

Recent developments in



Sustainability analysis

Jaap Gordijn

VUA Free University Amsterdam (NL)

Contact: jaap@e3value.com

© www.e3value.com

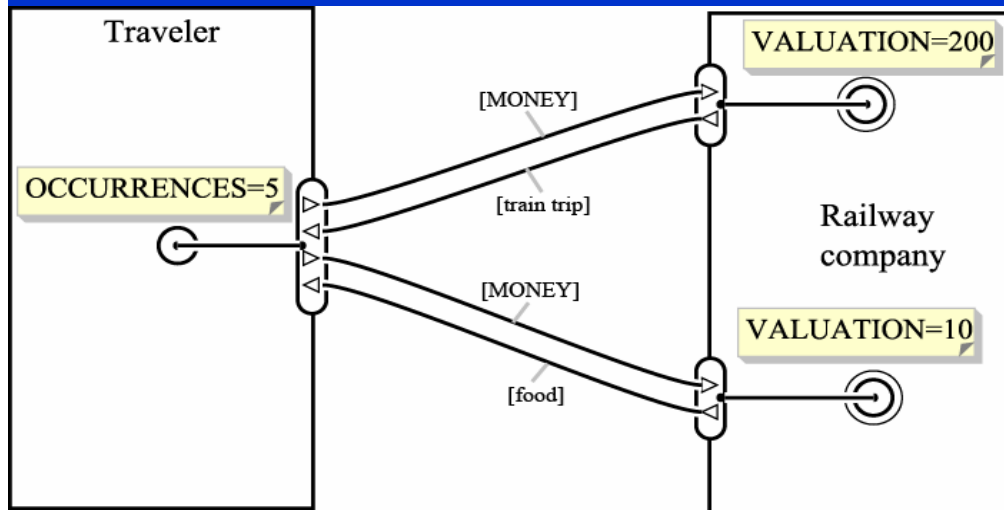
Take-home message ...

- **Sustainability assessment** in *e³value* consists of:
 - Calculation of **net value sheets** to create a baseline-understanding of profitability
 - Taking into account **multiple time periods**; for each period one value model is needed
 - Doing a **sensitivity analysis** because everything is an **estimate**

Sustainability analysis is about ...

- Understanding, if, and under what conditions, **enterprises** in value constellation are capable of **generating a positive net cash flow on the long term**, as a result of their participation in the constellation
- Techniques:
 - **Discounted Net Present Value Flow calculation**
 - **Scenario-based sensitivity analysis**
- Assumption in *e³value*: in a **network** creating a **joint** proposition, **all actors** should be able to generate a positive net value flow

First, an **educational** example



Steps:

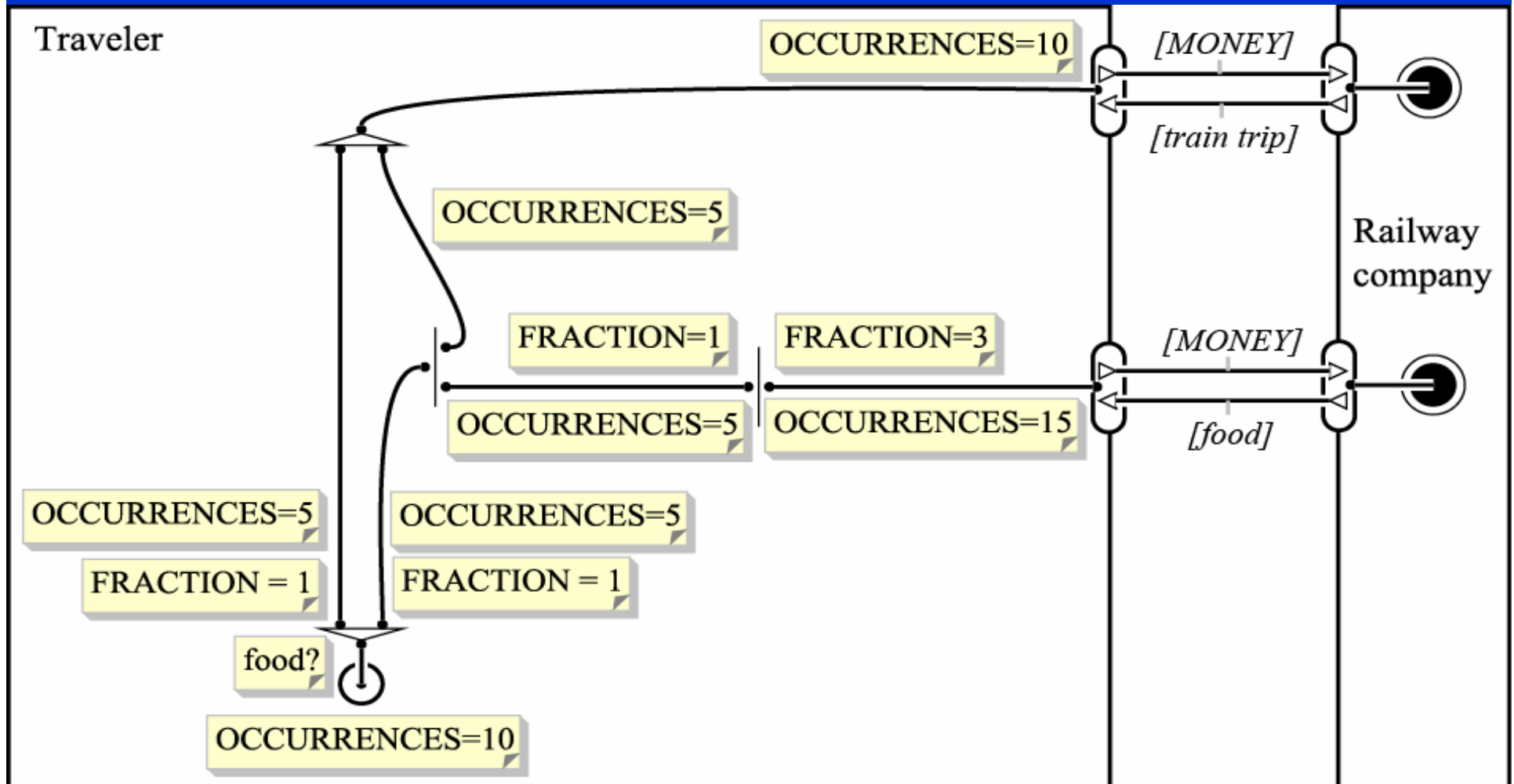
1. Count # value transfers
2. Value the objects transferred, for all interfaces: ingoing objects – outgoing objects, Sum up all interfaces per actor

TABLE 6.1: Net value flow sheet for the 'railway company'

