

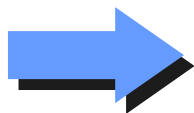
Simulation Based Experiments for Testing the Balanced Scorecard's Built-in Performance Improvement Theory



Jürgen Strohhecker
Oxford, 26th July 2004

Research Question

- “In our view, the balanced scorecard is among the most significant developments in management accounting and, thus, deserves intense research attention.”
(Atkinson et al. 1997)
- “The primary research question arising from the use of nonfinancial measures and the balanced scorecard is the net economic benefits from these measurement practices.”
(Ittner and Larcker 1998)



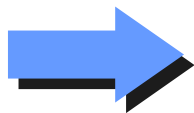
Does the balanced scorecard really improve organisational performance?

Current State of Research

- “Surprisingly little research has been conducted on the implementation or performance consequences of the balanced scorecard concept, despite widespread practitioner interest in the subject.”
(Ittner and Larcker 1998)
- "Given its high profile, surprisingly little academic research has focused on either the claims or the outcomes of the BSC."
(Malina 2001)
- Since Kaplan and Norton (1992) only 13 empirical research studies in German and English literature have been published:
 - 1 archival study
 - 10 survey studies
 - 2 experimental studies

Shortcomings of Existing Empirical Research Studies

- Poor Representativeness
 - Dubious sampling of organisations/participants included in the study
 - Insufficient feedback/low response rate
- Survey Biases
 - Authored or sponsored by firms offering consulting services
 - Highly subjective measurement of balanced scorecard usage/implementation and organisational performance
- Insufficient control of independent variables and other factors makes causal inference difficult or impossible.



Research design chosen: Laboratory experiment

Transforming the Research Question into an Operational Scientific Hypothesis

Question: Does the balanced scorecard really improve organisational performance?



H_1 : If the management of an organisation uses a balanced scorecard as management and controlling system, the organisation's performance will increase.

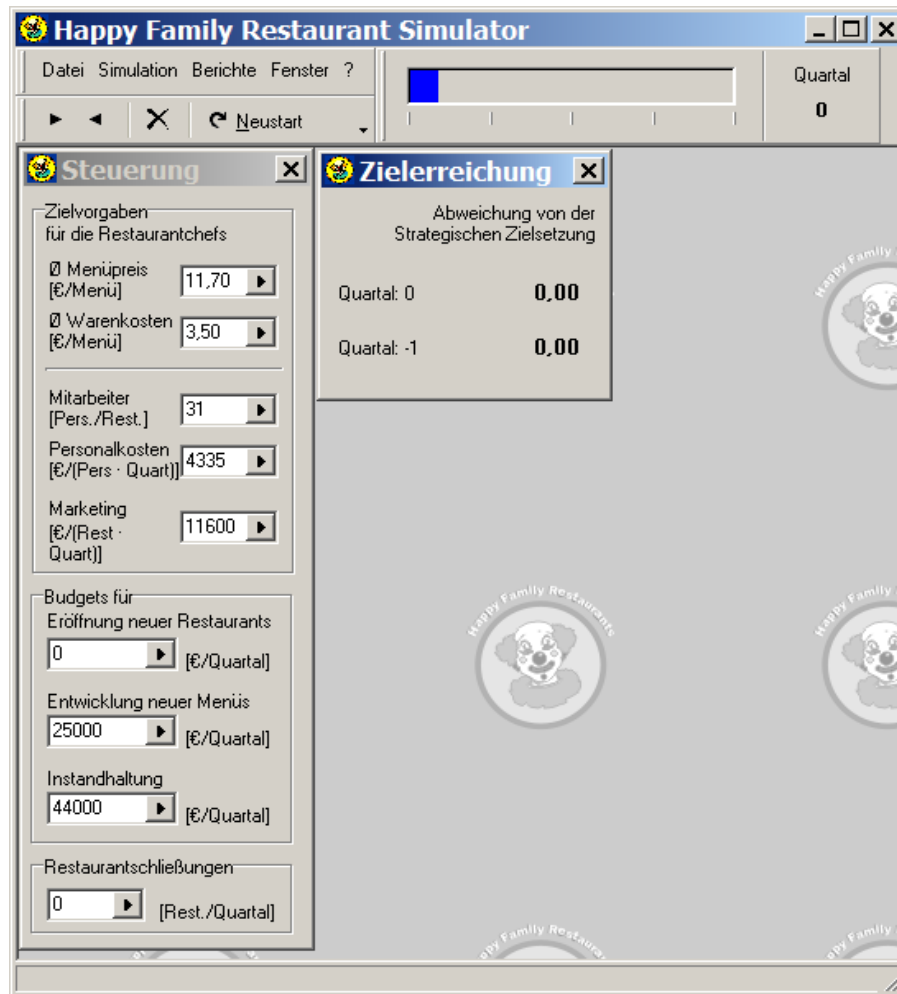


H_{10} : Participants in the laboratory experiment using a balanced scorecard as management and controlling system will perform better than participants using traditional reports as management and controlling system.

