D18 Investments - Solutions

1

a Intangible investment
b Fixed or expansion investment
c Financial investment
d Fixed or expansion investment
e Fixed or replacement investment
f Intangible investment
g Intangible investment
h Fixed or rationalization investment

2

a Cost comparison:

Annual interest on average committed capital = $[(I + L) / 2] \cdot i$
A: $[(1{,}000 + 0) / 2] \cdot 0.08 = 40$
B: $[(1{,}800 + 0) / 2] \cdot 0.08 = 72$

Annual depreciation (d) = I / n
A: 1,000 / 4 = 250
B: 1,800 / 6 = 300

Cost comparison	Chairlift A		Chairlift B	
Annual operating costs	CHF	500	CHF	400
+ Annual interest on comm.cap.	CHF	40	CHF	72
+ Annual depreciation	CHF	250	CHF	300
= Total annual costs	CHF	790	**CHF**	**772**

Chairlift B would be more advantageous, as it costs less than chairlift A.

b

Cost comparison	Chairlift A		Chairlift B	
Annual operating costs	CHF	500	CHF	400
+ Annual interest on comm.cap.	CHF	75	CHF	135
+ Annual depreciation	CHF	250	CHF	300
= Total annual costs	**CHF**	**825**	CHF	835

Based on cost considerations, the ski area would select chairlift A, because it is less expensive.

c The cost comparison takes into account the imputed interest in the form of costs. The amount of imputed interest rate is an assumption (estimate) and is therefore subject to some uncertainties and unknowns. If the reality does not match the assumptions in the model, the result can be distortions of the decision-making basis in investment planning. The example, therefore, well shows the uncertainty of planning.

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d Advantage: Easy to use
Disadvantage: A comparison of assets with different revenues is not possible because they are not included in the calculation.

3

a Cost and profit comparison:
Annual interest on average committed capital = [(I + L) / 2] · i
Woodchip system: (2,500 + 0) / 2 · 0.08 = 100
Heating-oil system: (2,000 + 0) / 2 · 0.08 = 80

Annual depreciation = I / n
Woodchip system: 2,500 / 20 = 125
Heating-oil system: 2,000 / 18 = 111

Cost comparison	**Woodchip system**		**Oil system:**	
Annual operating costs	CHF	500	CHF	400
+ Annual interest on comm.cap.	CHF	100	CHF	80
+ Annual depreciation	CHF	125	CHF	111
= Total annual costs	CHF	725	**CHF**	**591**

On the basis of a cost comparison, the oil system must be preferred.

Profit comparison	**Woodchip system**		**Oil system**	
Annual revenue	CHF	1 050	CHF	870
– Annual operating costs	CHF	500	CHF	400
– Annual interest on comm.cap.	CHF	100	CHF	80
– Annual depreciation	CHF	125	CHF	111
= Total annual costs	**CHF**	**325**	CHF	279

On the basis of a profit comparison, the woodchip system is preferable.

b
- CO_2 issue (consider emissions)
- Quality of service and maintenance
- Security of supply
- Susceptibility to interference
- Warranty
- etc.

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c Individual solutions (depending on the choice and weighting of criteria). Suggestion:

		Woodchip system		Heating-oil system	
Criteria	Weighting W	Points P	Product = W · P	Points P	Product = W · P
CO_2	40	5	200	2	80
Low tendency to fail	30	4	120	3	90
Service and maintenance	20	3	60	3	60
Security of supply	10	3	30	4	40
Total	100		**410**		270
Ranking			**1**		2

Recommendation to the board with reference to the inclusion of quantitative and qualitative data in the calculation: The profit comparison method and cost-benefit analysis speak for a woodchip system.

4

	Year 1	Year 2	Year 3	Average/year
Profit	CHF 260,000	CHF 220,000	CHF 180,000	CHF 220,000[1]
Avg. comm.cap.	CHF 5,000,000	CHF 5,000,000	CHF 5,000,000	CHF 5,000,000[2]
Avg. profitability	**5.2%**	**4.4%**	**3.6%**	**4.4%**[3]

[1] Average profit per year: Sum of the profits / number of years = 660,000 / 3 = 220,000
[2] Average committed capital per year: (I + L) / 2 = (10,000,000 + 0) / 2 = 5,000,000
[3] Average profitability: Avg. profit / Avg. comm.cap. = 220,000 / 5,000,000 = 0.044

5

a

Payback period (in CHF)	Project X	Project Y
Investment amount (I)	360,000	390,000
Annual profit (P)	80,000	140,000
Annual depreciation (d)[1]	30,000	30,000
Payback period (PB)[2]	**3.3 years**	**2.3 years**

[1] Annual depreciation: d = I / u
[2] Payback period: PB = I / (P + d)

b Based on the calculation of the payback period, the enterprise will decide for project Y because it takes less time for the invested amount of money to be fully covered by cash flows (2.3 years compared to 3.3 years for project X).

