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Deceleration - Revealed Preference in Society and Win-Win-Strategy for Sustainable Management. Concept and Exprimental Evidence

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Deceleration

Revealed Preference in Society and Win-Win-Strategy for Sustainable Management. Concept and Exprimental Evidence

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Deceleration

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Abstract:

Until recently “deceleration” has been little recognized as a technical term, or as an idea. However, it seems to be getting more attention now. For example the German magazine STERN dedicated a cover story to deceleration, in the Anglo-American world the “Quiet Life Hypothesis” is gaining followers, the “Heidelberger Club für Wirtschaft und Kultur” dedicated its annual meeting in 1998 to deceleration, and the competition for the German Study Award of the Körber Foundation in 2002 had the motto “Speed “ the accelerated world.? In Italy you can even study “Slow Food” and along German motorways you find signs with the slogan “be relaxed - just discover.” Without any doubt, time is a decisive factor for the productivity and competitive advantages of companies. But more speed by continual, or even accelerated, acceleration may well be counter-productive and lead to an “acceleration paradox” - for example by product life cycles that are too short and therefore increase the share of R&D-costs or by “Pyrrhus” victories, that lead to “the winner’s curse” instead of a stable market position. This acceleration paradox may show up in consumption, too. Consuming requires time and therefore competitors not only fight for their share of the consumers´ cost budget, but also for their share of the consumers´ time budget. It is this time budget, that must be split up into productive, consumptive and in all other leisure activities, such as going for a walk or playing chess, that are neither productive nor consumptive in an economic sense. The wide range of consumption goods in narrow markets and the increase in consumed goods and services together with the already mentioned shorter life cycles, e.g. of computers, cell phones or electronic equipment, are perceived by the consumers more and more as acceleration and personal burden. Speed can threaten the “happiness” of the consumers and so acceleration may become an “acceleration trap” for business and society. The term “deceleration” seems to be adequate for describing the opposite of acceleration. But is there truly a preference for deceleration in the society, and can deceleration become a paradigm in business management? These questions give the impulse for the research presented here by asking four questions and providing first answers: What are the reasons for acceleration in business and society? What have been the consequences of acceleration so far? Can deceleration contribute to sustainable management? Is there a preference for deceleration in society, and how can it be measured?

Keywords: Deceleration, Sustainable Management, Experimental Economics

1 Introduction

Until recently 'deceleration' has been little recognized as a technical term, or as an idea. However, it seems to be getting more attention now. For example the German magazine STERN dedicated a cover story to deceleration, in the Anglo-American world the "Quiet Life Hypothesis" is gaining followers, the "Heidelberger Club für Wirtschaft und Kultur" dedicated its annual meeting in 1998 to deceleration,[1] and the competition for the German Study Award of the Körber Foundation in 2002 had the motto "Speed – the accelerated world."[2] In Italy you can even study "Slow Food" and along German motorways you find signs with the slogan "be relaxed – just discover."

Without any doubt, time is a decisive factor for the productivity and competitive advantages of companies. But more speed by continual, or even accelerated, acceleration may well be counter-productive and lead to an "acceleration paradox" – for example by product life cycles that are too short and therefore increase the share of R&D-costs or by "Pyrrhus" victories, that lead to "the winner's curse" instead of a stable market position. This acceleration paradox may show up in consumption, too. Consuming requires time and therefore competitors not only fight for their share of the consumers´ cost budget, but also for their share of the consumers´ time budget. It is this time budget, that must be split up into productive, consumptive and in all other leisure activities, such as going for a walk or playing chess, that are neither productive nor consumptive in an economic sense. The wide range of consumption goods in narrow markets and the increase in consumed goods and services together with the already mentioned shorter life cycles, e.g. of computers, cell phones or electronic equipment, are perceived by the consumers more and more as acceleration and personal burden. Speed can threaten the "happiness" of the consumers and so acceleration may become an "acceleration trap" for business and society.