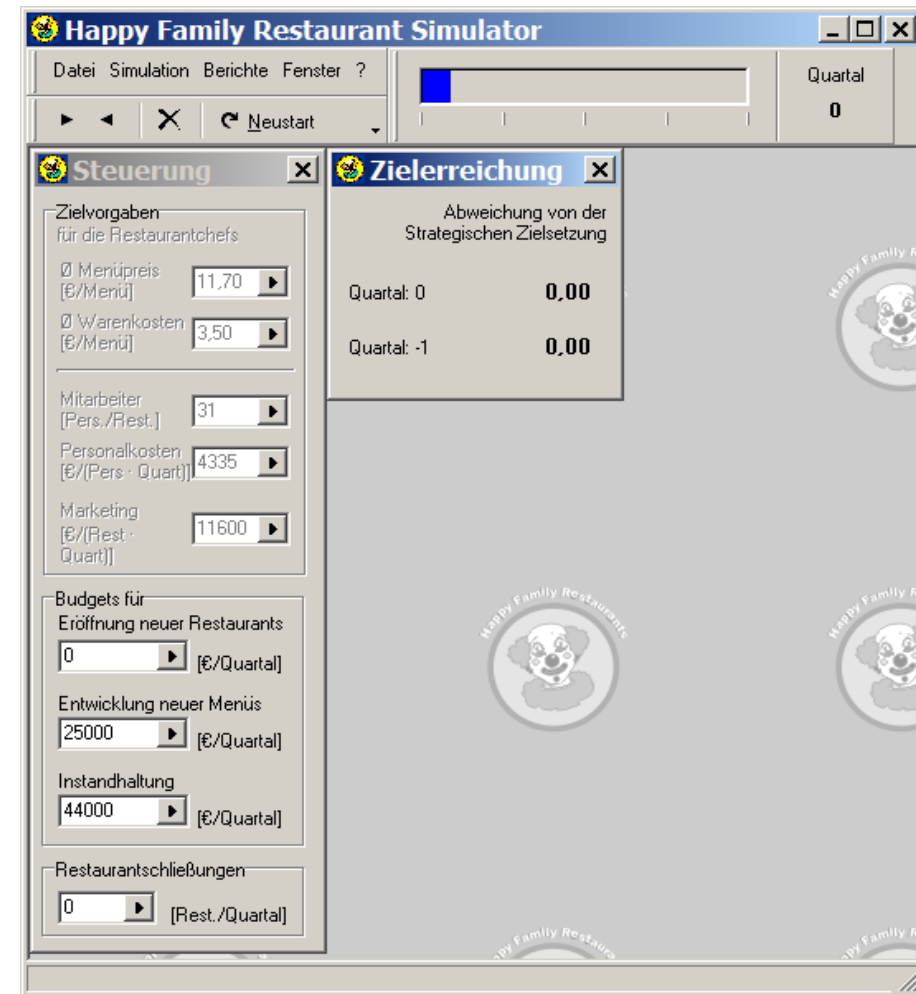
Setting of the Experiment

- Participants in the experiment are given the role of a managing director of a recently founded restaurant business – Happy Family Restaurants (HFR).
- HFR's business concept, strategy and environment are described in detail in a 13-page case-study.
- The experiment is conducted as a computer aided simulation experiment .
- A specifically developed simulator, which is similar to the Beefeater Restaurants Microworld, is used.
- The task of the participants is to make HFR's strategy a success by deciding on
 - 9 variables \Rightarrow high-complexity setting
 - 4 variables \Rightarrow low-complexity setting
- Given time span: 90 Minutes. Unlimited number of simulation runs.

