 | 35 1 14 16 | 10 15 36 28 | 10 15 36 37 | 6 35 10 | 35 24 | 6 35 36 | 36 35 21 | | 35 4 15 10 | 35 33 2 40 | 9 18 3 40 | 19 3 27 | all | 35 39 19 2 | all | 14 24 10 37 | all | 10 35 14 | 2 36 25 | 10 36 3 37 | all | 37 36 4 | 10 14 36 | 10 13 19 35 | 6 28 25 | 3 35 | 22 2 37 | 2 33 27 18 | 1 35 16 | 11 | 2 | 35 | 19 1 35 | 2 36 37 | 35 24 | 10 14 35 37 |
| 12 Shape | 8 10 29 40 | 15 10 26 3 | 29 34 5 4 | 13 14 10 7 | 5 34 4 10 | | 14 4 15 22 | 7 2 35 | 35 15 34 18 | 35 10 37 40 | 34 15 10 14 | | 33 1 18 4 | 30 14 10 40 | 14 26 9 25 | all | 22 14 19 32 | 13 15 32 | 2 6 34 14 | all | 4 6 2 | 14 | 35 29 3 5 | 14 10 34 17 | 36 22 | 10 40 16 | 28 32 1 | 32 30 40 | 22 1 2 35 | 35 1 | 1 32 17 28 | 32 15 26 | 2 13 1 | 1 15 29 | 16 29 1 28 | 15 13 39 | 15 1 32 | 17 26 34 10 | 35 10 14 |
| 13 Stability of object composition | 21 35 2 39 | 26 39 1 40 | 13 15 1 28 | 37 | 2 11 13 | 39 | 28 10 19 39 | 34 28 35 40 | 33 15 28 18 | 10 35 21 16 | 2 35 40 | 22 1 18 4 | | 17 9 15 | 13 27 10 35 | 39 3 35 23 | 35 1 32 | 32 3 27 16 | 13 19 | 27 4 29 18 | 32 35 27 31 | 14 2 39 6 | 2 14 30 40 | | 35 27 | 15 32 35 | 13 | 18 | 25 34 6 35 | 35 24 30 18 | 35 40 27 39 | 35 19 | 32 35 30 | 2 35 10 16 | 35 30 34 2 | 2 35 22 26 | 35 22 39 23 | 1 8 35 | 23 35 40 3 |
| 14 Strength | 1 8 40 15 | 40 26 27 1 | 1 15 8 35 | 15 14 28 26 | 3 34 40 29 | 9 40 28 | 10 15 14 7 | 9 14 17 15 | 8 13 26 14 | 10 18 3 14 | 10 3 18 40 | 10 30 35 40 | 13 17 35 | | 27 3 26 | all | 30 10 40 | 35 19 | 19 35 10 | 35 | 10 26 35 28 | 35 | 28 27 18 40 | 10 | 29 3 28 10 | 29 10 27 | 11 3 | 3 27 16 | 3 27 | 18 35 37 1 | 15 35 22 2 | 11 3 10 32 | 32 40 28 2 | 27 11 3 | 15 3 32 | 2 13 25 28 | 27 3 15 28 | 15 | 29 35 10 14 |
| 15 Duration of action by moving object | 19 5 34 31 | | 2 19 9 | | 3 17 19 | | 10 2 19 30 | | 3 35 5 | 19 2 16 | 19 3 27 | 14 26 28 25 | 13 3 35 | 27 3 10 | | | 19 35 39 | 2 19 4 35 | 28 6 35 18 | | 19 10 35 38 | | 28 27 3 18 | 10 | 20 10 28 18 | 3 35 10 40 | 11 2 13 | 3 | 3 27 16 40 | 22 15 33 28 | 21 39 16 22 | 27 1 4 | 12 27 | 29 10 27 | 1 35 13 | 10 4 29 15 | 19 29 39 35 | 6 10 | 35 17 14 19 |
