## Case study 1: Small network solution company

| | |
|---|---|
| Annual turnover ($) | $4,800,000 |
| Number of employees | 22 |
| Number of computer users | 22 |
| IT employee salary ($) | $31,000 |
| Annual employee organizational cost ($) | $46,500 |
| IT employee cost per day ($) | $129.00 |

| Attack Categories | Attack Outcomes |
|---|---|
| Malicious Code Infections | Information Theft/Disclosure |
| Root Compromise | Information Modification |
| Account Compromise | Information Destruction |
| Improper Use | Service Unavailable - User PC |
| Theft | Legal/Compliance Damage |
| Spam | |
| Natural Disaster | |

| Attack Categories | Attack Outcomes | Percentage |
|---|---|---|
| Malicious Code Infections | Information Theft/Disclosure | 0% |
| | Information Modification | 10% |
| | Information Destruction | 35% |
| | Service Unavailable - User PC | 55% |
| | Legal/Compliance Damage | 0% |
| | | 0% |
| | | |
| Root Compromise | Information Theft/Disclosure | 0% |
| | Information Modification | 30% |
| | Information Destruction | 0% |
| | Service Unavailable - User PC | 0% |
| | Legal/Compliance Damage | 70% |
| | | 0% |

| Attack Outcomes | Damage | | | | | Total | |
|---|---|---|---|---|---|---|---|
| | Diagnostic Effort | Reporting Effort | Repair Effort | PR/Reputation | Other Damage | Workdays | Nominal Damage |
| Information Theft/Disclosure | 0.50 | 0.00 | 0.00 | 2.00 | $0 | 2.50 | $322.92 |
| Information Modification | 1.00 | 0.00 | 2.00 | 2.00 | $500 | 5.00 | $1,145.83 |
| Information Destruction | 0.50 | 0.00 | 2.00 | 2.00 | $500 | 4.50 | $1,081.25 |
| Service Unavailable - User PC | 0.50 | 0.00 | 1.00 | 0.00 | $0 | 1.50 | $193.75 |
| Legal/Compliance Damage | 0.00 | 0.00 | 0.05 | 0.00 | $0 | 0.05 | $6.46 |

| Attack Outcomes | Attack Outcome Severity | | P10 | Nominal Loss per Attack Outcome | EL per Attack Outcome | Days of Work |
| | P100 | P1000 | | | | |
|---|---|---|---|---|---|---|
| Information Theft/Disclosure | 0.00 | 0.000 | 0.0000 | $322.92 | $322.92 | 2.50 |
| Information Modification | 0.00 | 0.000 | 0.0000 | $1,145.83 | $1,145.83 | 8.87 |
| Information Destruction | 0.01 | 0.000 | 0.0000 | $1,081.25 | $1,178.56 | 9.12 |
| Service Unavailable - User PC | 0.01 | 0.000 | 0.0000 | $193.75 | $211.19 | 1.64 |
| Legal/Compliance Damage | 0.00 | 0.000 | 0.0000 | $6.46 | $6.46 | 0.05 |

| Attacks | Number of Observed Attacks | Coverage (%) | Estimated Attacks per Year | Probability 50% lower | Probability 50% higher |
|---|---|---|---|---|---|
| Malicious Code Infections | 20 | 100% | 20 | 0 | 0 |
| Root Compromise | 1 | 100% | 1 | 0 | 0 |
| Account Compromise | 1 | 100% | 1 | 0 | 0 |
| Improper Use | 30 | 80% | 38 | 0 | 0 |
| Theft | 1 | 100% | 1 | 0 | 0 |
| Spam | 1000 | 100% | 1000 | 0 | 0 |
| Natural Disaster | 2 | 100% | 2 | 0 | 0 |

| Attack Outcomes | Frequency |
|---|---|
| Information Theft/Disclosure | 1 |
| Information Modification | 4 |
| Information Destruction | 11 |
| Service Unavailable - User PC | 43 |
| Legal/Compliance Damage | 1003 |

| Countermeasures | Cost |
|---|---|
| AntiVirus | $1,000 |
| Firewall | $2,000 |
| IDS | $600 |
| Training/Education | $1,500 |
| UPS | $2,500 |
| Active Directory | $1,000 |
| Backup Server | $1,200 |
| Spam Filtering | $500 |
| Network Access Control | $2,200 |
| Email Policy Enforcement Appliance | $2,000 |

| Countermeasures | Malicious Code Infections | Root Compromise | Account Compromise | Improper Use | Theft | Spam | Natural Disaster |
|---|---|---|---|---|---|---|---|
| AntiVirus | 90% | 10% | 0% | 0% | 0% | 0% | 0% |
| Firewall | 10% | 80% | 0% | 0% | 0% | 0% | 0% |
| IDS | 10% | 90% | 90% | 0% | 0% | 0% | 0% |
| Training/Education | 90% | 60% | 90% | 80% | 70% | 0% | 70% |
| UPS | 0% | 0% | 0% | 0% | 0% | 0% | 90% |
| Active Directory | 0% | 15% | 50% | 80% | 0% | 0% | 0% |
| Backup Server | 0% | 0% | 0% | 0% | 0% | 0% | 95% |
| Spam Filtering | 0% | 0% | 0% | 0% | 0% | 99% | 0% |
| Network Access Control | 0% | 0% | 10% | 80% | 0% | 0% | 0% |
| Email Policy Enforcement Appliance | 0% | 0% | 0% | 50% | 0% | 0% | 0% |