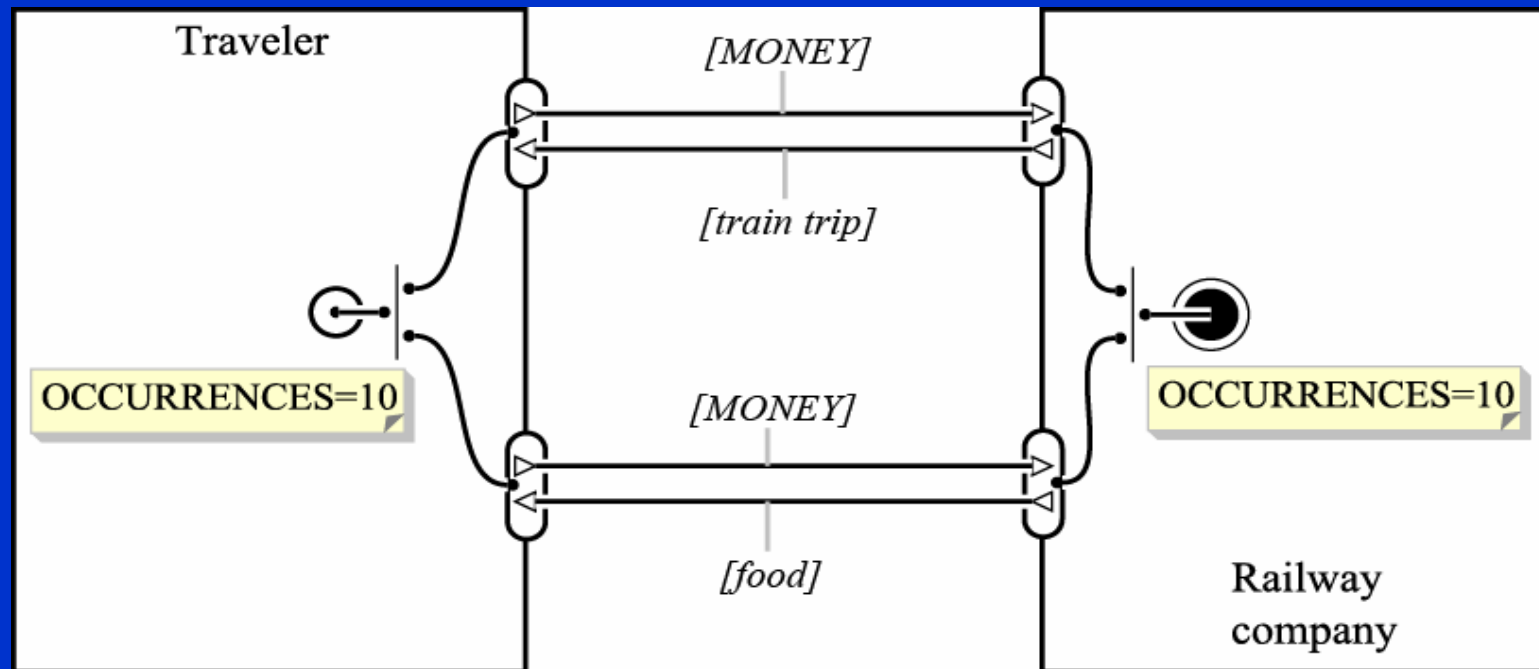
Interface	Port	Transfer	Occurrences	Valuation	Value	Total
food,MONEY			5		50	
	out: food	(all transfers)	5	0	0	
	in: MONEY	MONEY	5	10	50	
MONEY,train trip			5		1 K	
	in: MONEY	MONEY	5	200	1 K	
	out: train trip	(all transfers)	5	0	0	
total for actor						1.05 K

1. Counting value transfers:

Needs, OR/AND forks, OR join, Implosion
Explosion, Interface, Boundaries



1. Counting value transfers: **AND join**



1. OR constructions via **interfaces** and **transactions**

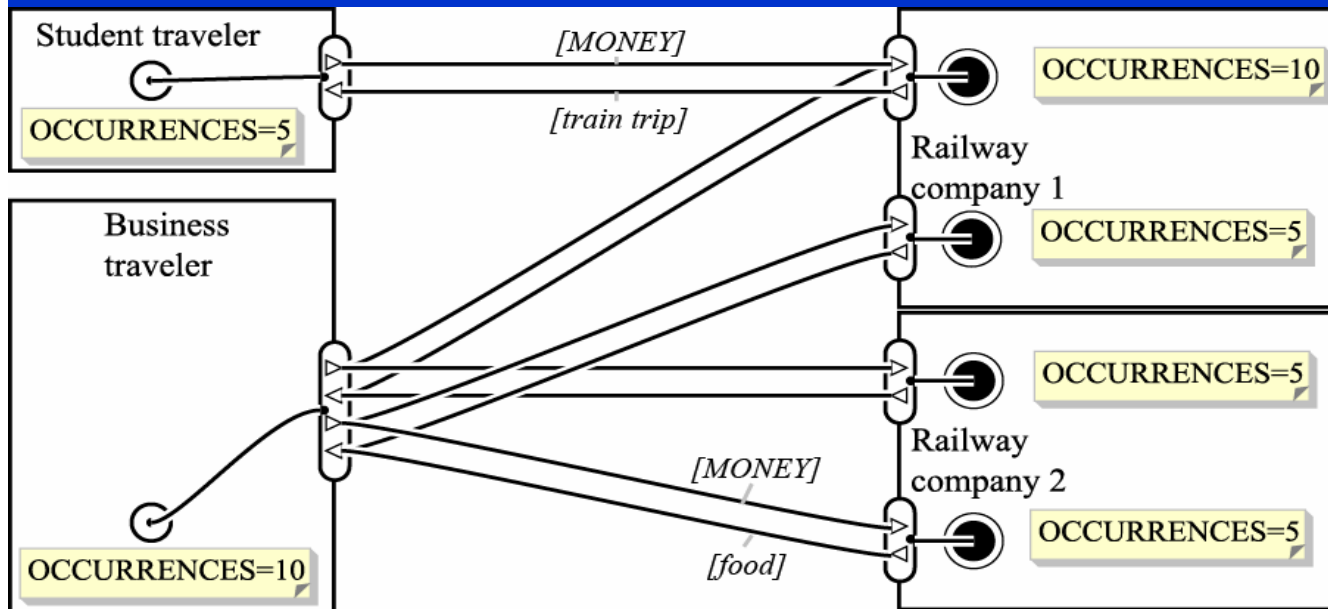
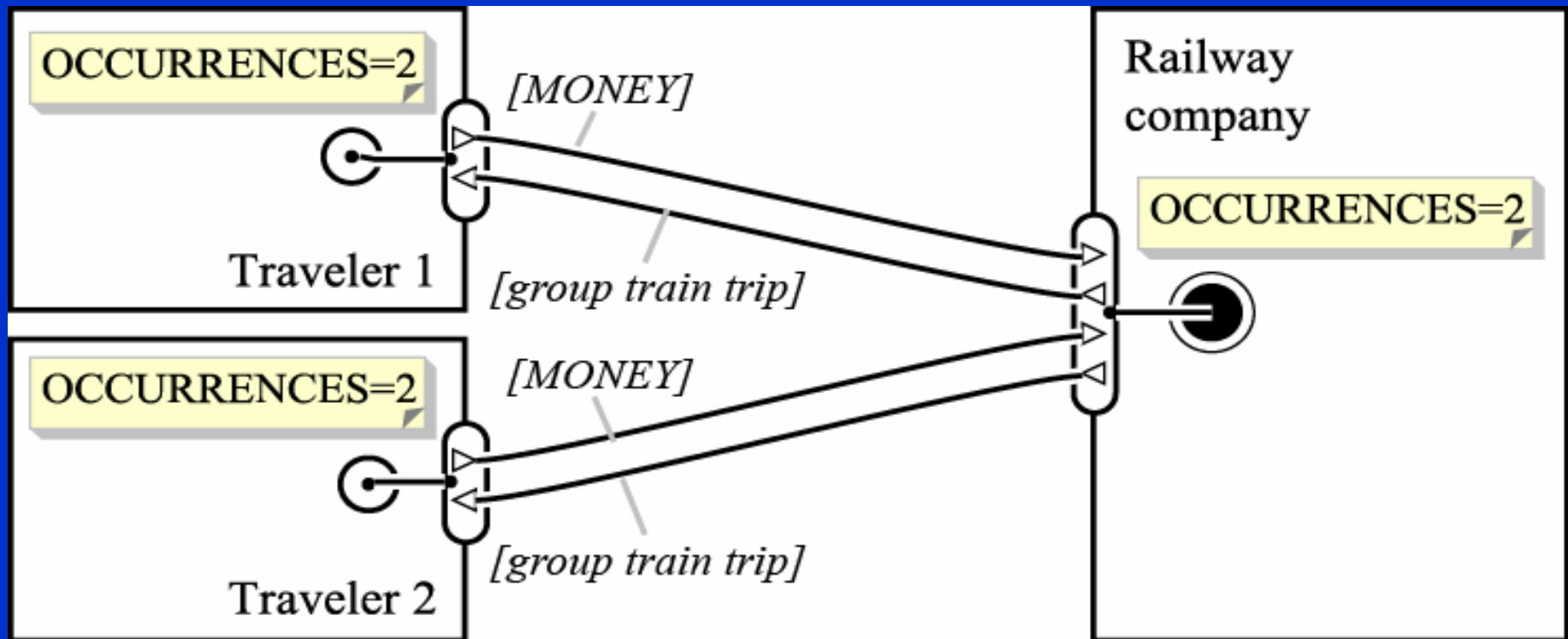