| 16 Duration of action by stationary object | | 6 27 19 16 | | 1 40 35 | all | all | all | all | | all | all | all | 39 3 35 23 | all | | | 19 18 36 40 | all | | all | 16 | all | 27 16 18 38 | 10 | 28 20 10 16 | 3 35 31 | 34 27 6 40 | 10 26 24 | | 17 1 40 33 | 22 | 35 10 | 1 | | 2 | | 25 34 6 35 | 1 | 20 10 16 38 |
| 17 Temperature | 36 22 6 38 | 22 35 32 | 15 19 9 | 15 19 9 | 3 35 39 18 | 35 38 | 34 39 40 18 | 35 6 4 | 2 28 36 30 | 35 10 3 21 | 35 39 19 2 | 14 22 19 32 | 1 35 32 | 10 30 22 40 | 19 13 39 | 19 18 36 40 | | 32 30 21 16 | 19 15 3 17 | all | 2 14 17 25 | 21 17 35 38 | 21 36 29 31 | | 35 28 21 18 | 3 17 30 39 | 19 35 3 10 | 32 19 24 | 24 | 22 33 35 2 | 22 35 2 24 | 26 27 | 26 27 | 4 10 16 | 2 18 27 | 2 17 16 | 3 27 35 31 | 26 2 19 16 | 15 28 35 |
| 18 Illumination intensity | 19 1 32 | 2 35 32 | 19 32 26 | | 19 32 26 | | 2 13 10 | | 10 13 19 | 26 19 6 | | 32 30 | 32 3 27 | 35 19 | 2 19 6 | | 32 35 19 | | 32 1 19 | 32 35 1 15 | 32 | 13 16 1 | 13 1 | 1 6 | 19 1 26 17 | 1 19 | | 11 15 32 | 3 32 | 15 19 | 35 19 32 39 | 19 35 28 26 | 28 26 19 | 15 17 13 16 | 15 1 19 | 6 32 13 | 32 15 | 2 26 10 | 2 25 16 |
| 19 Use of energy by moving object | 12 18 28 31 | all | 12 28 | all | 15 19 25 | all | 35 13 18 | | 8 15 35 | 16 26 21 2 | 23 14 25 | 12 2 29 | 19 13 17 24 | 5 19 9 35 | 28 35 6 18 | all | 19 24 3 14 | 2 15 19 | | all | 6 19 37 18 | 12 22 15 24 | 35 24 18 5 | all | 35 38 19 18 | 34 23 16 18 | 19 21 11 27 | 3 1 32 | all | 1 35 6 27 | 2 35 6 | 28 26 30 | 19 35 | 1 15 17 28 | 15 17 13 16 | 2 29 27 28 | 35 38 | 32 2 | 12 28 35 |
| 20 Use of energy by stationary object | all | 19 9 6 27 | all | all | all | all | all | all | all | 36 37 | all | all | 27 4 29 18 | 35 | all | all | all | 32 35 19 | all | | 19 2 35 32 | all | 28 27 18 31 | all | 1 | 3 35 31 | 10 36 23 | | all | 10 2 22 37 | 19 22 18 | 1 4 | | | 19 35 16 25 | | | | 1 6 |