| Probability Combined Countermeasures Fail to Block Attack Type | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.008 | 0.006 | 0.005 | 0.004 | 0.300 | 0.010 | 0.002 |

| Attacks | Estimated Attacks per Year | Probability Countermeasures Fail | Total Number of Attacks without Countermeasures |
|---|---|---|---|
| Malicious Code Infections | 20 | 0.01 | 2,469 |
| Root Compromise | 1 | 0.01 | 163 |
| Account Compromise | 1 | 0.00 | 222 |
| Improper Use | 38 | 0.00 | 9,375 |
| Theft | 1 | 0.30 | 3 |
| Spam | 1000 | 0.01 | 100,000 |
| Natural Disaster | 2 | 0.00 | 1,333 |

| Attack Outcomes | Expected Loss per Attack | Number of Attack Outcomes | Expected Loss with Countermeasures | Number of Attack Outcomes without Countermeasures | Expected Loss without Countermeasures |
|---|---|---|---|---|---|
| Information Theft/Disclosure | $322.92 | 1 | $161.46 | 2 | $538.19 |
| Information Modification | $1,145.83 | 4 | $5,127.60 | 831 | $952,588.38 |
| Information Destruction | $1,178.56 | 11 | $12,905.26 | 1935 | $2,280,554.81 |
| Service Unavailable - User PC | $211.19 | 43 | $9,144.42 | 10060 | $2,124,481.07 |
| Legal/Compliance Damage | $6.46 | 1003 | $6,479.48 | 100739 | $650,604.00 |
| | | | | Total | $6,008,766.46 |

| Attack | Resulting Attack Outcome | Percentage | Frequency |
|---|---|---|---|
| Malicious Code Infections | Information Theft/Disclosure | 0% | 0 |
| | Information Modification | 10% | 247 |
| | Information Destruction | 35% | 864 |
| | Service Unavailable - User PC | 55% | 1358 |
| | Legal/Compliance Damage | 0% | 0 |
| | | | |
| Root Compromise | Information Theft/Disclosure | 0% | 0 |
| | Information Modification | 30% | 49 |
| | Information Destruction | 0% | 0 |
| | Service Unavailable - User PC | 0% | 0 |
| | Legal/Compliance Damage | 70% | 114 |
| | | 0% | 0 |

| Attack Outcomes | Expected Loss per Attack Outcome | Estimated Observed Attack Outcomes | Number of Attack Outcomes Prevented | Loss Avoided | Residual Expected Loss |
|---|---|---|---|---|---|
| Information Theft/Disclosure | $322.92 | 1 | 1 | $377 | $161 |
| Information Modification | $1,145.83 | 4 | 827 | $947,461 | $5,128 |
| Information Destruction | $1,178.56 | 11 | 1924 | $2,267,650 | $12,905 |
| Service Unavailable - User PC | $211.19 | 43 | 10016 | $2,115,337 | $9,144 |
| Legal/Compliance Damage | $6.46 | 1003 | 99735 | $644,125 | $6,479 |
| | | | Total | $5,974,948 | $33,818 |

| Cost of Capital | 0.15 |
|---|---|
| Time t in Years | 2 |

| Countermeasures | Loss with Count. in Place | Benefit | Net Benefit | Cost | ROI | Ongoing Cost | Current NPV | NPV with r and t |
|---|---|---|---|---|---|---|---|---|
| AntiVirus | $22,240 | $11,578 | $10,578 | $1,000 | 1057.84% | $1,000 | $10,728 | $8,349 |
| Firewall | $32,254 | $1,565 | -$435 | $2,000 | -21.74% | $400 | -$135 | -$339 |
| IDS | $31,906 | $1,913 | $1,313 | $600 | 218.90% | $230 | $1,403 | $1,154 |
| Training/Education | $10,767 | $23,052 | $21,552 | $1,500 | 1436.78% | $1,500 | $21,777 | $18,770 |
| UPS | $33,265 | $554 | -$1,946 | $2,500 | -77.83% | $500 | -$1,571 | -$1,643 |
| Active Directory | $23,260 | $10,559 | $9,559 | $1,000 | 955.92% | $0 | $9,709 | $8,332 |
| Backup Server | $33,234 | $585 | -$615 | $1,200 | -51.24% | $60 | -$435 | -$511 |
| Spam Filtering | $27,425 | $6,394 | $5,894 | $500 | 1178.78% | $120 | $5,969 | $5,135 |
| Network Access Control | $22,866 | $10,953 | $8,753 | $2,200 | 397.85% | $0 | $9,083 | $7,654 |
| Email Policy Enforcement | $27,361 | $6,458 | $4,458 | $2,000 | 222.90% | $0 | $4,758 | $3,916 |

| Attack Outcomes | Expected Loss per Attack | Estimated Attacks per Year | Nominal Loss per Attack | Loss Avoided | Residual Expected Loss |
|---|---|---|---|---|---|
| Information Theft/Disclosure | $322.93 | 1 | $322.93 | $377 | $161 |
| Information Modification | $1,145.85 | 4 | $1,145.85 | $941,858 | $5,128 |
| Information Destruction | $1,178.58 | 11 | $1,081.27 | $2,267,681 | $12,905 |
| Service Unavailable - User PC | $211.19 | 43 | $193.76 | $2,115,391 | $9,145 |
| Legal/Compliance Damage | $6.46 | 1003 | $6.46 | $644,067 | $6,480 |
| | | | Total | $5,969,374 | $33,819 |

| Data | Value |
|---|---|
| IT employee cost per day ($) | $129.17 |
| Attack Severity (increase/decrease) | 100% |
| Estimated attacks per year (increase/decrease) | 100% |
| Attack frequency estimation accuracy | 100% |