The Happy Family Restaurant Simulator Interface

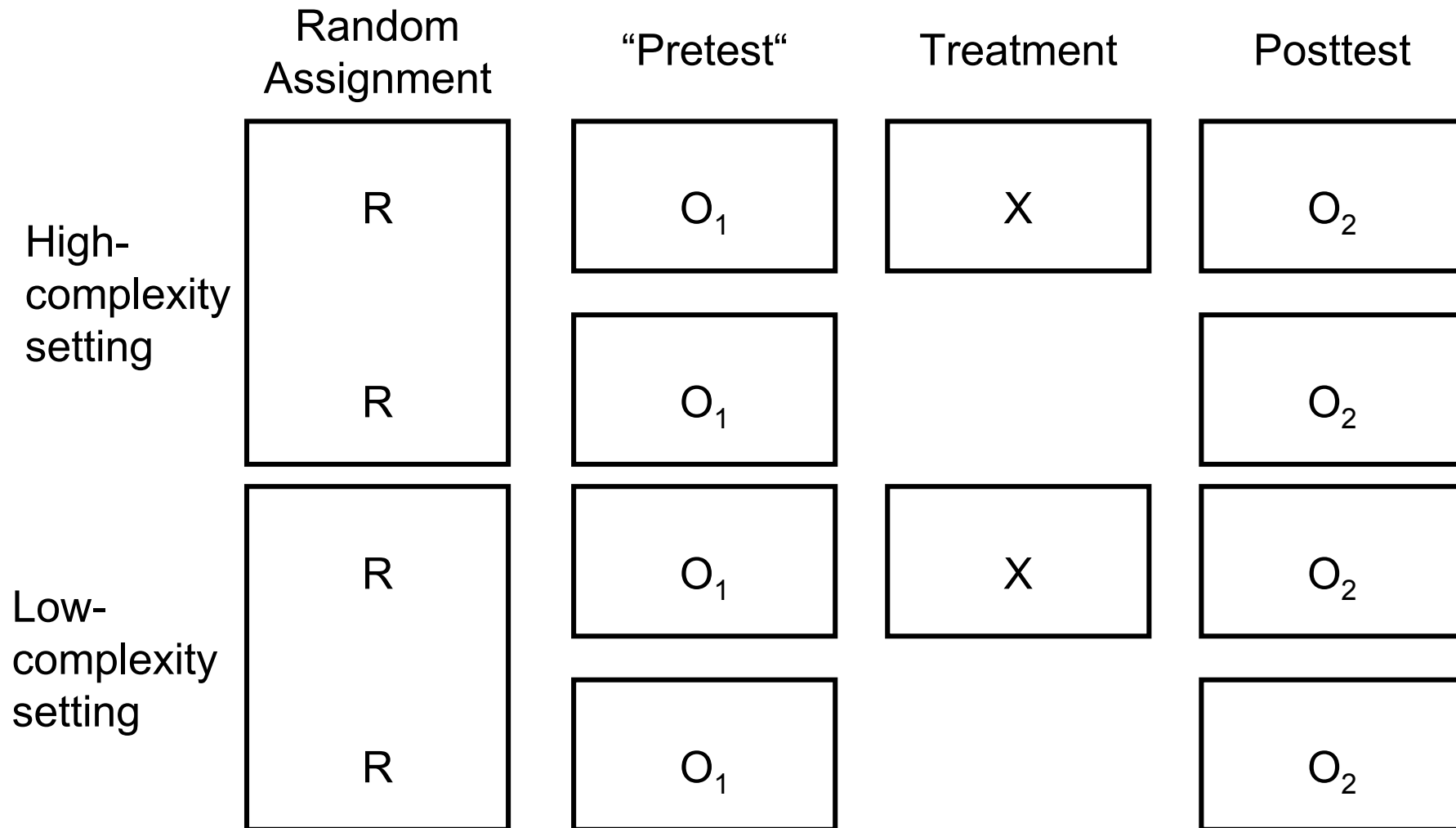


High-complexity setting

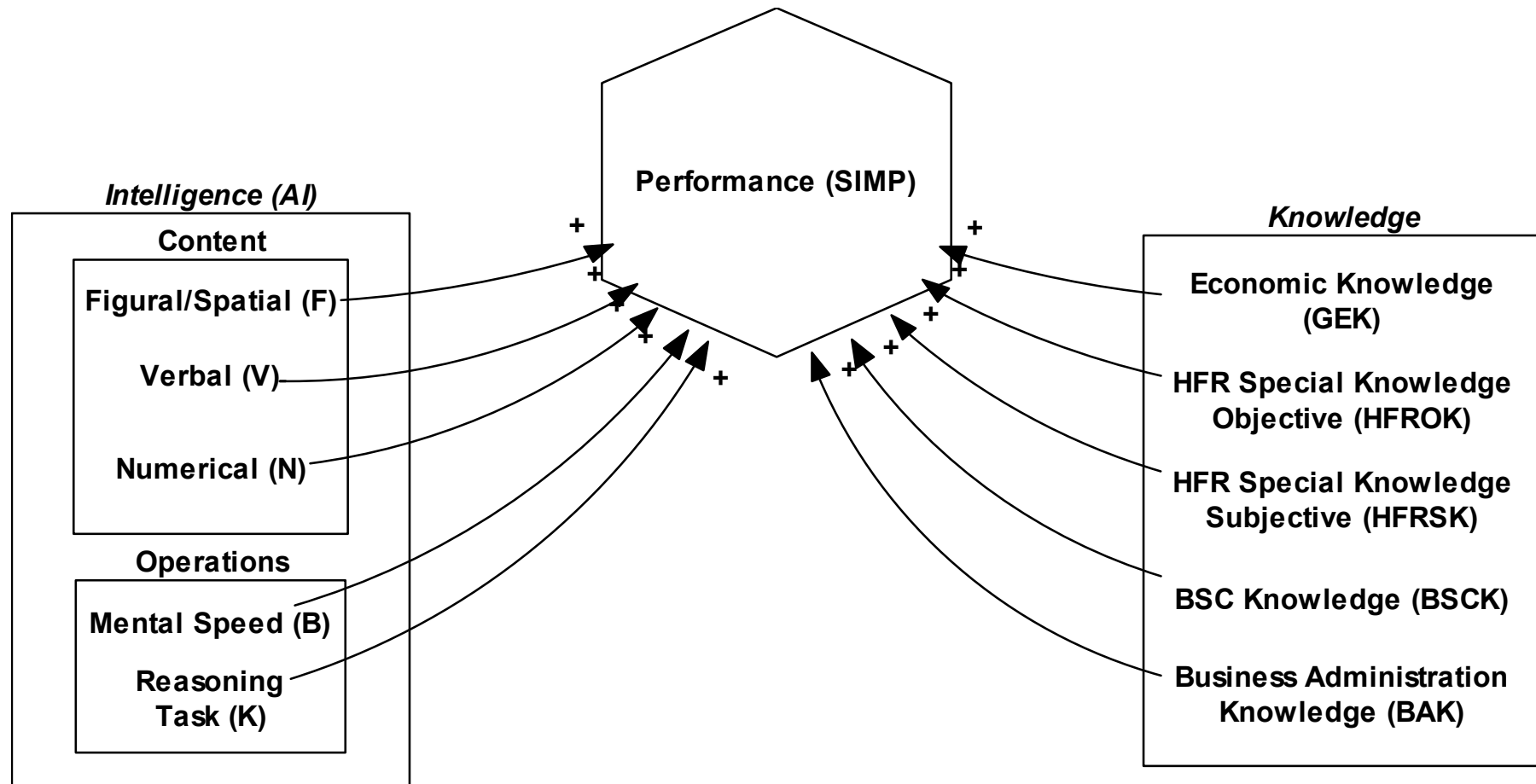


Low-complexity setting

Randomized, Pretest-Posttest, Control-Group Design



Parameters Controlled in the Pretest



Treatment for the Experiment Group: BSC as Information System

Happy Family Restaurant Simulator

Datei Simulation Berichte Fenster ?

Quartal 1

Neustart

Steuerung

Zielvorgaben für die Restaurantchefs

Menüpreis [€/Menü] 11,70

Warenkosten [€/Menü] 3,50

Mitarbeiter [Pers./Rest.] 31

Personalkosten [€/Pers. · Quart.] 4335

Marketing [€/Rest · Quart.] 11600

Budgets für

Eröffnung neuer Restaurants 0 [€/Quartal]

Entwicklung neuer Menüs 25000 [€/Quartal]

Instandhaltung 44000 [€/Quartal]

Restaurantschließungen 0 [Rest./Quartal]