| 21 Power | 8 36 38 31 | 19 26 17 27 | 1 10 35 37 | | 19 38 | 17 32 13 38 | 35 6 38 | 30 6 25 | 15 35 2 | 26 2 36 35 | 22 10 35 | 29 14 2 40 | 35 32 15 31 | 26 10 28 | 19 35 10 38 | 16 | 2 14 17 25 | 16 6 19 | 16 6 19 37 | | | 10 35 38 | 28 27 18 38 | 10 19 | 35 20 10 6 | 4 34 19 | 19 24 26 31 | 32 15 2 | | 19 22 31 2 | 2 35 18 | 26 10 34 | 26 35 10 | 35 2 10 34 | 19 17 34 | 20 19 30 34 | 19 35 16 | 28 2 17 | 28 35 34 |
| 22 Loss of energy | 15 6 19 28 | 19 6 18 9 | 7 2 6 13 | 6 38 7 | 15 26 17 30 | 17 7 30 18 | 7 18 23 | 7 | 16 35 38 | 36 38 | | | 14 2 39 6 | 26 | | | 19 38 7 | 1 13 32 15 | | | 3 38 | | 35 27 2 37 | 19 10 | 10 18 32 7 | 7 18 25 | 11 10 35 | 32 | | 21 22 35 2 | 21 35 2 22 | | 35 32 1 | 2 19 | | 7 23 | 35 3 15 23 | 2 | 28 10 29 35 |
| 23 Loss of substance | 35 6 23 40 | 35 6 22 32 | 14 29 10 39 | 10 28 24 | 35 2 10 31 | 10 18 39 31 | 1 29 30 36 | 3 39 18 31 | 10 13 28 38 | 14 15 18 40 | 3 36 37 10 | 29 35 3 5 | 2 14 30 40 | 35 28 31 40 | 28 27 3 18 | 27 16 18 38 | 21 36 39 31 | 1 6 13 | 35 18 24 5 | 28 27 12 31 | 28 27 18 38 | 35 27 2 31 | | all | 15 18 35 10 | 6 3 10 24 | 10 29 39 35 | 16 34 31 28 | 35 10 24 31 | 33 22 19 40 | 10 1 34 29 | 15 34 33 | 32 28 2 24 | 2 35 34 27 | 15 10 2 | 35 10 28 24 | 35 18 10 13 | 35 10 18 | 28 35 10 23 |
| 24 Loss of information | 10 24 35 | 10 35 5 | 1 26 | 26 | 30 26 | 30 16 | | 2 22 | 26 32 | | | | | | 10 | 10 | | 19 | all | | 10 19 | 19 10 | all | | 24 26 28 32 | 24 28 35 | 10 28 23 | | | 22 10 1 | 10 21 22 | 32 | 27 22 | | | 35 33 | 35 | 13 23 15 | |
| 25 Loss of time | 10 20 37 35 | 10 20 26 5 | 15 2 29 | 30 24 14 5 | 26 4 5 16 | 10 35 17 4 | 2 5 34 10 | 35 16 32 18 | all | 10 37 36 5 | 37 36 4 | 4 10 34 17 | 35 3 22 5 | 29 3 28 18 | 20 10 28 18 | 28 20 10 16 | 35 29 21 18 | 1 19 26 17 | 35 38 19 18 | 1 | 35 20 10 6 | 10 5 18 32 | 35 18 10 39 | 24 26 28 32 | | 35 38 18 16 | 10 30 4 | 24 34 28 32 | 24 26 28 18 | 35 18 34 | 35 22 18 39 | 35 28 34 4 | 4 28 10 34 | 32 1 10 | 35 28 | 6 29 | 18 28 32 10 | 24 28 35 30 | all |