VaR

| Value | Frequency | Probability | Cumulative probability |
|---|---|---|---|
| $21,273 | 1 | 0.10% | 100.00% |
| $22,653 | 1 | 0.10% | 99.90% |
| $24,033 | 4 | 0.40% | 99.80% |
| $25,412 | 11 | 1.10% | 99.40% |
| $26,792 | 26 | 2.60% | 98.30% |
| $28,171 | 31 | 3.10% | 95.70% |
| $29,551 | 59 | 5.90% | 92.60% |
| $30,931 | 89 | 8.90% | 86.70% |
| $32,310 | 118 | 11.80% | 77.80% |
| $33,690 | 132 | 13.20% | 66.00% |
| $35,070 | 151 | 15.10% | 52.80% |
| $36,449 | 126 | 12.60% | 37.70% |
| $37,829 | 90 | 9.00% | 25.10% |
| $39,208 | 68 | 6.80% | 16.10% |
| $40,588 | 45 | 4.50% | 9.30% |
| $41,968 | 26 | 2.60% | 4.80% |
| $43,347 | 10 | 1.00% | 2.20% |
| $44,727 | 10 | 1.00% | 1.20% |
| $46,107 | 2 | 0.20% | 0.20% |
| + | 0 | 0.00% | 0.00% |
| Sum | 1000 | 100% | |

| Confidence Level | Residual Risk Threshold |
|---|---|
| 0.00% | $21,273 |
| 0.10% | $22,653 |
| 0.20% | $24,033 |
| 0.60% | $25,412 |
| 1.70% | $26,792 |
| 4.30% | $28,171 |
| 7.40% | $29,551 |
| 13.30% | $30,931 |
| 22.20% | $32,310 |
| 34.00% | $33,690 |
| 47.20% | $35,070 |
| 62.30% | $36,449 |
| 74.90% | $37,829 |
| 83.90% | $39,208 |
| 90.70% | $40,588 |
| 95.20% | $41,968 |
| 97.80% | $43,347 |
| 98.80% | $44,727 |
| 99.80% | $46,107 |
| 100.00% | + |



Value at Risk
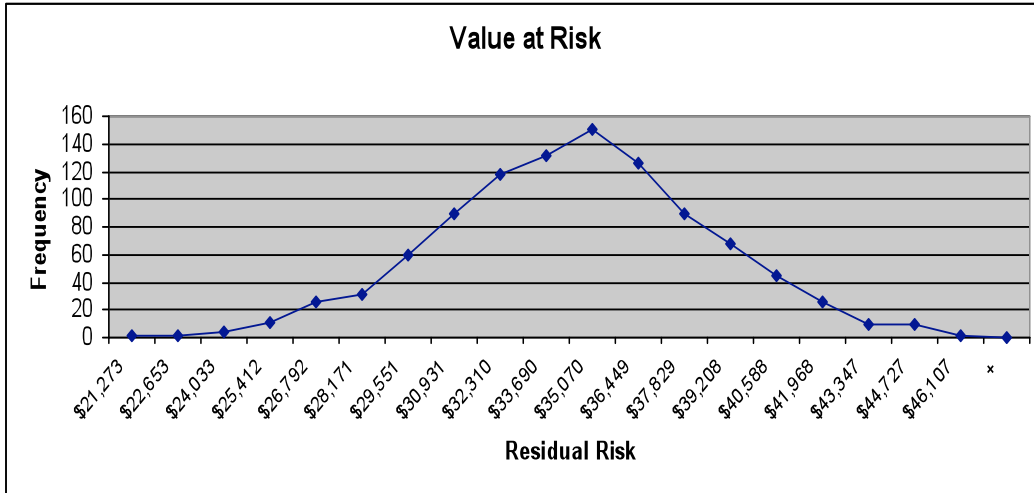
## Case study 2: Non-profit organization

| | |
|---|---|
| Annual turnover ($) | $12,000,000 |
| Number of employees | 56 |
| Number of computer users | 50 |
| IT employee salary ($) | $60,000 |
| Annual employee organizational cost ($) | $90,000 |
| IT employee cost per day ($) | $250.00 |

| Attack Categories |
|---|
| Malicious Code Infections |
| Root Compromise |
| |

| Attack Outcomes |
|---|
| Information Destruction |
| Service Unavailable - User PC |
| Service Unavailable - Email |

| Attack Categories | Attack Outcomes | Percentage |
|---|---|---|
| Malicious Code Infections | Information Destruction | 0% |
| | Service Unavailable - User PC | 20% |
| | Service Unavailable - Email | 30% |
| | | |
| Root Compromise | Information Destruction | 10% |
| | Service Unavailable - User PC | 0% |
| | Service Unavailable - Email | 30% |