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a

Payback period	Packaging machine (in CHF)
Investment amount (I)	80'000
	+ 10'000
	= 90'000
Benefit (B)	48'000
	– 12'000
	= 36'000
Payback period (I/B)	**2.5 years**

b The additional costs for the purchase and installation of packaging machine are compensated for by the savings after 2.5 years. The packaging machine has a useful life of 10 years, so CHF 36,000 can be saved annually in the remaining 7.5 years.

c Social aspects: employees made redundant
Ecological aspects: environmental friendliness of the machine, noise pollution

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a
- Fixed investment
- Replacement investment
- Expansion investment
- Rationalization investment

b

Year	Cash flow (Benefit) in CHF	Total (cum.) in CHF
1	100,000	100,000
2	150,000	250,000
3	170,000	420,000
	100,000	**520,000**
5	160,000	680,000
6	160,000	840,000
…		

Investment amount (I) = purchase price + transportation and installation costs
= 450,000 + 70,000
= 520,000

According to the table, the payback period is 4 years.

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a

Z_t = CHF 1
i = 10%
t = 1 year
$PV = Z_0 = Z_t / (1 + i)^t$

Time (t)	Discount rate $= 1 / (1+0.1)^t$	$PV = Z_0 = Z_t \cdot 1 / (1 + 0.1)^t$
1 year	0.909	CHF 0.909
5 years	0.621	CHF 0.621
10 years	0.386	CHF 0.386
15 years	0.239	CHF 0.239
20 years	0.149	CHF 0.149
25 years	0.092	CHF 0.092

General statement: The present value of a unit of money decreases as the point at which the value is received moves further into the future.

b

Z_t = CHF 1
t = 4 years
$PV = Z_0 = Z_t / (1 + i)^t = 1 / (1 + i)^t$

Interest rate (i)	Discount rate $= 1 / (1+i)^4$	$PV = Z_0 = Z_t \cdot 1 / (1 + i)^4$
4%	0.855	CHF 0.855
10%	0.683	CHF 0.683
20%	0.482	CHF 0.482
30%	0.350	CHF 0.350
40%	0.260	CHF 0.260

General statement: The greater the chosen interest rate, the smaller the present value.

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a

Model A

Year	Amount Z_t	Discount rate $= 1 / (1+0.1)^t$	$PV = Z_0 = Z_t \cdot 1 / (1 + i)^t$
t_0	CHF –8,000	1.0	CHF –8,000
t_1	CHF 3,500	0.983	CHF 3,125
t_2	CHF 3,800	0.797	CHF 3,029
t_3	CHF 3,900	0.712	CHF 2,776
t_4	CHF 4,000	0.636	CHF 2,542
NPV			CHF **3,472**

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Model B

Year	Amount Z_t	Discount rate $= 1 / (1+0.1)^t$	PV = Z_0 = $Z_t \cdot 1 / (1 + i)^t$
t_0	CHF –10,000	1.0	CHF –10,000
t_1	CHF 4,000	0.983	CHF 3,571
t_2	CHF 4,100	0.797	CHF 3,268
t_3	CHF 4,100	0.712	CHF 2,918
t_4	CHF 4,200	0.636	CHF 2,669
NPV			CHF **2,426**

Model A has an NPV that is CHF 1,046 greater. Simone and Gabriel should buy Model A.

b

Model A

Year	Amount Z_t	Discount rate $= 1 / (1+0.1)^t$	PV = Z_0 = $Z_t \cdot 1 / (1 + i)^t$
t_0	CHF –8,000	1.0	CHF –8,000
t_1	CHF 3,500	0.983	CHF 3,125
t_2	CHF 3,800	0.797	CHF 3,029
t_3	CHF 3,900	0.712	CHF 2,776
t_4	CHF 4,000	0.636	CHF 2,542
L	CHF 1,000	0.636	CHF 636
NPV			CHF **4,108**

Model B

Year	Amount Z_t	Discount rate $= 1 / (1+0.1)^t$	PV = Z_0 = $Z_t \cdot 1 / (1 + i)^t$
t_0	CHF –10,000	1.0	CHF –10,000
t_1	CHF 4,000	0.983	CHF 3,571
t_2	CHF 4,100	0.797	CHF 3,268
t_3	CHF 4,100	0.712	CHF 2,918
t_4	CHF 4,200	0.636	CHF 2,669
L	CHF 1,800	0.636	CHF 1,144
NPV			CHF **3,570**

L: Liquidation proceeds at the end of the useful life

Model A now has an NPV that is CHF 538 higher, making it preferable to Model B.

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$$
\begin{aligned}
\text{NVP } (= 0) &= (R_1 - E_1) / (1 + i)^1 - I_0 \\
0 &= (18{,}000 - 2{,}000) / (1 + i)^1 - 15{,}000 \\
15{,}000 &= 16{,}000 / (1 + i)^1 \\
(1+i)^1 &= 16{,}000 / 15{,}000 \\
i &= 0.0667 \\
i &= 6.7\%
\end{aligned}
$$

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