Zielerreichung

Abweichung von der Strategischen Zielsetzung

Quartal 1 **0,00**

Quartal 0 **0,00**

Balanced Scorecard

Perspek...	Strategisches...	Kennzahl	Ziel	Ist	Vorquartal	Einheit	Status
1 Finanzen							
Marktführerschaft							
		Marktanteil Familiengastronomie	45,0	0,6	0,6	%	Stop
		Umsatz	75.000.000	1.018.935	1.010.947	€/Quartal	Stop
Spitzenprofitabilität							
		Ergebnis	40.000,0	80.096,3	73.814,0	€/Quartal	Ok
		Kapitalrendite	20,0	40,0	36,9	%/Jahr	Ok
2 Kunden							
Kundenzufriedenheit							
		Leistungszufriedenheit	140,0	143,9	143,8	%	Ok
		Preiszufriedenheit	122,0	112,0	112,0	%	Ok
		Servierte Menüs je Platz	480,0	492,7	489,3	Menüs/Platz * Qu...	Ok
Markenbekanntheit							
		Bekanntheitsgrad	65,0	1,0	1,0	%	Stop
3 Interne Prozesse							
Auf- & Ausbau							
		Restaurants	148,4	2,0	2,0	Restaurants	Stop
		Standortqualität	100,0	100,0	100,0	%	Ok
Essensqualität							
		Kundenzufriedenheit mit Essensqualität	126,1	126,1	126,1	%	Ok
		mittleres Menüalter	4,0	3,9	3,9	Quartale/Menü	Ok
		Warenkostenanteil	33,0	36,2	33,0	%	Ok
Kapitalbeschaffung							
		verfügbares Kapital	10.000.000	800.000	800.000	€/Quartal	Stop
Operative Exzellenz							
		Umsatz pro Mitarbieter	16.800,0	16.312,6	16.139,0	€/Mitarbeiter * Qu...	Ok
Service							
		Servicequalität	100,0	103,4	103,4		Ok
		Servierte Menüs je Mitarbeiter	1.375,0	1.262,0	1.249,8	Menüs/(Mitarbeite...	Ok
Spielspass & Ambiente							
		Kapital je Sitzplatz	5.000,0	4.999,7	5.000,0	€/Platz	Ok
4 Lernen & Entwickeln							
Menüentwicklung							
		neue Menüs	5,0	5,0	5,0	Menüs/Quartal	Ok
Mitarbeiterkompetenz							
		Berufserfahrung	2,5	2,5	2,5	Jahre/Mitarbeiter	Ok
Mitarbeiterzufriedenheit							
		Fluktuationsrate	10,0	9,6	9,6	%/Quartal	Ok

Treatment for the Control Group: Traditional Reports

Happy Family Restaurant Simulator

Datei Simulation Berichte Fenster ?

Neustart

Quartal 1

Steuerung

Zielvorgaben für die Restaurantchefs

Ø Menüpreis [€/Menü]

Ø Warenkosten [€/Menü]

Mitarbeiter [Pers./Rest.]

Personalkosten [€/Pers. · Quart.]

Marketing [€/Rest. · Quart.]

Budgets für Eröffnung neuer Restaurants

[€/Quartal]

Entwicklung neuer Menüs

[€/Quartal]

Instandhaltung [€/Quartal]

Restaurantschließungen

[Rest./Quartal]

Zielerreichung

Abweichung von der Strategischen Zielsetzung

Quartal: 1 **0,00**

Quartal: 0 **0,00**

Restaurantbetriebsergebnis

Betriebsergebnisrechnung für das durchschnittliche Happy-Family-Restaurant

Quartal	1	0
Umsatzerlöse	492.535	496.300
- Warenkosten	148.679	151.262
- Personalkosten	134.504	134.587
- Betriebs- und Verwaltungskosten	34.826	35.055
- Marketingkosten	11.600	11.600
- sonstige betriebsbedingte Kosten	30.121	30.294
Betriebsergebnis I	132.805	133.502
- Mietkosten	40.000	40.000
- Abschreibungskosten	22.282	22.272
- Kapitalkosten	11.974	11.982
Betriebsergebnis II	58.549	59.247

in €/Quartal

Spartenbetriebsergebnis

Betriebsergebnisrechnung für die Sparte "Happy-Family-Restaurants"

Quartal	1	0
Betriebsergebnis II aller Restaurants	117.098	118.495
- Kosten für neue Restaurantprojekte	0	0
- Entwicklungskosten neuer Menüs	25.000	25.000
- Verwaltungskosten	15.153	15.214
+ Erlöse aus Schließungen	0	0
Betriebsergebnis der Sparte	76.946	78.281

in €/Quartal

Geschäftsentwicklung

Entwicklung der Happy-Family-Restaurantkette

Quartal	1	0
Restaurants		
Bestand	2	2 Rest.
Eröffnungen	0	0 Rest./Quart.
Schließungen	0	0 Rest./Quart.
neue Projekte in Planung	0,0	0,0 Rest./Quart.
Sitzplätze	160	160 Plätze
Kapitalbindung	798.034	798.595 €
Ø Standortqualität	100,0	100,0 %
Mitarbeiter		
Anzahl	62,0	62,1 Pers.
Zugänge	6,0	6,0 Pers./Quart.
Abgänge	6,1	6,1 Pers./Quart.
Ø Berufserfahrung	2,5	2,5 Jahre/Pers.
Fluktuationsrate	9,7	9,7 %/Quart.
Leistung		
Servierte Menüs	80.874	80.673 Menüs/Quart.
Umsatzerlöse	985.069	992.600 €/Quart.
Ø Umsatz je Menü	12,18	12,30 €/Menü
Ø Umsatz je Mitarb.	15.874	15.986 €/Person
Marktposition		
Marktanteil Fam.Gastr.	0,6	0,6 %
Bekanntheitsgrad	1,0	1,0 %
Kennzahlen		
Quartal	1	0
Kapitalrendite	38,5	39,1 %/Jahr
Umsatzrendite	7,8	7,9 %
Ø serv. Menüs je MA	1.303	1.299 M/(Pers. · Quart.)
Ø serv. Menüs je Platz	505,5	504,2 M/(Platz · Quart.)
Anteil Warenkosten	34,3	34,6 %
Anteil Personalkosten	31,0	30,8 %
geb. Kapital je Sitzplatz	4.989	4.992 €/Platz