| Attack Outcomes | Diagnostic Effort | Reporting Effort | Repair Effort | PR/Reputation | Other Damage | Workdays | Nominal Damage |
|---|---|---|---|---|---|---|---|
| Information Destruction | 0.10 | 0.10 | 1.50 | 0.00 | $200 | 1.70 | $625.00 |
| Service Unavailable - User PC | 0.10 | 0.00 | 0.40 | 0.00 | $50 | 0.50 | $175.00 |
| Service Unavailable - Email | 0.50 | 0.00 | 0.50 | 0.00 | $0 | 1.00 | $250.00 |

| Attack Outcomes | Attack Outcome Severity P100 | P1000 | P10 | Nominal Loss per Attack Outcome | EL per Attack Outcome | Days of Work |
|---|---|---|---|---|---|---|
| Information Destruction | 0.50 | 0.000 | 0.0000 | $625.00 | $3,437.50 | 13.75 |
| Service Unavailable - User PC | 0.50 | 0.000 | 0.0000 | $175.00 | $962.50 | 3.85 |
| Service Unavailable - Email | 0.50 | 0.000 | 0.0000 | $250.00 | $1,375.00 | 5.50 |

| Attacks | Number of Observed Attacks | Coverage (%) | Estimated Attacks per Year | Probability 50% lower | Probability 50% higher |
|---|---|---|---|---|---|
| Malicious Code Infections | 90 | 80% | 113 | 0 | 0 |
| Root Compromise | 10 | 80% | 13 | 0 | 0 |

| Attack Outcomes | Frequency |
|---|---|
| Information Destruction | 1 |
| Service Unavailable - User PC | 23 |
| Service Unavailable - Email | 38 |

| Countermeasures | Cost |
|---|---|
| AntiVirus | $1,000 |
| Firewall | $800 |
| IDS | $1,500 |
| Training/Education | $3,000 |
| Backup Server | $2,000 |
| Spam Filtering | $400 |

| Countermeasures | Malicious Code Infections | Root Compromise |
|---|---|---|
| AntiVirus | 90% | 20% |
| Firewall | 70% | 10% |
| IDS | 40% | 20% |
| Training/Education | 30% | 40% |
| Backup Server | 0% | 0% |
| Spam Filtering | 80% | 10% |

| Probability Combined Countermeasures Fail to Block Attack Type | | |
|---|---|---|
| | 0.003 | 0.311 |

| Attacks | Estimated Attacks per Year | Probability Countermeasures Fail | Total Number of Attacks without Countermeasures |
|---|---|---|---|
| Malicious Code Infections | 113 | 0.003 | 44,643 |
| Root Compromise | 13 | 0.311 | 40 |

| Attack Outcomes | Expected Loss per Attack | Number of Attack Outcomes | Expected Loss with Countermeasures | Number of Attack Outcomes without Countermeasures | Expected Loss without Countermeasures |
|---|---|---|---|---|---|
| Information Destruction | $3,437.50 | 1 | $4,296.88 | 4 | $13,814.54 |
| Service Unavailable - User PC | $962.50 | 23 | $21,656.25 | 8929 | $8,593,750.00 |
| Service Unavailable - Email | $1,375.00 | 38 | $51,562.50 | 13405 | $18,431,756.02 |

| Attack | Resulting Attack Outcome | Percentage | Frequency |
|---|---|---|---|
| Malicious Code Infections | Information Destruction | 0% | 0 |
| | Service Unavailable - User PC | 20% | 8929 |
| | Service Unavailable - Email | 30% | 13393 |
| | | | |
| Root Compromise | Information Destruction | 10% | 4 |
| | Service Unavailable - User PC | 0% | 0 |
| | Service Unavailable - Email | 30% | 12 |

| Attack Outcomes | Expected Loss per Attack Outcome | Estimated Observed Attack Outcomes | Number of Attack Outcomes Prevented | Loss Avoided | Residual Expected Loss |
|---|---|---|---|---|---|
| Information Destruction | $3,437.50 | 1 | 3 | $9,518 | $4,297 |
| Service Unavailable - User PC | $962.50 | 23 | 8906 | $8,572,094 | $21,656 |
| Service Unavailable - Email | $1,375.00 | 38 | 13367 | $18,380,194 | $51,563 |
| | | | Total | $26,961,805 | $77,516 |

| | |
|---|---|
| Cost of Capital | 15% |
| Time t in Years (max. 5 yrs) | 3 |

| Countermeasures | Loss with Countermeasures in Place | Benefit | Net Benefit | Cost | ROI | Ongoing Cost | Current NPV | NPV with r and t |
|---|---|---|---|---|---|---|---|---|
| AntiVirus | $883,689 | $26,155,632 | $26,154,632 | $1,000 | 2615463% | $6,000 | $26,154,782 | $59,702,947 |
| Firewall | $8,130,031 | $18,909,289 | $18,908,489 | $800 | 2363561% | $500 | $18,908,609 | $43,171,417 |
| IDS | $16,229,671 | $10,809,650 | $10,808,150 | $1,500 | 720543% | $500 | $10,808,375 | $24,676,332 |
| Training/Education | $18,924,485 | $8,114,835 | $8,111,835 | $3,000 | 270395% | $0 | $8,112,285 | $18,520,346 |
| Backup Server | $27,039,321 | $0 | -$2,000 | $2,000 | -100% | $0 | -$1,700 | -$5,100 |
| Spam Filtering | $5,429,139 | $21,610,182 | $21,609,782 | $400 | 5402446% | $3,000 | $21,609,842 | $49,335,649 |

| Attack Outcomes | Expected Loss per Attack | Estimated Attacks per Year | Nominal Loss per Attack | Loss Avoided | Residual Expected Loss |
|---|---|---|---|---|---|
| Information Destruction | $3,437.50 | 1 | $625.00 | $9,518 | $4,297 |
| Service Unavailable - User PC | $962.50 | 23 | $175.00 | $8,572,094 | $21,656 |
| Service Unavailable - Email | $1,375.00 | 38 | $250.00 | $18,380,194 | $51,563 |
| | | | Total | $26,961,805 | $77,516 |

| Data | Value |
|---|---|
| IT employee cost per day ($) | $250.00 |
| Attack Severity (increase/decrease) | 100% |
| Estimated attacks per year (increase/decrease) | 100% |
| Attack frequency estimation accuracy | 100% |