TABLE 6.4: Value transactions for figure 6.4.

<i>Value transaction</i>	<i>Fraction</i>	<i>Value transfer</i>	<i>Actor</i>	<i>Actor</i>
1	1	'train trip'	'business traveler'	'railway company 1'
		'money'	'business traveler'	'railway company 1'
		'food'	'business traveler'	'railway company 1'
		'money'	'business traveler'	'railway company 1'
2	1	'train trip'	'business traveler'	'railway company 2'
		'money'	'business traveler'	'railway company 2'
		'food'	'business traveler'	'railway company 2'
		'money'	'business traveler'	'railway company 2'
3	1	'train trip'	'student traveler'	'railway company 1'
		'money'	'student traveler'	'railway company 1'

1. AND constructions via **interfaces** and **transactions**



2. Valuation

Money versus non-money

- Assigning **valuation formulas** to value ports or value transfers, transferring **value objects**
- Two different **types** of value objects:
 - **Money objects**: the **amount** transferred can be **objectively stated** and observed, so **no disagreement**
 - **Non-money objects**: everything else; the value is **subjective**, actors can **disagree** about the amount of value (in terms of economic units), they assign to it.
- Valuation formulas can be **arithmetic expressions** (with the ability to use properties of modeling constructs); for the coming slides we use just constants