[1] Heidelberger Club für Kultur und Wirtschaft (Hrsg.) (1999): Im Rausch der Geschwindigkeit, Springer Verlag. To be sure this title should be understood in a critical, not an affirmative manner.
[2] „Tempo! – die beschleunigte Welt", forschen - Das Magazin des deutschen Studienpreises, Heft 1, 2003

The term “deceleration” seems to be adequate for describing the opposite of acceleration. But is there truly a preference for deceleration in the society, and can deceleration become a paradigm in business management? These questions give the impulse for the research presented here by asking four questions and providing first answers: What are the reasons for acceleration in business and society? What have been the consequences of acceleration so far? Can deceleration contribute to sustainable management? Is there a preference for deceleration in society, and how can it be measured?

2 Reasons for and development of acceleration in business and society

In this section we will describe three levels of the emergence and spread of the acceleration phenomenon: on the macroeconomic, the microeconomic, and the motivational levels.

2.1 The macroeconomic level

From the macroeconomic perspective acceleration is familiar: Economic growth, reflected in a constant rate of growth and the resulting exponential growth curve, expresses acceleration. While modern economic systems aim for growth, they aim equally for acceleration. The reasons for growth and acceleration, which have been discussed for years, are multiple. The range of reasons reaches from the institutional conditions of economics, such as the compound interest and employment problems due to technologically caused productivity growth, to psychological aspects of an elementary need of modern human beings to be equal to God.

But does the economy really grow exponentially? Analyzing the real development since World War II, for all developed countries – some exceptions omitted – no exponential growth of the aggregated economic performance, but a linear trend can be shown. However the money supply

grew exponentially due to compound interest. The dynamics caused by this misalliance can lead to a misbalance for the developed countries that may even threaten wealth. But beside this inherent explosive force of our economic system based on endogenously produced credit money, there is another threat from exponential and also linear economic growth – the over use of natural resources. Section 3.1. will describe these threats in more details.

2.2 The microeconomic level of the company

From a company`s perspective the reasons for acceleration can be identified if the question who determines the handling of time in companies is answered. Therefore three sources can be identified: The consumers and the environment as stakeholders in the handling of time and the companies themselves through being affected by these stakes and by reacting to them one way or another.

The consumers set “point-of-time requirements” by requiring delivery at a specific point of time. That may be expressed by the characteristics timeliness (delivery at a fixed point of time, e.g. just in time), recentness (regarding existing conditions, such as legislation) and novelty (respecting new developments, such as renewable energies). Recentness and novelty may compete, as existing legislation may block new technologies, e.g. gene technology. Moreover the consumers set “period-of-time” requirements by requiring delivery in a certain period of time. Reasons may be expected time savings (e.g. maintenance within 24 hours) or flexibility (e.g. independence of office hours by internet banking).

The environment sets restrictions in three ways, that may reduce the choice set of companies:

1. the rate of reproduction (defined as 1 / time period of a complete renewal of resources in years) as a measure for the supply function of the environment with renewable and non-renewable resources,

2. the rate of decomposition (defined as 1 / time period of a complete decomposition of emissions; half times describe the rate of decomposition for exponential decomposition processes) as a measure of the carrier function of environment for conducts, i.e. non-desired output such as waste water, waste and polluted air.
3. the rate of regeneration (defined as 1 / time period of a reconstitution to the original state) as a measure for the regulation function of the environment that interlinks the supply and the carrier function.

Embedded in these requirements of the consumers and the environment, the companies have to find the right measure of time, that is, they have to optimize their time target. So far the answer has been to increase the speed of their processes, because acceleration allowed time dependent demands (timeliness, recentness, novelty, time savings and flexibility) to be satisfied, thus creating competitive advantages that ended in price premiums. As market cycles are restricted, the first supplier on a market (pioneer) can completely capture the market, whereas the follower, whose R&D time is longer, can only capture a reduced market volume and so has to make profit sacrifices. Moreover time strategies open up potentials for cost reduction.[3] For example throughput times can be shortened by a change in production and stock, thereby reducing the capital employed.