## Calculations

| Value | Frequency | Probability | Cumulative probability |
|---|---|---|---|
| $14,839 | 1 | 0.10% | 100.00% |
| $22,520 | 2 | 0.20% | 99.90% |
| $30,200 | 9 | 0.90% | 99.70% |
| $37,880 | 18 | 1.80% | 98.80% |
| $45,561 | 31 | 3.10% | 97.00% |
| $53,241 | 61 | 6.10% | 93.90% |
| $60,922 | 105 | 10.50% | 87.80% |
| $68,602 | 119 | 11.90% | 77.30% |
| $76,282 | 138 | 13.80% | 65.40% |
| $83,963 | 141 | 14.10% | 51.60% |
| $91,643 | 108 | 10.80% | 37.50% |
| $99,324 | 98 | 9.80% | 26.70% |
| $107,004 | 77 | 7.70% | 16.90% |
| $114,684 | 46 | 4.60% | 9.20% |
| $122,365 | 25 | 2.50% | 4.60% |
| $130,045 | 12 | 1.20% | 2.10% |
| $137,725 | 6 | 0.60% | 0.90% |
| $145,406 | 2 | 0.20% | 0.30% |
| $153,086 | 1 | 0.10% | 0.10% |
| + | 0 | 0.00% | 0.00% |
| Sum | 1000 | 100% | |

## Value at Risk

| Confidence Level | Residual Risk Threshold |
|---|---|
| 0.00% | $14,839 |
| 0.10% | $22,520 |
| 0.30% | $30,200 |
| 1.20% | $37,880 |
| 3.00% | $45,561 |
| 6.10% | $53,241 |
| 12.20% | $60,922 |
| 22.70% | $68,602 |
| 34.60% | $76,282 |
| 48.40% | $83,963 |
| 62.50% | $91,643 |
| 73.30% | $99,324 |
| 83.10% | $107,004 |
| 90.80% | $114,684 |
| 95.40% | $122,365 |
| 97.90% | $130,045 |
| 99.10% | $137,725 |
| 99.70% | $145,406 |
| 99.90% | $153,086 |
| 100.00% | + |

**Value at Risk**

Frequency / Residual Risk
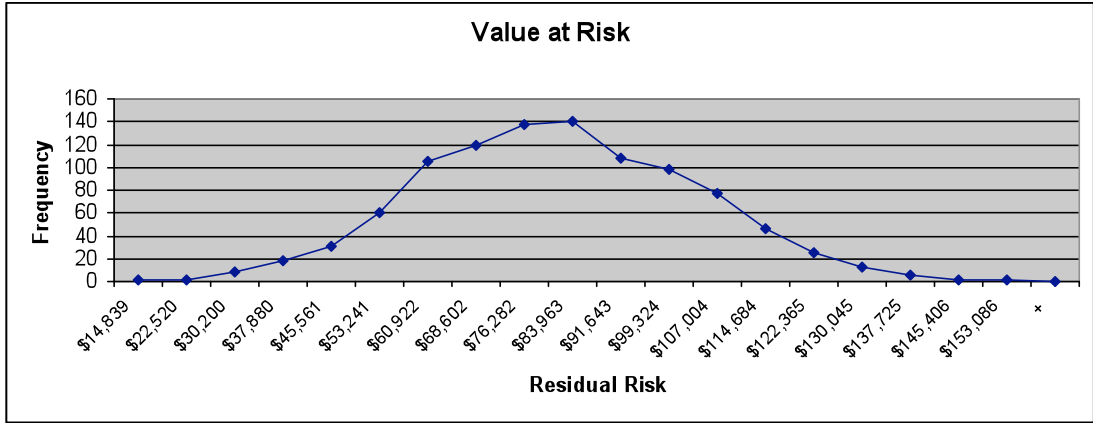
## Case study 3: Multinational insurance company project

| | |
|---|---|
| Annual turnover ($) | $10,000,000 |
| Number of employees | 100 |
| Number of computer users | 110 |
| IT employee salary ($) | $60,000 |
| Annual employee organizational cost ($) | $90,000 |
| IT employee cost per day ($) | $250.00 |

| Attack Categories | Attack Outcomes |
|---|---|
| Malicious Code Infections | Information Theft/Disclosure |
| Account Compromise | Information Modification |
| Theft | Information Destruction |
| Spam | Service Unavailable - User PC |
| Natural Disaster | Service Unavailable - Email |
| | Service Unavailable - Website |
| | Legal/Compliance Damage |