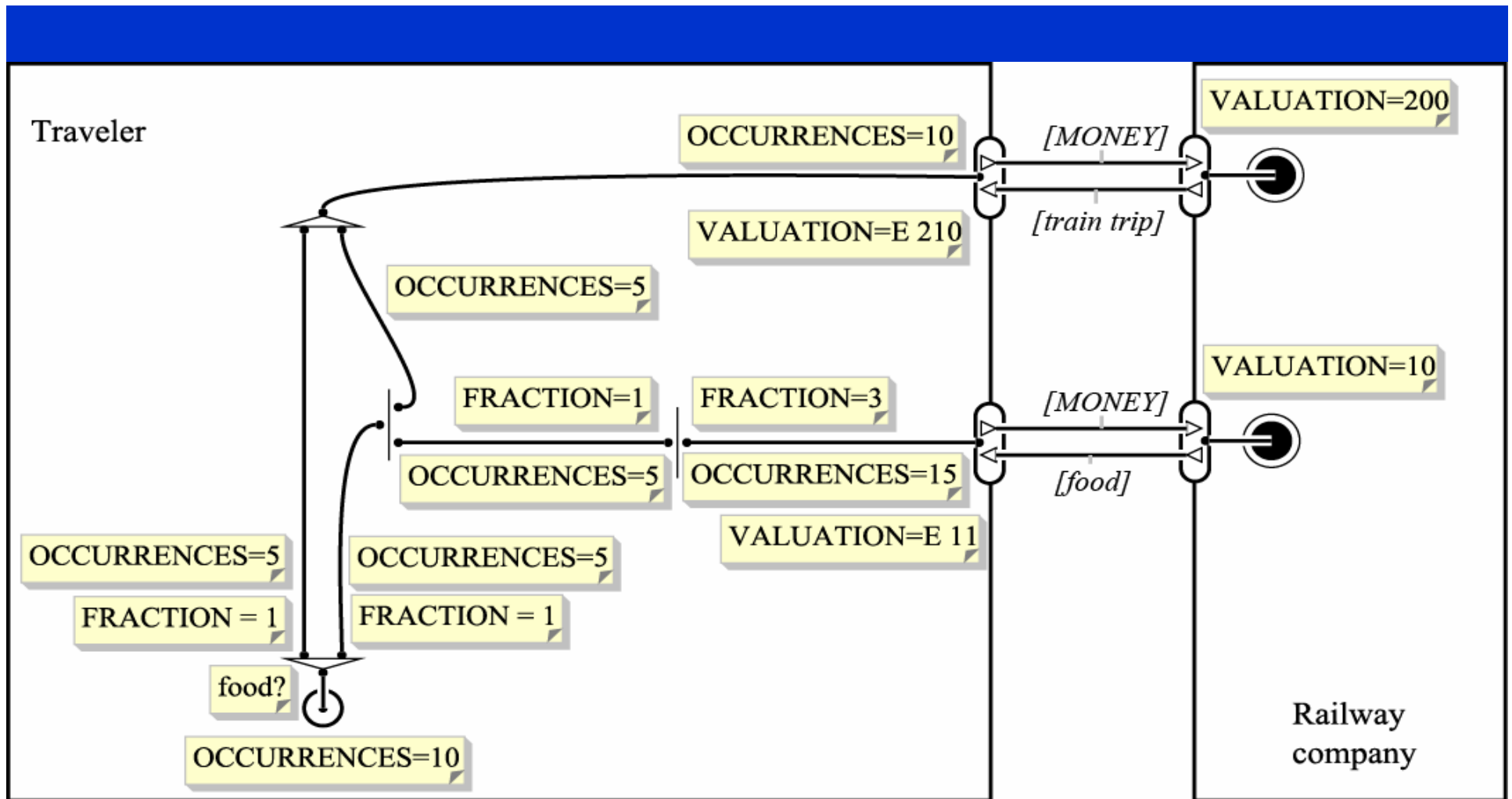


TABLE 6.5: Net value flow sheet for the 'railway company'

Interface	Port	Transfer	Occurrences	Valuation	Value	Total
train trip,MONEY			10		2 K	
	out: train trip	(all transfers)	10	0	0	
	in: MONEY	MONEY	10	200	2 K	
food,MONEY			15		150	
	out: food	(all transfers)	15	0	0	
	in: MONEY	MONEY	15	10	150	
total for actor						2.15 K

2. Valuation: **Assigning valuation formulas for money objects**

e³value looks for valuation formulas in the following order **decreasing priority**:

1. To the **transfer** connecting two ports: pricing is a **negotiation**
2. To the **port requesting** a money object: pricing is determined by the **supplier**
3. To the **port offering** a money object: pricing is determined by the **consumer**

2. Valuation

Transfers and requesting ports, money objects

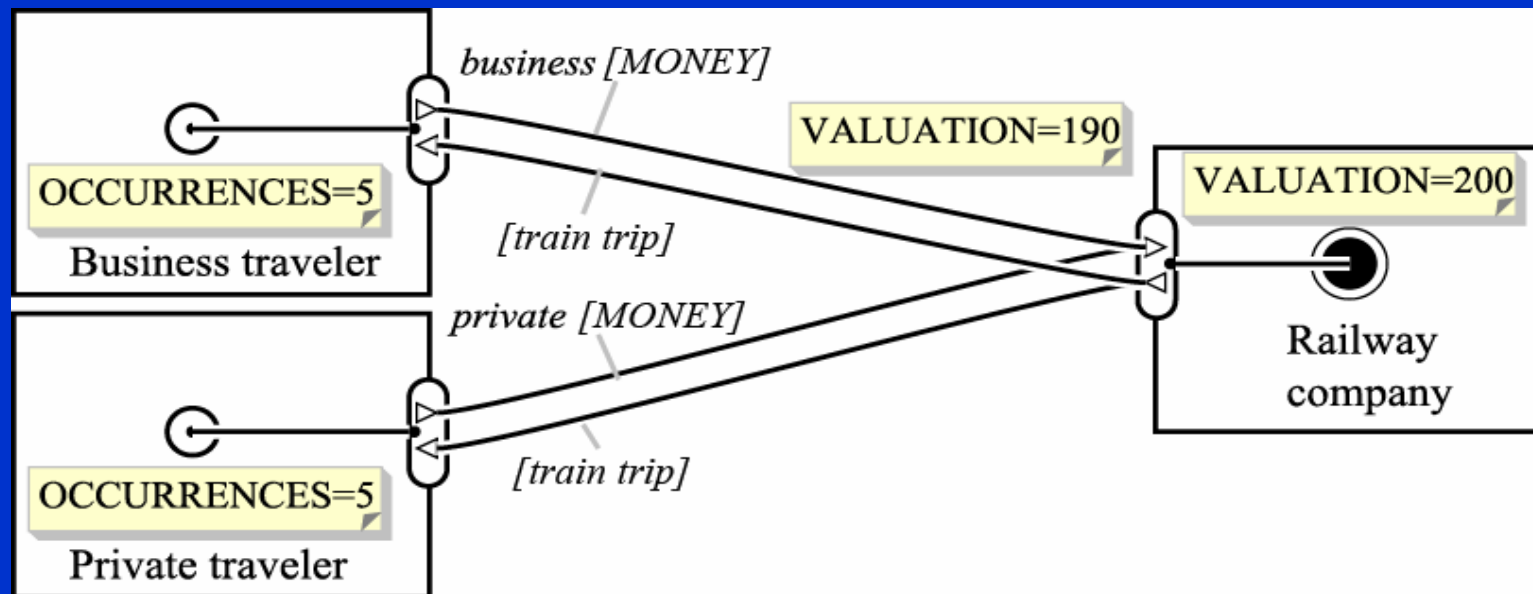


TABLE 6.6: Net value flow sheet for the 'railway company'

Interface	Port	Transfer	Occurrences	Valuation	Value	Total
train trip,MONEY			10		1.95 K	
	out: train trip	(all transfers)	10	0	0	
	in: MONEY	private:MONEY	5	200	1 K	
	in: MONEY	business:MONEY	5	190	950	
total for actor						1.95 K