| 26 Quantity of substance | 35 6 18 31 | 27 26 18 35 | 29 14 35 18 | | 15 14 29 | 2 18 40 4 | 15 20 29 | | 35 29 34 28 | 35 14 3 | 10 36 14 3 | 35 14 | 15 2 17 40 | 14 35 34 10 | 3 35 10 40 | 3 35 31 | 3 17 39 | | 34 29 16 18 | 3 35 31 | 35 | 7 18 25 | 6 3 10 24 | 24 28 35 | 35 38 18 16 | | 18 3 28 40 | 13 2 28 | 33 30 | 35 33 29 31 | 3 35 40 39 | 29 1 35 27 | 35 29 10 25 | 2 32 10 25 | 15 3 29 | 3 13 27 10 | 3 27 29 18 | 8 35 | 13 29 3 27 |
| 27 Reliability | 3 8 10 40 | 3 10 8 28 | 15 9 14 4 | 15 29 28 11 | 17 10 14 16 | 32 35 40 4 | 3 10 14 24 | 2 35 24 | 21 35 11 28 | 8 28 10 3 | 10 24 35 19 | 35 1 16 11 | 11 28 | 2 35 3 25 | 34 27 6 40 | 3 35 10 | 11 32 13 | 21 11 27 19 | 36 23 | 21 11 26 31 | 10 11 35 | 10 35 29 39 | 10 28 | 10 30 4 | 21 28 40 3 | 32 3 11 23 | | 11 32 1 | 27 35 2 40 | 35 2 40 26 | | 27 17 40 | 1 11 | 13 35 8 24 | 13 35 1 | 27 40 28 | 11 13 27 | 1 35 29 38 | |
| 28 Measurement accuracy | 32 35 26 28 | 28 35 25 26 | 28 26 5 16 | 32 28 3 16 | 26 28 32 3 | 26 28 32 3 | 32 13 6 | | 28 13 32 24 | 32 2 | 6 28 32 | 6 28 32 | 32 35 13 | 28 6 32 | 28 6 32 | 10 26 24 | 6 19 28 24 | 6 1 32 | 3 6 32 | | 3 6 32 | 26 32 27 | 10 16 31 28 | | 24 34 28 32 | 2 6 32 | 5 11 1 23 | | | 28 24 22 26 | 3 33 39 10 | 6 35 25 18 | 1 13 17 34 | 1 32 13 11 | 13 35 2 | 27 35 10 34 | 26 24 32 28 | 28 2 10 34 | 10 34 28 32 |
| 29 Manufacturing precision | 28 32 13 18 | 28 35 27 9 | 10 28 29 37 | 2 32 10 | 28 33 29 32 | 2 29 18 36 | 32 23 2 | 25 10 35 | 10 28 32 | 28 19 34 36 | 3 35 | 32 30 40 | 30 18 | 3 27 | 3 27 40 | | 19 26 | 3 32 | 32 2 | | 32 2 | 13 32 2 | 35 31 10 24 | | 32 26 28 18 | 32 30 | 11 32 1 | | | 26 28 10 36 | 4 17 34 26 | | 1 32 35 23 | 25 10 | | 26 2 18 | | 26 28 18 23 | 10 18 32 39 |
| 30 Object affected harmful factors | 22 21 27 39 | 2 22 13 24 | 17 1 39 4 | 1 18 | 22 1 33 28 | 27 2 39 35 | 22 23 37 35 | 34 39 19 27 | 21 22 35 28 | 13 35 39 18 | 22 2 37 | 22 1 3 35 | 35 24 30 18 | 18 35 37 1 | 22 15 33 28 | 17 1 40 33 | 22 33 35 2 | 1 19 32 13 | 1 24 6 27 | 10 2 22 37 | 19 22 31 2 | 21 22 35 2 | 33 22 19 40 | 22 10 2 | 35 18 34 | 35 33 29 31 | 27 24 2 40 | 28 33 23 26 | 26 28 10 18 | | | 24 35 2 | 2 25 28 39 | 35 10 2 | 35 11 22 31 | 22 19 29 40 | 22 19 29 40 | 33 3 34 | 22 35 13 24 |