| Attack Categories | Attack Outcomes | Percentage |
|---|---|---|
| Malicious Code Infections | Information Theft/Disclosure | 5% |
| | Information Modification | 2% |
| | Information Destruction | 5% |
| | Service Unavailable - User PC | 20% |
| | Service Unavailable - Email | 30% |
| | Service Unavailable - Website | 2% |
| | Legal/Compliance Damage | 5% |
| | | |
| Account Compromise | Information Theft/Disclosure | 2% |
| | Information Modification | 5% |
| | Information Destruction | 5% |
| | Service Unavailable - User PC | 0% |
| | Service Unavailable - Email | 0% |
| | Service Unavailable - Website | 0% |
| | Legal/Compliance Damage | 20% |
| | | |
| Theft | Information Theft/Disclosure | 3% |
| | Information Modification | 0% |
| | Information Destruction | 2% |
| | Service Unavailable - User PC | 0% |
| | Service Unavailable - Email | 0% |
| | Service Unavailable - Website | 3% |
| | Legal/Compliance Damage | 5% |
| | | |
| Spam | Information Theft/Disclosure | 5% |
| | Information Modification | 0% |
| | Information Destruction | 0% |
| | Service Unavailable - User PC | 5% |
| | Service Unavailable - Email | 15% |
| | Service Unavailable - Website | 0% |
| | Legal/Compliance Damage | 0% |
| | | |
| Natural Disaster | Information Theft/Disclosure | 0% |
| | Information Modification | 0% |
| | Information Destruction | 20% |
| | Service Unavailable - User PC | 40% |
| | Service Unavailable - Email | 30% |
| | Service Unavailable - Website | 30% |
| | Legal/Compliance Damage | 0% |

| Attack Outcomes | Damage | | | | | Total | |
|---|---|---|---|---|---|---|---|
| | Diagnostic Effort | Reporting Effort | Repair Effort | PR/Reputation | Other Damage | Workdays | Nominal Damage |
| Information Theft/Disclosure | 1.00 | 0.20 | 1.00 | 0.30 | $0 | 2.50 | $625.00 |
| Information Modification | 2.50 | 0.50 | 2.00 | 0.10 | $0 | 5.10 | $1,275.00 |
| Information Destruction | 1.00 | 1.00 | 2.00 | 0.00 | $0 | 4.00 | $1,000.00 |
| Service Unavailable - User PC | 0.50 | 0.50 | 0.50 | 0.00 | $0 | 1.50 | $375.00 |
| Service Unavailable - Email | 0.20 | 0.10 | 1.00 | 0.10 | $0 | 1.40 | $350.00 |
| Service Unavailable - Website | 0.00 | 0.00 | 0.00 | 0.00 | $0 | 0.00 | $0.00 |
| Legal/Compliance Damage | 0.50 | 2.00 | 0.00 | 2.00 | $0 | 4.50 | $1,125.00 |

| Attack Outcomes | Attack Outcome Severity P100    P1000 | P10 | Nominal Loss per Attack Outcome | EL per Attack Outcome | Days of Work |
|---|---|---|---|---|---|
| Information Theft/Disclosure | 0.10 | 0.000 | 0.0000 | $625.00 | $1,187.50 | 4.75 |
| Information Modification | 0.05 | 0.000 | 0.0000 | $1,275.00 | $1,848.75 | 7.40 |
| Information Destruction | 0.30 | 0.000 | 0.0000 | $1,000.00 | $3,700.00 | 14.80 |
| Service Unavailable - User PC | 0.01 | 0.000 | 0.0000 | $375.00 | $408.75 | 1.64 |
| Service Unavailable - Email | 0.10 | 0.000 | 0.0000 | $350.00 | $665.00 | 2.66 |
| Service Unavailable - Website | 0.01 | 0.000 | 0.0000 | $0.00 | $0.00 | 0.00 |
| Legal/Compliance Damage | 0.10 | 0.000 | 0.0000 | $1,125.00 | $2,137.50 | 8.55 |

| Attacks | Number of Observed Attacks | Coverage (%) | Estimated Attacks per Year | Probability 50% lower | Probability 50% higher |
|---|---|---|---|---|---|
| Malicious Code Infections | 4 | 100% | 4 | 0 | 0 |
| Account Compromise | 1 | 100% | 1 | 0 | 0 |
| Theft | 1 | 100% | 1 | 0 | 0 |
| Spam | 5 | 100% | 5 | 0 | 0 |
| Natural Disaster | 0 | 100% | 0 | 0 | 0 |

| Attack Outcomes | Frequency |
|---|---|
| Information Theft/Disclosure | 1 |
| Information Modification | 0 |
| Information Destruction | 0 |
| Service Unavailable - User PC | 1 |
| Service Unavailable - Email | 2 |
| Service Unavailable - Website | 0 |
| Legal/Compliance Damage | 0 |

| Countermeasures | Cost |
|---|---|
| AntiVirus | $8,000 |
| Firewall | $10,000 |
| IDS | $10,000 |
| Training/Education | $5,000 |
| UPS | $10,000 |
| Server Room - Physical Security | $8,000 |
| Employee Monitoring | $5,000 |
| Active Directory | $10,000 |
| Backup Server | $15,000 |
| Spam Filtering | $10,000 |
| BCP/DR | $30,000 |