2. Valuation

Transfers and offering ports, money objects

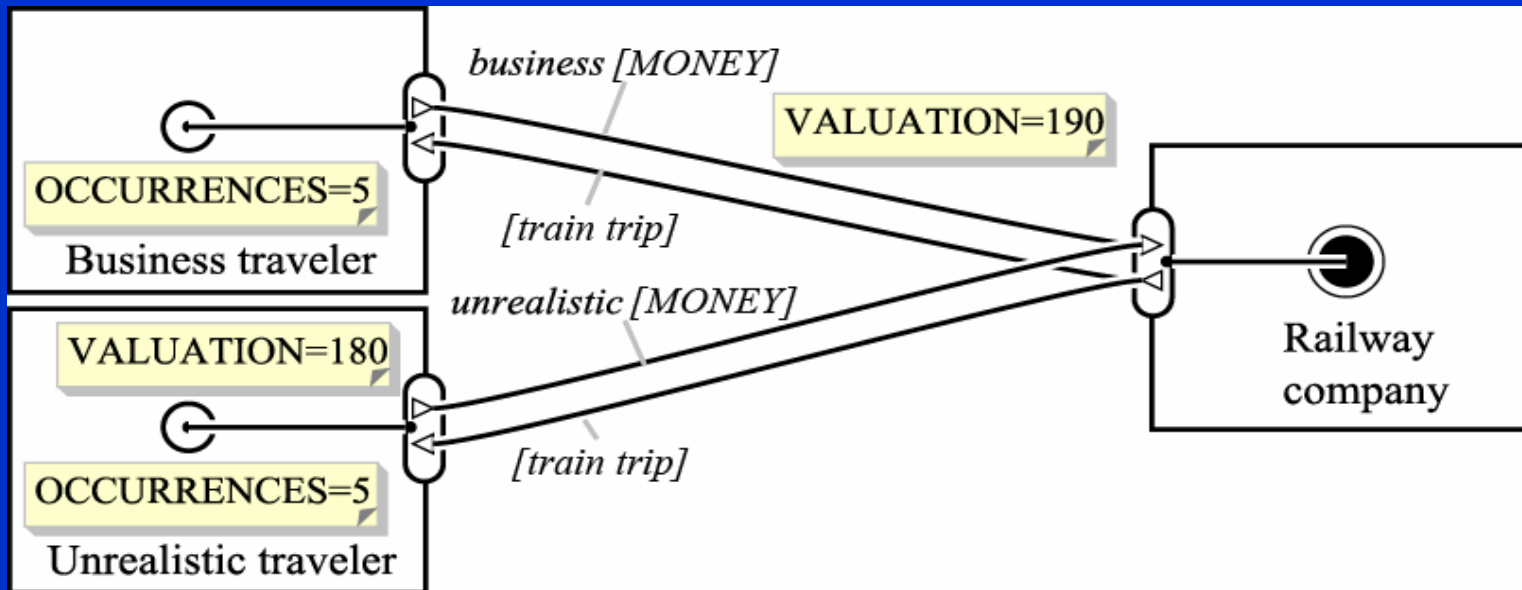


TABLE 6.7: Net value flow sheet for the 'railway company'

Interface	Port	Transfer	Occurrences	Valuation	Value	Total
MONEY,train trip			10		1.85 K	
	in: MONEY	business:MONEY	5	190	950	
	in: MONEY	unrealistic:MONEY	5	180	900	
	out: train trip	(all transfers)	10	0	0	
total for actor						1.85 K

2. Valuation: **Assigning valuation formulas for non-money objects**

- We consider them only for **final customers, not enterprises** (assumption: all non-money objects flowing in an enterprise also flow out)
- Valuation formulas can be **only be assigned to ports** (of actors transferring the objects)

2. Valuation: non-money objects, example

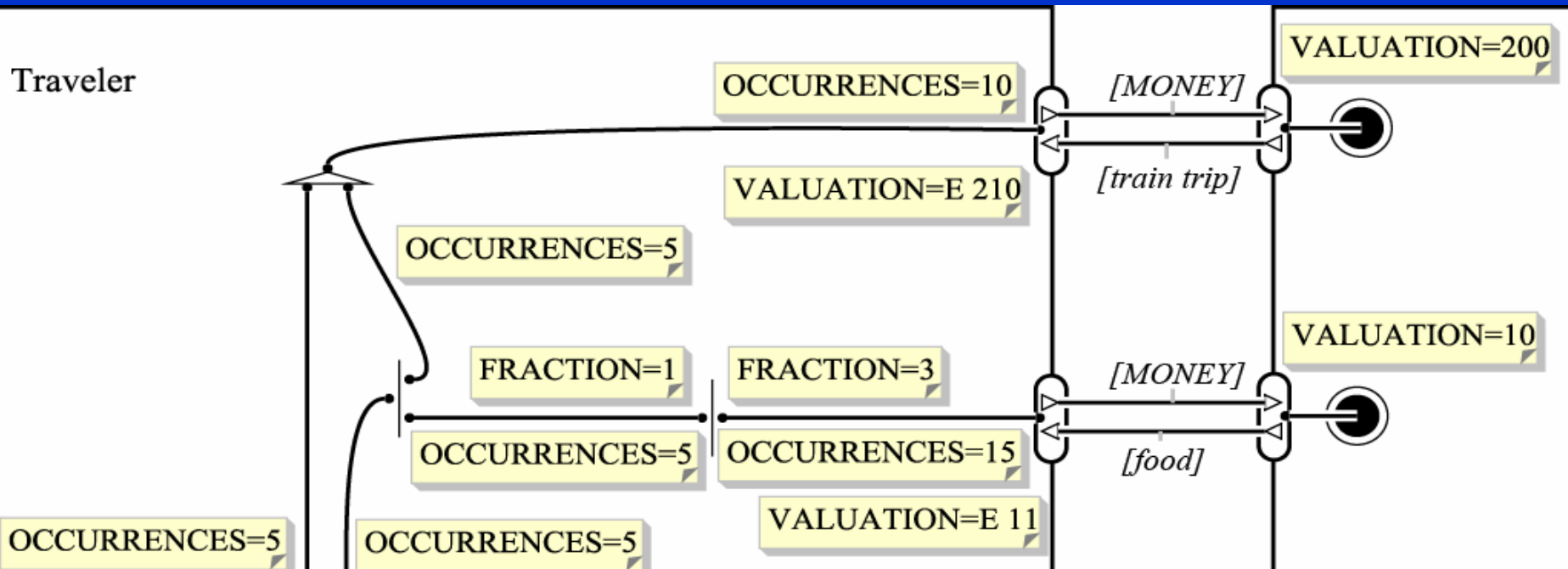


TABLE 6.8: Net value flow sheet for the 'traveler'

Interface	Port	Transfer	Occurrences	Valuation	Value	Total
food,MONEY			15		15	
	in: food	(all transfers)	15	11	165	
	out: MONEY	MONEY	15	10	-150	
train trip,MONEY			10		100	
	in: train trip	(all transfers)	10	210	2.1 K	
	out: MONEY	MONEY	10	200	-2 K	
total for actor						115