2.3 The level of human motivation

It is part of economic thinking to ask for the deeper motivation for acceleration, even if this question requires knowledge of other disciplines such as psychology or anthropology. Here we restrict the analysis to acceleration in consumption. Before consumption becomes a burden for people, there seems to be a long period, which our society has not yet

[3] Baum, H.-G. / Coenenberg, A.G. / Günther, T. (1999): Strategisches Controlling, 2. Aufl., Stuttgart 1999, pp 154 – 161.

passed, where acceleration in consumption is perceived positively.[4] Leaving aside that perception is intentionally influenced by the mass media the question remains: Where does the motivation and the willingness of the consumers for accelerated consumption come from?

Modern research answers this question with psychological arguments. So the scientist G. Scherhorn sees, like E. Fromm („Haben oder Sein“) or H. E. Richter („Der Gotteskomplex“), an elementary need of the modern human beings to become like God (“Entgrenzungs- und Gottgleichheitsbedürfnis”) by overcoming the essential human limits. This can be the hidden engine for the behavior in consumption. Simply stated: The fear of loss (e.g. loss of security in religious or feudal societies or mortality) is overcompensated by human activities that realize the similarity or even equality to god (promised in the Old Testament and other early Jewish and Christian texts). Consumption is a platform for realizing this “salvation”, as permanently accelerated consumption gives the illusion of infinite determination by humans who perceive themselves as the creators of their own world.

3 The consequences of acceleration

In Section 2 the reasons and the development of acceleration in business and society were presented, and some of the consequences were already shown. These will be elaborated in more details in this chapter.

3.1 The macroeconomic growth-related illusion of acceleration: the acceleration trap

In the late 1990s there was much discussion between Herman Daly and other critics of growth on the one side and the Nobel prize winner Robert Solow and other advocates of growth on the other. Neoclassical theory shows a substantial contradiction in the heart of its theory: If neoclassic theory is

[4] S. z. B. Gross, Peter (1998): Die Multioptionsgesellschaft, Suhrkamp Verlag

based on self-restriction by negative feedback and the definition of optima and balances, for the theory of growth, neither one nor the other is true. Instead of an optimum or a balance of the analyzed variables in absolute terms, the theory of growth defines optimal rates of growth and hence an exponential, infinite growth of the considered variables in absolute terms. However, at the same point the potential infinite growth of physical economic variables meets the limits of the physical resources. Therefore the belief in growth is an illusion, unless technical progress and the dematerialization of consumption and production allow an infinite, sustainable economic growth based in value, not in physical terms.

This is the focus of the recent discussion of ”weak” vs. ”strong” sustainability between the critics and the advocates of growth. Can the speed of linear growth – or even an accelerated speed of exponential growth – be maintained sustainably without endangering the natural resources in a way that economic artifacts such capital goods, consumption possibilities and institutions can no longer regenerate them? Or does the belief in economic growth inducing wealth become a growth illusion and trap?

3.2 The microeconomic company-related illusion of acceleration: the productivity trap

Even if only economic aspects are taken into consideration, phenomena such as the acceleration trap, show that it may be senseless to accelerate processes i.e. that there are limits of acceleration.[5]

Translated words for the following chart:

Framework conditions: dynamics, individualization; fragmentation of markets, necessity of generation of relative competitive advantages, investment in R&D, growing R&D budgets, shorter development periods, more products faster than competitor, faster obsolescence of products,

[5] cf. von Braun, C.-F. (1991a): Die Beschleunigungsfalle, in: Zeitschrift für Planung, 2. Jg., 1991, Heft 1, pp. 58ff.

shorter market cycles, amortization difficult, more dynamic by increasing product R&D-budgets.