| Countermeasures | Malicious Code Infections | Account Compromise | Theft | Spam | Natural Disaster |
|---|---|---|---|---|---|
| AntiVirus | 95% | 0% | 0% | 0% | 0% |
| Firewall | 96% | 0% | 0% | 0% | 0% |
| IDS | 90% | 0% | 0% | 0% | 0% |
| Training/Education | 15% | 40% | 60% | 60% | 0% |
| UPS | 0% | 0% | 0% | 0% | 90% |
| Server Room - Physical Security | 0% | 0% | 90% | 0% | 0% |
| Employee Monitoring | 0% | 10% | 90% | 0% | 0% |
| Active Directory | 0% | 90% | 0% | 0% | 0% |
| Backup Server | 0% | 0% | 95% | 0% | 90% |
| Spam Filtering | 70% | 0% | 0% | 95% | 0% |
| BCP/DR | 0% | 0% | 90% | 0% | 90% |

| Attacks | Estimated Attacks per Year | Probability Countermeasures Fail | Total Number of Attacks without Countermeasures |
|---|---|---|---|
| Malicious Code Infections | 4 | 0.000 | 78,431 |
| Account Compromise | 1 | 0.054 | 19 |
| Theft | 1 | 0.000 | 50,000 |
| Spam | 5 | 0.020 | 250 |
| Natural Disaster | 0 | 0.001 | 0 |

| Attack Outcomes | Expected Loss per Attack | Number of Attack Outcomes | Expected Loss with Countermeasures | Number of Attack Outcomes without Countermeasures | Expected Loss without Countermeasures |
|---|---|---|---|---|---|
| Information Theft/Disclosure | $1,187.50 | 1 | $593.75 | 5434 | $6,453,396.31 |
| Information Modification | $1,848.75 | 0 | $240.34 | 1570 | $2,901,711.81 |
| Information Destruction | $3,700.00 | 0 | $999.00 | 4922 | $18,213,229.85 |
| Service Unavailable - User PC | $408.75 | 1 | $429.19 | 15699 | $6,416,874.08 |
| Service Unavailable - Email | $665.00 | 2 | $1,296.75 | 23567 | $15,671,996.32 |
| Service Unavailable - Website | $0.00 | 0 | $0.00 | 3069 | $0.00 |
| Legal/Compliance Damage | $2,137.50 | 0 | $961.88 | 6425 | $13,734,019.61 |
| Total | | | $4,520.90 | 60,686 | $63,391,227.98 |

| Attack | Resulting Attack Outcome | Percentage | Frequency |
|---|---|---|---|
| Malicious Code Infections | Information Theft/Disclosure | 5% | 3922 |
| | Information Modification | 2% | 1569 |
| | Information Destruction | 5% | 3922 |
| | Service Unavailable - User PC | 20% | 15686 |
| | Service Unavailable - Email | 30% | 23529 |
| | Service Unavailable - Website | 2% | 1569 |
| | Legal/Compliance Damage | 5% | 3922 |
| | | | |
| Account Compromise | Information Theft/Disclosure | 2% | 0 |
| | Information Modification | 5% | 1 |
| | Information Destruction | 5% | 1 |
| | Service Unavailable - User PC | 0% | 0 |
| | Service Unavailable - Email | 0% | 0 |
| | Service Unavailable - Website | 0% | 0 |
| | Legal/Compliance Damage | 20% | 4 |
| | | | |
| Theft | Information Theft/Disclosure | 3% | 1500 |
| | Information Modification | 0% | 0 |
| | Information Destruction | 2% | 1000 |
| | Service Unavailable - User PC | 0% | 0 |
| | Service Unavailable - Email | 0% | 0 |
| | Service Unavailable - Website | 3% | 1500 |
| | Legal/Compliance Damage | 5% | 2500 |
| | | | |
| Spam | Information Theft/Disclosure | 5% | 13 |
| | Information Modification | 0% | 0 |
| | Information Destruction | 0% | 0 |
| | Service Unavailable - User PC | 5% | 13 |
| | Service Unavailable - Email | 15% | 38 |
| | Service Unavailable - Website | 0% | 0 |
| | Legal/Compliance Damage | 0% | 0 |
| | | | |
| Natural Disaster | Information Theft/Disclosure | 0% | 0 |
| | Information Modification | 0% | 0 |
| | Information Destruction | 20% | 0 |
| | Service Unavailable - User PC | 40% | 0 |
| | Service Unavailable - Email | 30% | 0 |
| | Service Unavailable - Website | 30% | 0 |
| | Legal/Compliance Damage | 0% | 0 |

| Attack Outcomes | Expected Loss per Attack Outcome | Estimated Observed Attack Outcomes | Number of Attack Outcomes Prevented | Loss Avoided | Residual Expected Loss |
|---|---|---|---|---|---|
| Information Theft/Disclosure | $1,187.50 | 1 | 5434 | $6,452,803 | $594 |
| Information Modification | $1,848.75 | 0 | 1569 | $2,901,471 | $240 |
| Information Destruction | $3,700.00 | 0 | 4922 | $18,212,231 | $999 |
| Service Unavailable - User PC | $408.75 | 1 | 15698 | $6,416,445 | $429 |
| Service Unavailable - Email | $665.00 | 2 | 23565 | $15,670,700 | $1,297 |
| Service Unavailable - Website | $0.00 | 0 | 3069 | $0 | $0 |
| Legal/Compliance Damage | $2,137.50 | 0 | 6425 | $13,733,058 | $962 |
| | | | Total | $63,386,707 | $4,521 |