| 31 Object generated harmful factors | 19 22 15 39 | 35 22 1 39 | 17 15 16 22 | | 17 2 18 39 | 22 1 40 | 17 2 40 | 30 18 35 4 | 35 28 3 23 | 35 28 1 40 | 2 33 27 18 | 35 1 | 35 40 27 39 | 15 35 22 2 | 21 39 16 22 | 22 | 22 35 2 24 | 19 24 39 32 | 2 35 6 | 19 22 18 | 2 35 18 | 21 35 2 22 | 10 1 34 | 10 21 29 | 1 22 | 3 24 39 1 | 24 2 40 39 | 3 33 26 | 4 17 34 26 | | | | | | | | 19 1 31 | 2 21 27 1 | 2 |
| 32 Ease of manufacture | 28 29 15 16 | 1 27 36 13 | 1 29 13 17 | 15 17 27 | 13 1 26 12 | 16 40 | 13 29 1 40 | 35 | 35 13 8 1 | 35 12 | 35 19 1 37 | 1 28 13 27 | 11 13 1 | 1 3 10 32 | 27 1 4 | 35 16 | 27 26 18 | 28 24 27 1 | 28 26 27 1 | 1 4 | 27 1 12 24 | 19 35 | 15 34 33 | 32 24 18 16 | 35 28 34 4 | 35 23 1 24 | | 1 35 12 18 | | 24 2 | | | 2 5 13 16 | 35 1 11 9 | 2 13 15 | 27 26 1 | 6 28 11 1 | 8 28 1 | 35 1 10 28 |
| 33 Convenience of use | 25 2 13 15 | 6 13 1 25 | 1 17 13 12 | | 1 17 13 16 | 18 16 15 39 | 1 16 35 15 | 4 18 39 31 | 18 13 34 | 28 13 35 | 2 32 12 | 15 34 29 28 | 32 35 30 | 32 40 28 2 | 29 3 8 25 | 1 16 25 | 26 27 13 | 13 17 1 24 | 1 13 24 | | 35 34 2 10 | 2 19 13 | 28 32 2 24 | 4 10 27 22 | 4 28 10 34 | 12 35 | 17 27 8 40 | 25 13 2 34 | 1 32 35 23 | 2 25 28 39 | | 2 5 12 | | 12 26 1 32 | 15 34 1 16 | 32 26 12 17 | | 1 34 12 3 | 15 1 28 |
| 34 Ease of repair | 2 27 35 11 | 2 27 35 11 | 1 28 10 25 | 3 18 31 | 15 13 32 | 16 25 | 25 2 35 11 | 1 | 34 9 | 1 11 10 | 13 | 1 13 2 4 | 2 35 | 11 1 2 9 | 11 29 28 27 | 1 | 4 10 | 15 1 13 | 15 1 28 16 | | 15 10 32 2 | 15 1 32 19 | 2 35 34 27 | | 32 1 10 25 | 2 28 10 25 | 11 10 1 16 | 10 2 13 | 25 10 | 35 10 2 16 | | 1 35 11 10 | 1 12 26 15 | | 7 1 4 16 | 35 1 13 11 | | 34 35 7 13 | 1 32 10 |
| 35 Adaptability or versatility | 1 6 15 8 | 19 15 29 16 | 35 1 29 2 | 1 35 16 | 35 30 29 7 | | 15 16 | 15 35 29 | all | 35 10 14 | 15 17 20 | 35 16 | 15 37 1 8 | 35 30 14 | 35 3 32 6 | 13 1 35 | 2 16 | 27 2 3 35 | 6 22 26 1 | 19 35 29 13 | | 19 1 29 | 18 15 1 | 15 10 2 13 | 35 28 | 3 35 15 | 35 13 8 24 | 35 5 1 10 | | 35 11 32 31 | | 1 13 31 | 15 34 1 16 | 1 16 7 4 | | 15 29 37 28 | 1 | 27 34 35 | 12 17 28 |