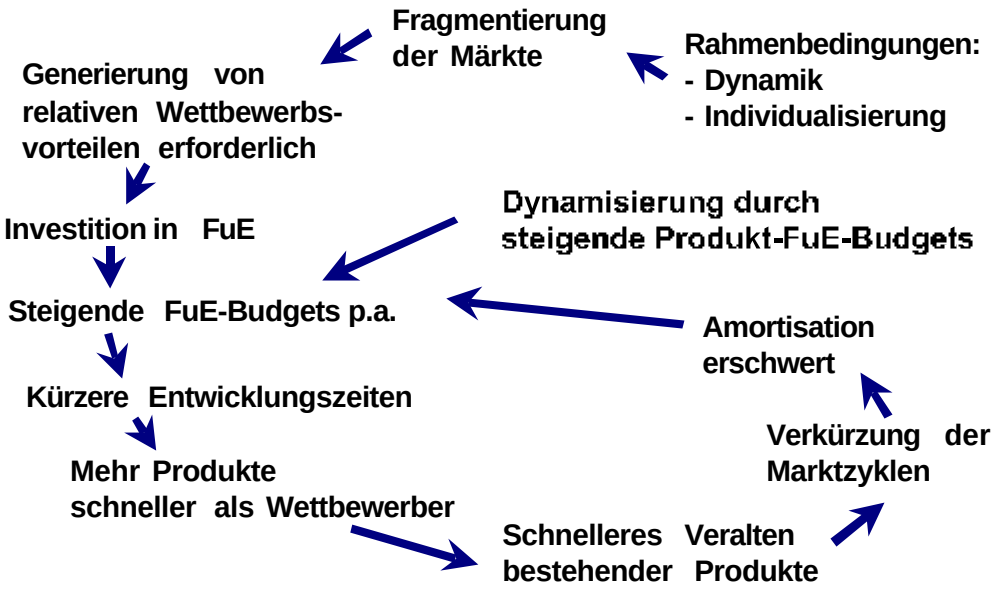


Figure 1: Mechanism of the acceleration trap

The starting point for this mechanism is the framework conditions that can be characterized by a dynamic development – related to competition – and by individualization – related to the customers. The consumers ask for products that are adopted individually to their existing or created needs. The companies try to avoid price and cost competition by differentiating their product range. This leads to a fragmentation of markets. For a firm to distinguish itself from its competitors, it is necessary to create many different relative competitive advantages. Therefore extensive investments in research and development are necessary. If investments in research and development are intensified to gain a relative advantage, the budgets have to increase annually. Consequently the development periods decrease so the company can enter the market with more products in a shorter period of time. This also means, that the existing products become obsolete faster, i.e. they have to become obsolete to create demand for the new products. Overall the market cycles become shorter, amortization becomes more difficult. If the

reaction is to increase the R&D-budget to become even faster, the circle is repeated and a dynamic, self-enforcing process is started. If there is only one acceleration, a bigger portion of the market volume can be captured („flash in the pan“). If there is a continuous acceleration, the sales decrease due to the shorter market cycles. This effect is called an “acceleration-resistant sales-slide” [6] by Backhaus. Empirically von Braun shows this acceleration trap for American companies[7].

From the ecological point of view the acceleration of processes shows consequences if time measures are not respected, as nature sets restrictions. These consequences refer to the already mentioned functions of the environment, the supply function (“the source runs dry”), the carrier function (“the valley is filled”) and the regeneration function (“the channel is blocked”). They can be analyzed with respect to two types of scarcity: the scarcity of rate and the scarcity of accumulation. The scarcity of rate asks for a critical rate of extraction (e.g. for renewable resources), of carrying capacity (e.g. of air) or of regeneration (e.g. water). The environment can tolerate a critical rate (e.g. a certain amount of emissions), if this rate is exceeded, long-term damage of the ecosystem may result. The scarcity of accumulation analyzes a resource or a carrier that is exhausted after a finite number of uses (e.g. fossils, or a landfill).