| | |
|---|---|
| Cost of Capital | 15% |
| Time t in Years (max. 5 yrs) | 3 |

| Countermeasures | Loss with Countermeasures in Place | Benefit | Net Benefit | Cost | ROI | Ongoing Cost | Current NPV | NPV with r and t |
|---|---|---|---|---|---|---|---|---|
| AntiVirus | $27,327,404 | $36,063,824 | $36,055,824 | $8,000 | 450698% | $10,000 | $36,057,024 | $82,298,595 |
| Firewall | $12,983,699 | $50,407,529 | $50,397,529 | $10,000 | 503975% | $20,000 | $50,399,029 | $115,037,964 |
| IDS | $16,134,169 | $47,257,059 | $47,247,059 | $10,000 | 472471% | $20,000 | $47,248,559 | $107,844,730 |
| Training/Education | $48,987,719 | $14,403,509 | $14,398,509 | $5,000 | 287970% | $5,000 | $14,399,259 | $32,866,634 |
| UPS | $63,391,228 | $0 | -$10,000 | $10,000 | -100% | $5,000 | -$8,500 | -$32,568 |
| Server Room - Physical Security | $53,648,728 | $9,742,500 | $9,734,500 | $8,000 | 121681% | $10,000 | $9,735,700 | $22,209,784 |
| Employee Monitoring | $53,647,379 | $9,743,849 | $9,738,849 | $5,000 | 194777% | $5,000 | $9,739,599 | $22,227,583 |
| Active Directory | $63,379,083 | $12,145 | $2,145 | $10,000 | 21% | $5,000 | $3,645 | -$4,839 |
| Backup Server | $53,107,478 | $10,283,750 | $10,268,750 | $15,000 | 68458% | $20,000 | $10,271,000 | $23,413,593 |
| Spam Filtering | $26,593,092 | $36,798,136 | $36,788,136 | $10,000 | 367881% | $20,000 | $36,789,636 | $83,964,656 |
| BCP/DR | $53,648,728 | $9,742,500 | $9,712,500 | $30,000 | 32375% | $30,000 | $9,717,000 | $22,125,411 |

| Attack Outcomes | Expected Loss per Attack | Estimated Attacks per Year | Nominal Loss per Attack | Loss Avoided | Residual Expected Loss |
|---|---|---|---|---|---|
| Information Theft/Disclosure | $1,187.50 | 1 | $625.00 | $6,452,803 | $594 |
| Information Modification | $1,848.75 | 0 | $1,275.00 | $2,901,471 | $240 |
| Information Destruction | $3,700.00 | 0 | $1,000.00 | $18,212,231 | $999 |
| Service Unavailable - User PC | $408.75 | 1 | $375.00 | $6,416,445 | $429 |
| Service Unavailable - Email | $665.00 | 2 | $350.00 | $15,670,700 | $1,297 |
| Service Unavailable - Website | $0.00 | 0 | $0.00 | $0 | $0 |
| Legal/Compliance Damage | $2,137.50 | 0 | $1,125.00 | $13,733,058 | $962 |
| | | | Total | $63,386,707 | $4,521 |

| Data | Value |
|---|---|
| IT employee cost per day ($) | $250.00 |
| Attack Severity (increase/decrease) | 100% |
| Estimated attacks per year (increase/decrease) | 100% |
| Attack frequency estimation accuracy | 100% |

Calculations

| Value | Frequency | Probability | Cumulative probability |
|---|---|---|---|
| $1,711 | 1 | 0.10% | 100.00% |
| $2,042 | 3 | 0.30% | 99.90% |
| $2,372 | 6 | 0.60% | 99.60% |
| $2,702 | 8 | 0.80% | 99.00% |
| $3,032 | 30 | 3.00% | 98.20% |
| $3,362 | 46 | 4.60% | 95.20% |
| $3,692 | 77 | 7.70% | 90.60% |
| $4,023 | 134 | 13.40% | 82.90% |
| $4,353 | 133 | 13.30% | 69.50% |
| $4,683 | 135 | 13.50% | 56.20% |
| $5,013 | 126 | 12.60% | 42.70% |
| $5,343 | 134 | 13.40% | 30.10% |
| $5,673 | 70 | 7.00% | 16.70% |
| $6,004 | 47 | 4.70% | 9.70% |
| $6,334 | 29 | 2.90% | 5.00% |
| $6,664 | 12 | 1.20% | 2.10% |
| $6,994 | 7 | 0.70% | 0.90% |
| $7,324 | 1 | 0.10% | 0.20% |
| $7,654 | 1 | 0.10% | 0.10% |
| + | 0 | 0.00% | 0.00% |
| Sum | 1000 | 100% | |

### Value at Risk

| Confidence Level | Residual Risk Threshold |
|---|---|
| 0.00% | $1,711 |
| 0.10% | $2,042 |
| 0.40% | $2,372 |
| 1.00% | $2,702 |
| 1.80% | $3,032 |
| 4.80% | $3,362 |
| 9.40% | $3,692 |
| 17.10% | $4,023 |
| 30.50% | $4,353 |
| 43.80% | $4,683 |
| 57.30% | $5,013 |
| 69.90% | $5,343 |
| 83.30% | $5,673 |
| 90.30% | $6,004 |
| 95.00% | $6,334 |
| 97.90% | $6,664 |
| 99.10% | $6,994 |
| 99.80% | $7,324 |
| 99.90% | $7,654 |
| 100.00% | + |