Kundenfeedback

Auswertung von Kundenbefragungen und Feedbackkarten

Quartal	1	0
Service	103,2	103,3 %
Speisekarte	120,0	120,0 %
Essen	126,0	126,2 %
Atmosphäre	100,0	100,0 %
Ambiente	100,0	100,0 %
Preisniveau	112,8	112,3 %
Wartezeiten	91,4	91,6 %
insgesamt	142,6	143,4 %

Die Kunden antworten auf die Frage nach ihrer Zufriedenheit. Werden die Ansprüche voll erfüllt, dann entspricht dies einer Zufriedenheit von 100%.

Menüentwicklung

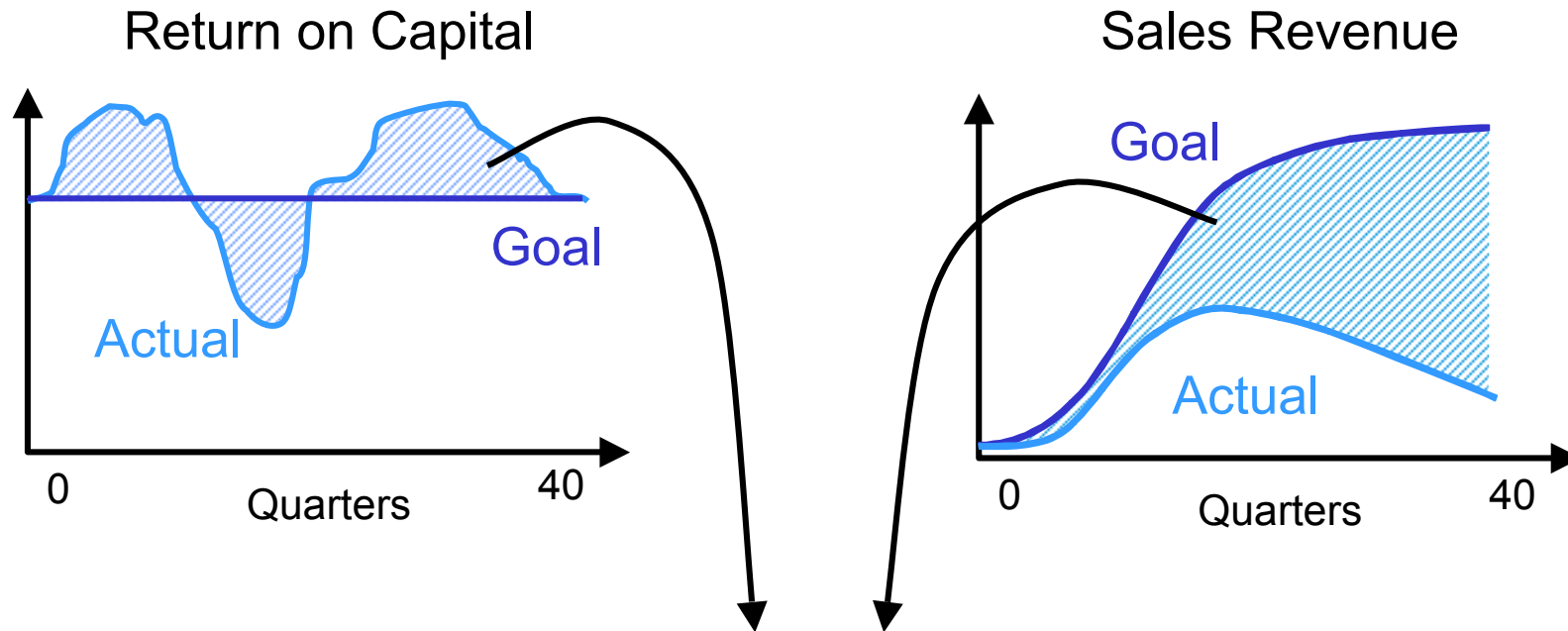
FuE-Aktivitäten der HFR-Zentrale

Quartal	1	0
Menüs auf der Karte	20,0	20,0
Menüs in Entwicklung	15,0	15,0
neue Menüs im Quartal	5,0	5,0
Ø Menüalter [Quartale]	4,0	3,9