2. Market segments

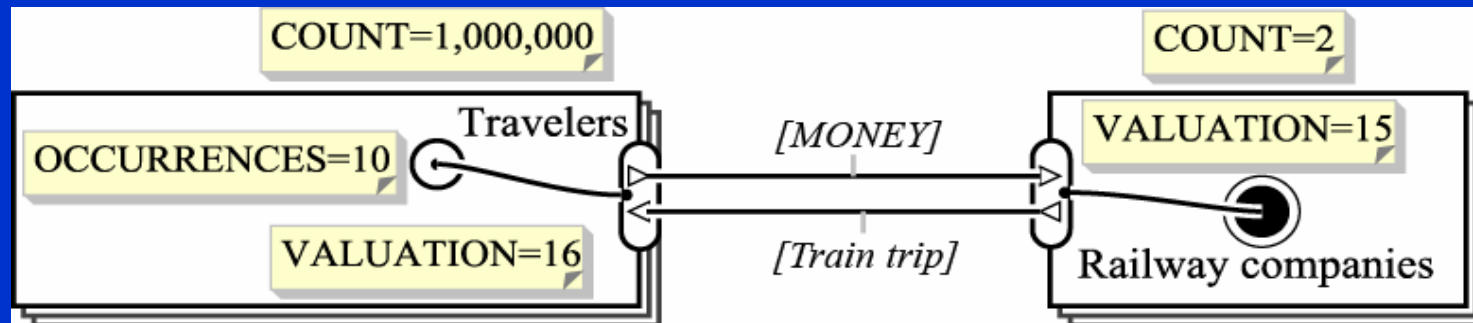


TABLE 6.9: Net value flow sheet for the 'traveler' as a market segment

Interface	Port	Transfer	Occurrences	Valuation	Value	Total
Train trip, MONEY			10		10	
	in: Train trip	(all transfers)	10	16	160	
	out: MONEY	MONEY	10	15	-150	
COUNT	1 M					
total for actor						10

TABLE 6.10: Net value flow sheet for the 'railway company' as a market segment

Interface	Port	Transfer	Occurrences	Valuation	Value	Total
MONEY, Train trip			5 M		75 M	
	in: MONEY	MONEY	5 M	15	75 M	
	out: Train trip	(all transfers)	5 M	0	0	
COUNT	2					
total for actor						75 M

2. Taking **investments** into account

- Upfront, **one time** expenses

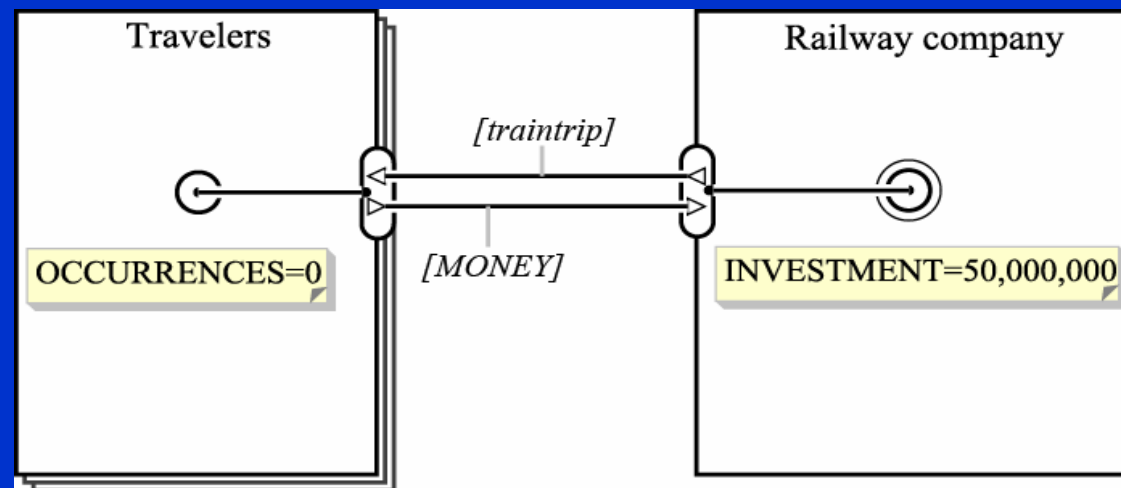


TABLE 6.11: Net value flow sheet for the 'railway company'

Interface	Port	Transfer	Occurrences	Valuation	Value	Total
MONEY,traintrip			0		0	
	in: MONEY	MONEY	0	200	0	
	out: traintrip	(all transfers)	0	0	0	
INVESTMENT					50 M	
EXPENSES					0	
total for actor						-50 M

2. And **expenses**

- **Fixed** expenses: independent from transaction volume, so **assigned to actors, activities, or market segments**
- **Variable** expenses: directly related to transaction volume, so **assigned to ports of actors/activities/segments** carrying the ports

2. Expenses example

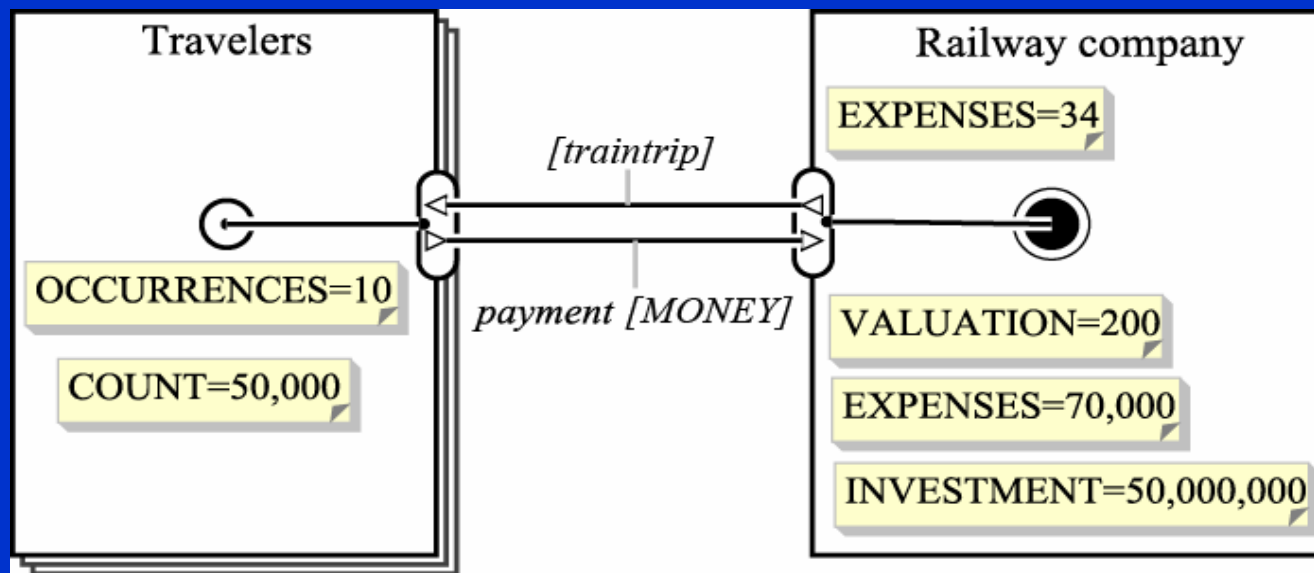


TABLE 7.1: Net value flow sheet for the 'railway company'