| 36 Device complexity | 26 30 34 36 | 2 26 35 39 | 1 19 26 24 | 26 | 14 1 13 16 | 6 36 | 34 26 6 | 1 16 | 34 10 28 | 26 16 | 19 1 35 | 29 13 28 15 | 2 22 17 19 | 2 13 28 | 10 4 28 15 | all | 2 17 13 | 24 17 13 | 27 2 29 28 | all | 20 19 30 34 | 10 35 13 2 | 35 10 28 29 | | 6 29 | 13 3 27 10 | 13 35 1 | 2 26 10 34 | 26 24 32 | 22 19 29 40 | 19 1 | 27 26 1 13 | 27 9 26 24 | 1 13 | 29 15 28 37 | | 15 10 37 28 | 15 1 24 | 12 17 28 |
| 37 Difficulties of detecting and measuring | 27 26 28 13 | 6 13 28 1 | 16 17 26 24 | 26 | 2 13 18 17 | 2 39 30 16 | 29 1 4 16 | 2 18 26 31 | 3 4 16 35 | 30 28 40 19 | 35 36 37 32 | 27 13 1 39 | 11 22 39 30 | 27 3 15 28 | 19 29 39 25 | 25 34 6 35 | 3 27 35 16 | 2 24 26 | 35 38 | 19 35 16 | 19 1 16 10 | 35 3 15 19 | 1 18 10 24 | 35 33 27 22 | 18 28 32 9 | 3 27 29 18 | 27 40 28 8 | | 26 24 32 28 | 22 19 29 28 | 2 21 | 5 28 11 29 | 2 5 | 12 26 | 1 15 | 15 10 37 28 | | 34 21 | 35 18 |
| 38 Extent of automation | 28 26 18 35 | 28 26 35 10 | 14 13 17 28 | 23 | 17 14 13 | all | 35 13 16 | | 28 10 | 2 35 | 13 35 | 15 32 1 13 | 18 1 | 25 13 | 6 9 | | 26 2 19 | 8 32 19 | 2 32 13 | | 28 2 27 | 23 28 | 35 10 18 5 | 35 33 | 24 28 35 30 | 35 13 | 11 27 32 | 28 26 10 34 | 28 26 18 23 | 2 33 | 2 | 1 26 13 | 1 12 34 3 | 1 35 13 | 27 4 1 35 | 15 24 10 | 34 27 25 | | 5 12 35 26 |
| 39 Productivity | 35 26 24 37 | 28 27 15 3 | 18 4 28 38 | 30 7 14 26 | 10 26 34 31 | 10 35 17 7 | 2 6 34 10 | 35 37 10 2 | all | 28 15 10 36 | 10 37 14 | 14 10 34 40 | 35 3 22 39 | 29 28 10 18 | 35 10 2 18 | 20 10 16 38 | 35 21 28 10 | 26 17 19 1 | 35 10 38 19 | 1 | 35 20 10 | 28 10 29 35 | 28 10 35 23 | 13 15 23 | all | 35 38 | 1 35 10 38 | 1 10 34 28 | 18 10 32 1 | 22 35 13 24 | 35 22 18 39 | 35 28 2 24 | 1 28 7 10 | 1 32 10 25 | 1 35 28 37 | 12 17 28 24 | 35 18 27 2 | 5 12 35 26 | |

Table 1: A blank means no principle suggested; try exploring a different contradiction. – Means no sensitive principles; try exploring a different contradiction.