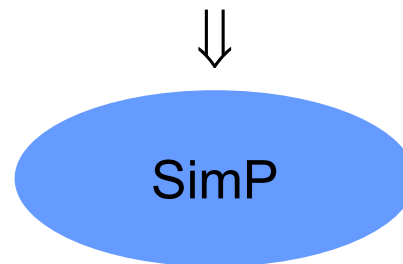
Wachstumspotenzial

Quartal	1	0
verf. Kapital f. neue Restaurantprojekte [€/Quartal]	1.000.000	850.000
Restaurantdichte [Rest./Region]	0,02	0,02
Kundenpotenzial in D [Personen]	5.000.000	5.000.000
davon erreichbar	100.000	100.000

Posttest Measuring Performance



Weighted average of cumulated fractional deviation between goal and actual outcome



Implementing the Research Design

Complexity	Experiment	Date	Treatment	No. Participants	Total
1 (High)	2	27/05/2003	BSC	14	25
			Reports	11	
	3	03/06/2003	BSC	12	25
			Reports	13	
	4	27/11/2003	BSC	18	33
			Reports	15	
5	04/12/2003	BSC	21	32	
		Reports	11		
6	08/12/2003	BSC	20	28	
		Reports	8		
Total			BSC	85	143
			Reports	58	
2 (Low)	7	12/12/2003	BSC	11	18
			Reports	7	
	8	06/01/2004	BSC	12	26
Reports			14		
Total			BSC	23	44
			Reports	21	
Total			BSC	108	187
			Reports	79	

Performance Measure SimP - Descriptive Statistics

Complexity	Experiment	Treatment	Mean	Std. Deviation	N
Total	2-8	BSC	-39.24	18.17	108
		Reports	-35.70	17.99	79
1 (High)	2-6	BSC	-39.62	18.35	85
		Reports	-38.61	16.27	58
2 (Low)	7-8	BSC	-37.84	17.79	23
		Reports	-27.66	20.39	21

ANOVA and ANCOVA Results

ANOVA

Difference in the mean performance:

- Not significant for the whole sample and the high-complexity sample
- **Significant** (0.08) for the **low-complexity** sample

ANCOVA

Adjusting for differences in the pretest-parameters, the differences in the mean performance are

- Not significant for the whole sample and the high-complexity sample
- **Significant** (0.03) for the **low-complexity** sample

Linear Regression confirms the ANOVA/ANCOVA results.



Linear Regression

Model:
$$\text{SimP} = b_1 + b_2\text{GEK} + b_3\text{BAK} + b_4\text{K_S} + b_5\text{B_S} \\ + b_6\text{N_S} + b_7\text{AI_S} + b_8\text{Treatment}$$

Linear Regression confirms the ANOVA/ANCOVA results:

	Treatment	
	Beta	Sig.
Whole Dataset (N = 152)	0.030	0.691
High Complexity (N = 113)	-0.069	0.447
Low Complexity (N = 39)	0.302	0.032

Limitations

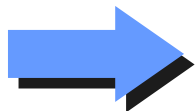
- The data sample especially for the low-complexity setting is rather small (N = 39).
- Assumptions of ANOVA, ANCOVA and linear regression are violated for some data samples (e.g. normal distribution).
- Implementing HFR's strategy in the microworld was obviously challenging for many participants. Approximately half of the participants were not able to finish the simulation without being fired (SimP \leq -50).
- Balanced scorecard's performance impact through
 - improved strategy translation and communication within the organisation,
 - improved alignment of the organisation to the strategy,
 - improved strategy control and evaluationwas (deliberately) not investigated in the laboratory experiment.

Summary

- Mean performance differences between treatment group (BSC) and control group (Reports) are statistically insignificant for the whole data sample and for the high-complexity sample.
- In the low-complexity setting participants equipped with the balanced scorecard perform significantly worse compared to the control group relying on traditional reports.



Hypothesis H_{10} has to be rejected.



Using a BSC as single source of information could lead to wrong decisions.

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Empirical Research Studies and Research Methods Used

Archival	Survey	Experimental
<ul style="list-style-type: none"> ▪ Bryant, Jones and Widener 2004 (forthcoming) 	<ul style="list-style-type: none"> ▪ Hoque and James 2000 ▪ Buckmaster 2000 ▪ Sim and Koh 2001 ▪ Rigby 2001 ▪ PriceWaterhouseCoopers 2001 ▪ Gilles 2002 ▪ Bauer et al 2002 ▪ Speckbacher, Bischof and Pfeiffer 2003 ▪ Horvath & Partners Management Consultants 2003 ▪ Maiga and Jacobs 2003 	<ul style="list-style-type: none"> ▪ Lipe, Salterio 2000 ▪ Roberts, Albright and Hibbets 2004