Social consequences, time pressure and less job enrichment due to monotonous work processes should also be evaluated. Even business shows the wisdom “More haste, less speed.” The time span needed to get decision tools into use on a standardized level is much longer than assumed. It took 30 years for the net present value to be applied by the majority of the companies. [8] This process of incubation is necessary, especially for complex facts.

[6] Backhaus, K.; Bonus, H. (Hrsg.): Die Beschleunigungsfalle oder der Triumph der Schildkröte. 2., erweiterte Aufl. Stuttgart 1997.
[7] cf von Braun, C.-F. (1991b): Die Beschleunigungsfalle in der Praxis, in: Zeitschrift für Planung, 2. Jg., 1991, Heft 3, pp 267ff.
[8] Weber, J. (2002): Betriebswirtschaftliche Instrumente – Segen oder Fluch? In: Kostenrechnungspraxis, 46. Jg., 2002, H. 6, S. 339-340.

The acceleration trap as an expression of economic consequences has been partially perceived by companies. However, ecological and social consequences are not yet recognized.

4 Sustainable management instead of acceleration: deceleration as a win-win strategy of companies

In this section we will show which strategies may be applied to realize deceleration in companies. Deceleration processes will only be accepted if they are win-win strategies, that means if they have a positive impact on ecological targets and foster company interests at the same time. This is the crucial point, as companies often do not know all their interests, especially if long-term interests are taken into consideration.

First of all we want to define "deceleration in production": Deceleration in production is the intended retardation of processes on all levels of the value chain that lead to slower material, energy and information flows. Von Braun uses the image of a water tube for the relationship of process and speed, i.e. its direction, its speed and its volume. [9] This picture helps to explain the three determinants of the deceleration of processes:

Direction: In which direction does the material flow go, i.e. are resources used or generated?

Speed: How often is there a material flow per unit of time, i.e. how fast are the resources used or generated?

Volume: How big is the material flow, i.e. how many resources are used or generated per process?

Deceleration can be implemented by the consumers, or the company itself. Consumption can be changed by conservatism, leapfrogging, or time investments:

[9] Vgl. von Braun, C.-F. (1991a): Die Beschleunigungsfalle, in: Zeitschrift für Planung, 2. Jg., 1991, Heft 1, S. 51-70.

Conservatism is characterized by preferences for goods that can be used for a longer period of time. It is a consequence of experienced negative effects of progress and acceleration. For example, the porcelain company in Meissen nearby Dresden follows a strategy to preserve tried and tested forms and holds a stock of forms dating back to the 18th century.

Shorter innovation and product life cycles combined with price decreases, such as in information technology, may result in slapping one or more technology steps (leapfrogging). The consumers decide against the new technology available on the market and focus on future developments (for example slapping one release of a software product). This behavior is influenced by the degree of diffusion and maturity of the new technology and by consumer expectations about upcoming technologies. Leapfrogging is restricted by the fact that capacity and efficiency of the existing technology influence the new technology. Leapfrogging is an alternative if the time span for the adaptation of the system (training etc.) is greater than the time span for the introduction of the new technology.

A third strategy for deceleration by consumers is time investment. Time investments mean to abstain from possible time savings. Deceleration is the difference between the time expenses for a time saving alternative (e.g. fast food) and a time ineffective alternative (e.g. candle light dinner). Sufficiency is a prerequisite for this strategy and turns upside down the so far accepted logic “The faster the better”. Other examples can be found in tourism.

Companies can apply two strategies: deceleration trusts and eclecticism:

Deceleration trusts aim at a common deceleration of all competitors of a market. Longer life cycles or innovation cycles are agreed upon. This self-restriction, e.g. in Japanese chip production, is a reaction to threatening efficiency losses and long amortization periods for newly developed products (cf Deutsch, C. (1995), p. 84).

Eclecticism – often with a negative connotation – stands for the development of new products out of old ideas. Combined with deceleration eclecticism stands for the creation of new products and services out of existing components, that are refined, improved and adapted to individual needs.