Peter Childs 28-Oct-11

| No | Title | Explanation |
|---|---|---|
| 1 | Weight of moving object | The mass of the object, in a gravitational field. The force that the body exerts on its support or suspension. |
| 2 | Weight of stationary object | The mass of the object, in a gravitational field. The force that the body exerts on its support or suspension, or on the surface on which it rests. |
| 3 | Length of moving object | Any one linear dimension, not necessarily the longest, is considered a length. |
| 4 | Length of stationary object | Any one linear dimension, not necessarily the longest, is considered a length. |
| 5 | Area of moving object | A geometrical characteristic described by the part of a plane enclosed by a line. The part of a surface occupied by the object. OR the square measure of the surface, either internal or external, of an object. |
| 6 | Area of stationary object | A geometrical characteristic described by the part of a plane enclosed by a line. The part of a surface occupied by the object. OR the square measure of the surface, either internal or external, of an object. |
| 7 | Volume of moving object | The cubic measure of space occupied by the object. Length x width x height for a rectangular object, height x area for a cylinder, etc. |
| 8 | Volume of stationary object | The cubic measure of space occupied by the object. Length x width x height for a rectangular object, height x area for a cylinder, etc. |
| 9 | Speed | The velocity of an object; the rate of a process or action in time. |
| 10 | Force | Force measures the interaction between systems. In Newtonian physics, force = mass X acceleration. In TRIZ, force is any interaction that is intended to change an object's condition. |
| 11 | Stress or pressure | Force per unit area. Also, tension. |
| 12 | Shape | The external contours, appearance of a system. |
| 13 | Stability of the object's composition | The wholeness or integrity of the system; the relationship of the system's constituent elements. Wear, chemical decomposition, and disassembly are all decreases in stability. Increasing entropy is decreasing stability. |
| 14 | Strength | The extent to which the object is able to resist changing in response to force. Resistance to breaking. |
| 15 | Duration of action by a moving object | The time that the object can perform the action. Service life. Mean time between failures is a measure of the duration of action. Also, durability. |
| 16 | Duration of action by a stationary object | The time that the object can perform the action. Service life. Mean time between failures is a measure of the duration of action. Also, durability. |
| 17 | Temperature | The thermal condition of the object or system. Loosely includes other thermal parameters, such as heat capacity, that affect the rate of change of temperature. |
| 18 | Illumination intensity | Light flux per unit area, also any other illumination characteristics of the system such as brightness, light quality, etc. |
| 19 | Use of energy by moving object | The measure of the object's capacity for doing work. In classical mechanics, Energy is the product of force time's distance. This includes the use of energy provided by the super-system (such as electrical energy or heat.) Energy required doing a particular job. |
| 20 | Use of energy by stationary object | The measure of the object's capacity for doing work. In classical mechanics, Energy is the product of force time's distance. This includes the use of energy provided by the super-system (such as electrical energy or heat.) Energy required doing a particular job. |
| 21 | Power | The time rate at which work is performed. The rate of use of energy. |
| 22 | Loss of Energy | Use of energy that does not contribute to the job being done. See 19. Reducing the loss of energy sometimes requires different techniques from improving the use of energy, which is why this is a separate category. |
| 23 | Loss of substance | Partial or complete, permanent or temporary, loss of some of a system's materials, substances, parts, or subsystems. |
| 24 | Loss of Information | Partial or complete, permanent or temporary, loss of data or access to data in or by a system. Frequently includes sensory data such as aroma, texture, etc. |
| 25 | Loss of Time | Time is the duration of an activity. Improving the loss of time means reducing the time taken for the activity. "Cycle time reduction" is a common term. |
| 26 | Quantity of substance/the matter | The number or amount of a system's materials, substances, parts or subsystems which might be changed fully or partially, permanently or temporarily. |
| 27 | Reliability | A system's ability to perform its intended functions in predictable ways and conditions. |
| 28 | Measurement accuracy | The closeness of the measured value to the actual value of a property of a system. Reducing the error in a measurement increases the accuracy of the measurement. |
| 29 | Manufacturing precision | The extent to which the actual characteristics of the system or object match the specified or required characteristics. |
| 30 | External harm affects the object | Susceptibility of a system to externally generated (harmful) effects. |