ANOVA Results

Complexity		Sum of Squares	df	Mean Square	F	Sig.
1 (High)	Between Groups	35.51	1	35.51	0.1154	0.7346
	Within Groups	43,385.38	141	307.70		
	Total	43,420.89	142			
2 (Low)	Between Groups	1,137.28	1	1,137.28	3.1274	0.0842
	Within Groups	15,273.35	42	363.65		
	Total	16,410.64	43			
Total	Between Groups	573.43	1	573.43	1.7516	0.1873
	Within Groups	60,564.64	185	327.38		
	Total	61,138.07	186			

ANCOVA Results – Whole Sample, Selected Covariates

Dependent Variable: SimP

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10,749.92	7	1,535.70	5.1414	0.0000	0.2000
Intercept	4,140.43	1	4,140.43	13.8620	0.0003	0.0878
BAK	1,445.48	1	1,445.48	4.8394	0.0294	0.0325
GEK	1,906.93	1	1,906.93	6.3843	0.0126	0.0425
K_S	2,178.66	1	2,178.66	7.2940	0.0077	0.0482
B_S	1,682.23	1	1,682.23	5.6320	0.0190	0.0376
N_S	815.48	1	815.48	2.7302	0.1006	0.0186
AI_S	1,995.81	1	1,995.81	6.6819	0.0107	0.0443
Treatment	47.46	1	47.46	0.1589	0.6908	0.0011
Error	43,011.44	144	298.69			
Total	254,073.22	152				
Corrected Total	53,761.36	151				

^a R Squared = ,200 (Adjusted R Squared = ,161)

ANCOVA Results

High-complexity, Selected Covariates

Dependent Variable: SimP

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6,390.27	7	912.90	3.0253	0.0062	0.1678
Intercept	3,335.28	1	3,335.28	11.0531	0.0012	0.0952
BAK	54.25	1	54.25	0.1798	0.6724	0.0017
GEK	1,333.80	1	1,333.80	4.4202	0.0379	0.0404
K_S	2,180.62	1	2,180.62	7.2265	0.0084	0.0644
B_S	1,973.09	1	1,973.09	6.5388	0.0120	0.0586
N_S	228.42	1	228.42	0.7570	0.3863	0.0072
AI_S	2,068.63	1	2,068.63	6.8554	0.0101	0.0613
Treatment	175.60	1	175.60	0.5819	0.4473	0.0055
Error	31,683.99	105	301.75			
Total	197,812.91	113				
Corrected Total	38,074.27	112				

^a R Squared = .168 (Adjusted R Squared = .112)

ANCOVA Results

Low-complexity, Selected Covariates

Dependent Variable: SimP

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	7,752.31	7	1,107.47	4.7716	0.0010	0.5186
Intercept	1,218.08	1	1,218.08	5.2481	0.0289	0.1448
BAK	1,819.84	1	1,819.84	7.8408	0.0087	0.2019
GEK	554.62	1	554.62	2.3896	0.1323	0.0716
K_S	736.40	1	736.40	3.1728	0.0847	0.0928
B_S	386.86	1	386.86	1.6668	0.2062	0.0510
N_S	0.04	1	0.04	0.0002	0.9901	0.0000
AI_S	591.08	1	591.08	2.5467	0.1207	0.0759
Treatment	1,177.76	1	1,177.76	5.0744	0.0315	0.1407
Error	7,195.05	31	232.10			
Total	56,260.31	39				
Corrected Total	14,947.36	38				

^a R Squared = .519 (Adjusted R Squared = .410)

Linear Regression

Model	Whole Dataset (N = 152)			High Complexity (N = 113)			Low Complexity (N = 39)		
	B	Beta	Sig.	B	Beta	Sig.	B	Beta	Sig.
(Constant)	-352.78		0.0002	-285.47		0.0014	-326.56		0.0166
BAK	34.61	0.1781	0.0294	16.55	0.0420	0.6724	74.58	0.4368	0.0087
GEK	42.18	0.2064	0.0126	-10.32	0.2115	0.0379	48.14	0.2300	0.1323
K_S	5.74	2.8681	0.0077	0.98	4.5646	0.0084	4.87	2.3836	0.0847
B_S	3.89	2.0488	0.0190	-8.58	3.5779	0.0120	2.84	1.3734	0.2062
N_S	0.32	0.1883	0.1006	11.81	0.1206	0.3863	0.01	0.0027	0.9901
AI_S	-7.34	-4.1060	0.0107	3.62	-6.6013	0.0101	-5.93	-3.2040	0.1207
Treatment	1.13	0.0300	0.6908	2.58	-0.0689	0.4473	11.81	0.3016	0.0315
R Square	0.200			0.168			0.519		

Dependent Variable: SimP