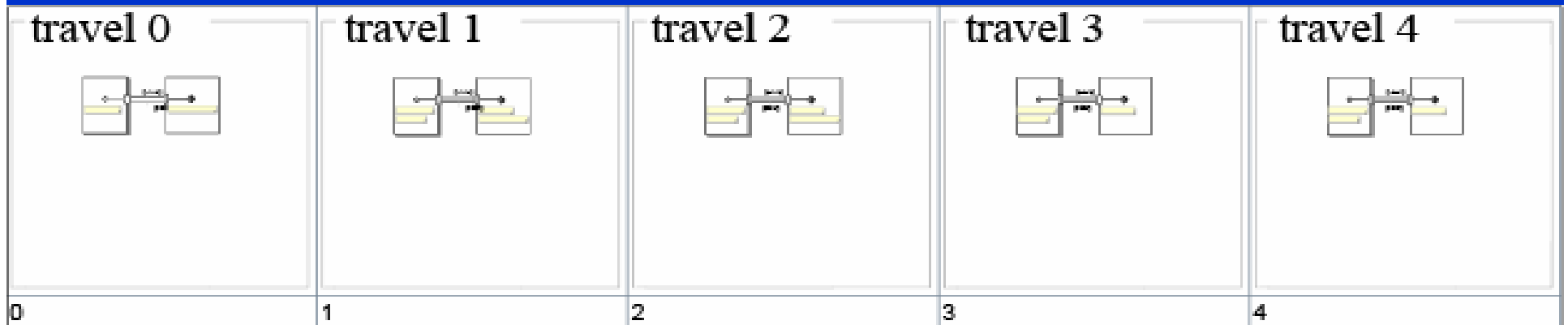
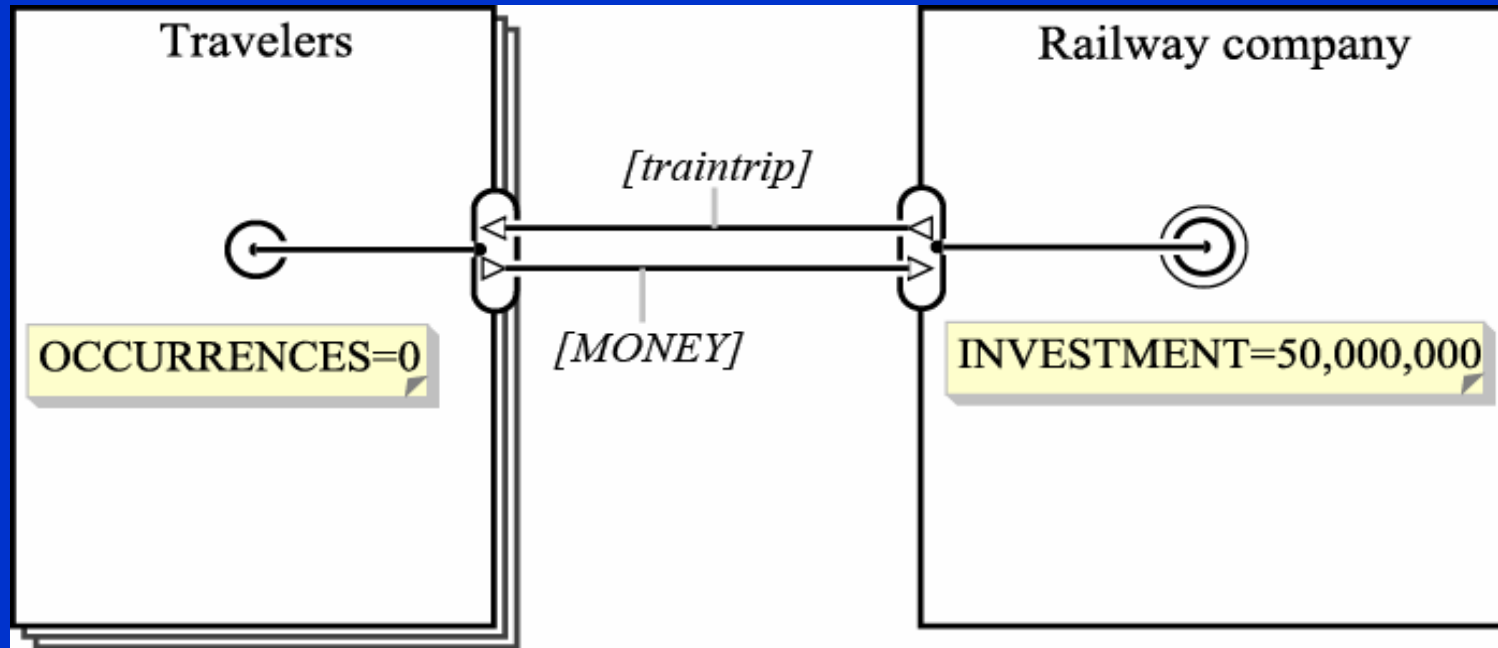
Interface	Port	Transfer	Occurrences	Valuation	Value	Total
traintrip,MONEY			500 K		83 M	
	out: traintrip	(all transfers)	500 K	0.00	0.00	
	out: traintrip	(EXPENSES)	500 K	34.00	-17 M	
	in: MONEY	MONEY	500 K	200.00	100 M	
INVESTMENT					50 M	
EXPENSES					70 K	
total for actor						32.930 M

Sustainability is **more than one time-period ...**

- An *e³value* model describes value flows for a **specific time period** (day, month, year)
- Typically, you need **more than one time-period** to earn-back investments
- This is why we have developed *e³timeseries*

e³timeseries

A **time-sequence** of value models



e³timeseries

Representing **evolution** of a networked value constellation

- Value models in a **time-sequence** may be different with respect to:
 - **Number of consumer needs** (increase/decrease in demand)
 - **Actors participating** (actors entering and leaving the constellation)
 - **Valuation formulas** (price increases)
 - (overall structure)

e³timeseries

Discounted net value flow calculation

TABLE 6.15: Net value flow sheet for the 'railway company': discounted net value flow sheet for the 'railway company'

Interface	Port	Transfer	Occurrences	Valuation	Value	Total
Period 0						
Interface	Port	Transfer	Occurrences	Valuation	Value	Total
traintrip,MONEY			0		0.00	
	out: traintrip	(all transfers)	0	0	0.00	
	in: MONEY	MONEY	0	200	0.00	
INVESTMENT					50 M	
total for actor						-50 M
Period 1						
Interface	Port	Transfer	Occurrences	Valuation	Value	Total
MONEY,traintrip			500 K		100 M	
	in: MONEY	MONEY	500 K	200	100 M	
	out: traintrip	(all transfers)	500 K	0	0.00	
total for actor						100 M
Period 2						
Interface	Port	Transfer	Occurrences	Valuation	Value	Total
MONEY,traintrip			600,000		120 M	
	in: MONEY	MONEY	600 K	200	120 M	
	out: traintrip	(all transfers)	600 K	0	0.00	
total for actor						120 M
Period 3						
Interface	Port	Transfer	Occurrences	Valuation	Value	Total
MONEY,traintrip			720 K		144 M	
	in: MONEY	MONEY	720 K	200	144 M	
	out: traintrip	(all transfers)	720 K	0	0.00	
total for actor						144 M
Period 4						
Interface	Port	Transfer	Occurrences	Valuation	Value	Total
traintrip,MONEY			720 K		151.2 M	
	out: traintrip	(all transfers)	720 K	0	0.00	
	in: MONEY	MONEY	720 K	210	151.2 M	
total for actor						151.2 M
Discounted Net Present Value					381,167,241.65	