| 31 | Object-generated harmful factors | A harmful effect is one that reduces the efficiency or quality of the functioning of the object or system. These harmful effects are generated by the object or system, as part of its operation. |
| 32 | Ease of manufacture | The degree of facility, comfort or effortlessness in manufacturing or fabricating the object/system. |
| 33 | Ease of operation | Simplicity: The process is NOT easy if it requires a large number of people, large number of steps in the operation, needs special tools, etc. "Hard" processes have low yield and "easy" process have high yield; they are easy to do right. |
| 34 | Ease of repair | Quality characteristics such as convenience, comfort, simplicity, and time to repair faults, failures, or defects in a system. |
| 35 | Adaptability or versatility | The extent to which a system/object positively responds to external changes. Also, a system that can be used in multiple ways in a variety of circumstances. |
| 36 | Device complexity | The number and diversity of elements and element interrelationships within a system. The user may be an element of the system that increases the complexity. The difficulty of mastering the system is a measure of its complexity. |
| 37 | Difficulty of detecting and measuring | Measuring or monitoring systems that are complex, costly, require much time and labour to set up and use, or that have complex relationships between components or components that interfere with each other all demonstrate "difficulty of detecting and measuring." Increasing cost of measuring to a satisfactory error is also a sign of increased difficulty of measuring. |
| 38 | Extent of automation | The extent to which a system or object performs its functions without human interface. The lowest level of automation is the use of a manually operated tool. For intermediate levels, humans program the tool, observe its operation, and interrupt or re-program as needed. For the highest level, the machine senses the operation needed, programs itself, and monitors its own operations. |
| 39 | Productivity | The number of functions or operations performed by a system per unit time. The time for a unit operation. The output per unit time, or the cost per unit output. |

| | Title | Explanation |
|---|---|---|
| | **Moving objects** | Objects which can easily change position in space, either on their own, or as a result of external forces. Vehicles and objects designed to be portable are the basic members of this class. |
| | **Stationary objects** | Objects which do not change position in space, either on their own, or as a result of external forces. Consider the conditions under which the object is being used. |

**Table 2: The 39 parameters**

| NUMBER | PRINCIPLE | ALTERNATIVE NAMES |
|---|---|---|
| 1 | Segmentation | Fragmentation; Segmentation |
| 2 | Extraction | Separation; Take out |
| 3 | Local quality | Local property |
| 4 | Asymmetry | Symmetry change |
| 5 | Combining | Merging; Combination; Consolodation; Unite |
| 6 | Universality | Multi-functionality |
| 7 | Nesting | Nested doll; matryoshka |
| 8 | Counter-weight | Anti-weight; weight compensation |
| 9 | Prior counter-action | Preliminary anti-action; Preliminary counter-action |
| 10 | Prior action | Preliminary action; do it in advance |
| 11 | Cushion in advance | Beforehand cushioning; Beforehand compensation; Previously installed cushions |
| 12 | Equi-potentiality | |
| 13 | Inversion | The other way round; Inverse action |
| 14 | Spheroidality | Curvature |
| 15 | Dynamics | Dynamacity; Dynamism |
| 16 | Partial or excessive action | |
| 17 | Transition into another dimension | Dimensionality; Another dimension |
| 18 | Mechanical vibration | Use of mechanical oscillations |
| 19 | Periodic action | |
| 20 | Continuity of useful action | Uninterrupted useful function |
| 21 | Rushing through | Skipping; Quick jump |
| 22 | Convert harm into benefit | Blessing in disguise; Transform damage into use; Lemons to lemonade |
| 23 | Feedback | |
| 24 | Mediator | Intermediary |
| 25 | Self-service | |
| 26 | Copying | |
| 27 | Inexpensive short life | Cheap disposables; Cheap short-living |
| 28 | Mechanical substitution | Another sense; Replacement of a mechanical system; Use of fields; Replacement of mechanical matter |
| 29 | Pneumatics and hydraulic construction | Pneumatics and hydraulics |
| 30 | Flexible membranes and thin films | Flexible shells and thin films |
| 31 | Porous materials | |
| 32 | Colour change | Optical property changes |
| 33 | Homogeneity | |
| 34 | Discard and renewal | Rejecting and regenerating parts; Discarding and recovering |
| 35 | Transforming the physical or chemical state of an object | Parameter change; Transforming physical or chemical states; Transformation of properties; Change in the aggregate state of an object |
| 36 | Phase change | Phase transition |
| 37 | Thermal expansion | |
| 38 | Strong oxidants | Accelerated oxidisation |
| 39 | Inert environment | Inert atmosphere |
| 40 | Composite materials | |

**Table 3: 40 principles. Principles for resolving design contradictions**