Scenario-based sensitivity analysis

- All numbers are just **best estimates** ...
- Scenarios: **future events** resulting in changes of the constellation

Sensitivity Analysis	Scenarios and risks SA-1
SCENARIO TITLE	State only the future event.
SCENARIO DESCRIPTION	Make a short description of the future event that impacts the value web.
IMPACT ON VALUE WEB	Indicate in a concise manner the changes in value web if the foreseen event really happens. Possible changes are: <ol style="list-style-type: none">1. Increasing or decreasing consumer needs.2. Increasing or decreasing market segment size.3. Different valuation formulas.4. Actors / Market segments entering or leaving the web, changes in value transfers.5. The performing actor of value activities changes.
CHANCE	In case the event imposes a risk, estimate the likelihood of occurrence. If the event is a structural uncertainty, the estimate is <i>unknown</i> .
PERIOD	Indicate the time period(s), the event is expected to occur.

Example **sensitivity** analysis

Sensitivity Analysis	Scenarios and risks SA-1
SCENARIO TITLE	Disturbances in the infrastructure.
SCENARIO DESCRIPTION	Because of insufficient maintenance, many disturbances in the railway infrastructure occur.
IMPACT ON VALUE WEB	1. Consumer needs decrease with 2, as compared to the previous period (people take the train less). 2. 'Traveler' market segment size decreases with 15%, as compared to the previous period (less people take the train).
CHANCE	Given the current state of maintenance, the chance is about 30 %.
PERIOD	The event can happen in all considered periods, if maintenance is not improved.

TABLE 6.16: Sensitivity analysis for figure 6.11

Scenario	Chance	'Railway Company'	'Traveler'
Null-scenario	n.a.	381,167,241.65	-7,497.65
Disturbances in the infrastructure	30 %	249,792,462.70	-6,127.50

Summary

- Apart from a **formalism to represent networked enterprises**, *e³value* is also useful to:
 - Represent **valuation** issues (money versus non-money objects)
 - Represent **fixed** and **variable** expenses
 - Assess **net value flows** on a per actor basis
 - Model **evolution** of a networked value constellation by using *e³timeseries*
 - Assess **long-term sustainability** on a per actor basis
 - Assess **sensitivity** for estimates

Further information on *e³value*

www.e3value.com

e3-value.com - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.e3value.com/

Getting Started Latest Headlines

e3value™

The *e³value* toolset
14-05-2006 | The latest available version of the e3value toolset is version 3.28

Welcome back!

Home | Contact | cs.vu.nl

Search

Home [E3value.com](#) >> [This](#)

Testimonials

Publications

Book

Tools

Education

Projects

Research

News archive

Version 3.28 of the editor available

A new version of the e3editor is available.

[>> more info](#) | 41 views

New website for e3value

We have created a new website for the e3value methodology

[>> more info](#) | 72 views

Quick links

The e3editor for Windows XP

Download here the latest version of the e3editor for Windows XP

[>> more info](#)

e3value video clips

The e3value methodology has been used in a variety of industries including entertainment, news, internet service provisioning, banking, trade documents and energy supply. Check out some video clips we made with our case study partners

[>> more info](#)

e3value projects

The e3value methodology is developed in a series of national and international projects. Have a look at our projects.


[>> more info](#)

The *e³value* methodology: Exploring innovative e-business ideas

The *e3value* methodology helps you to explore your innovative e-business idea - starting from understanding which enterprises and actors are actually involved, to an assessment of profitability for each enterprise.

As a methodology, *e3value* is a *graphical* approach: you can paint your business idea. Furthermore, *e3value* explicitly recognizes that most e-businesses are *networks* of enterprises.

Typically, you develop your e-business idea as an *e3value* model in a short timeframe; the methodology has been developed to be tractable and lightweight.



After you designed a graphical *e3value* model, you can *check* your model for *business rules* (e.g. that you get paid for each product you deliver), and you can generate value-flow sheets that are used to assess profitability (see left screen shot). Also, you will do sensitivity analysis to understand the strengths and weaknesses of your e-business idea.

Try the example on this page yourself by downloading our free [tool support](#), and the example files below.

[>> more info](#)

Value Interfac	Value Trans	Occurrence	Valuation	Value	Total
(MONEY,GOOD)		10		100	
	MONEY	10	10	100	
	(all transfers)	10	0	0	
INVESTMENT				0	
EXPENSES				0	
total for actor					100

Files and links

File Name	Description	Date	Size	Icon
Latest version of the e3editor	This link contains the latest full version of the e3editor. If you start the editor, the editor will retrieve the latest components - if available	05/15/06	19.07 MB	📄
Example	The spreadsheet on this page	05/09/06	22.5 KB	📊
Example	The e3value model on this page	05/09/06	25.9 KB	📄

Sort by [name](#), [date](#), [type](#)

Read [www.e3value.com](#)

Further reading on *e³value*

- **E-Service Design Using *i** and *e³value* Modeling**, in IEEE Software, Vol. 23(3):26-33, May 2006, Jaap Gordijn, Eric Yu and Bas van der Raadt (download from <http://www.e3value.com/bibquery/?key=Gordijn2006e3istar>)
-
- **Value based requirements engineering: Exploring innovative e-commerce idea**, in Requirements Engineering Journal, Vol. 8(2):114-134, 2003, Jaap Gordijn and Hans Akkermans (download from <http://www.e3value.com/bibquery/?key=Gordijn2003e3value>)
- **Designing and Evaluating e-Business Models**, in IEEE Intelligent systems, July/August 2001, Jaap Gordijn and Hans Akkermans (download from <http://www.e3value.com/bibquery/?key=Gordijn2001e3value>)

BUSITAL 2007

- **BUSITAL 2007: A workshop on Business/IT Alignment and Interoperability**
- **IMPORTANT DATES**
 - Papers due: March 1st 2007
 - Author notification: April 1st 2007
 - Camera ready copies: April 16th 2007
- Workshop: June 11 or 12th 2007 (preceding CAiSE)
- See **busital.e3value.com**