This enables the so far “not fully used” characteristics of existing products and services to be used, and totally new developments become obsolete. This can be combined with conservatism and ends up in an increase in flexibility. Differentiation is the strategy applied here.

Concluding, time target optimization can be structured as follows: The period of development must follow the target of a maximal innovation ability. For the production the principle of optimal supply performance can be applied. To meet the functions optimally for the use phase, a maximal use intensity must be reached. And last but not least disposal has to take into consideration the function of the environment.

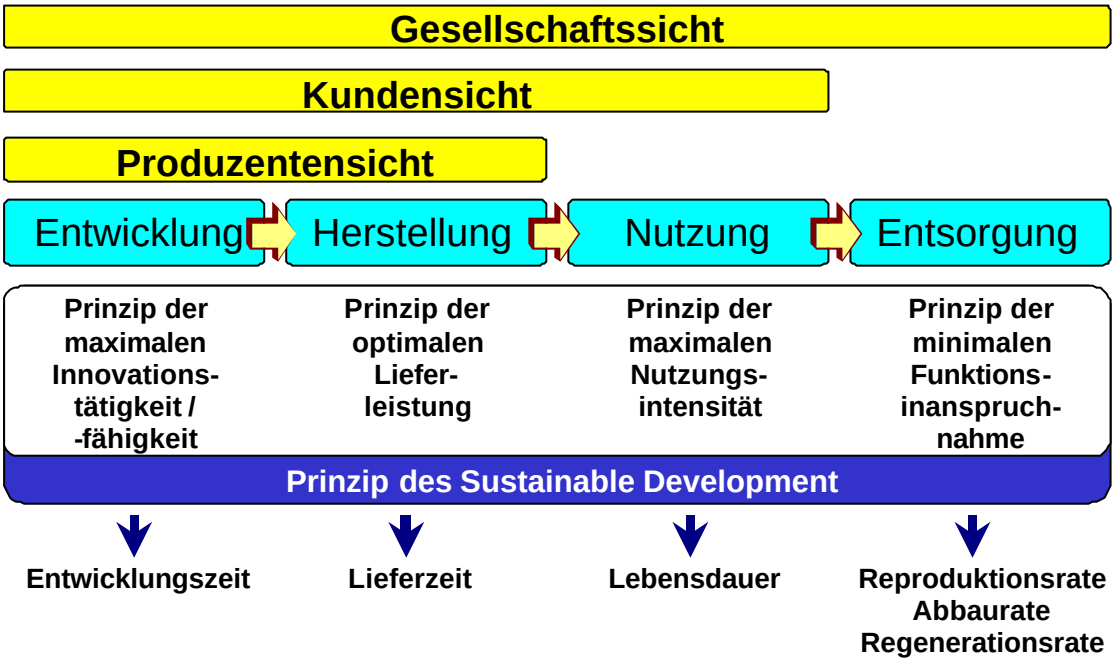


Figure 2: Principles of time target optimization

Notions in the Chart: Society view, consumer view, producer view, development, production, use, disposal, principle of maximal innovation, principle of optimal supply performance, principle of use intensity, principle of minimal use of environmental functions, development time, delivery time, useful life, reproduction rate, decomposition rate, regeneration rate.

5 Is there a preference for deceleration? Measuring the willingness to pay for deceleration[10]

In the previous four sections of this paper different theoretical arguments and empirical material on the issue of deceleration mainly from the producers' sphere have been presented. The question of whether there is also a preference for deceleration in the population generally, and if so, how can it be measured exactly, has yet to be answered. There are several approaches that can be used to analyze this question, for instance, demoscopic studies by questionnaires, or by econometric studies using statistical data. The procedure used in this study will be to measure the preference for deceleration by the agents' willingness to pay for deceleration in laboratory experimental settings.

We designed three experimental settings which we have conducted as class room experiments with students from an advanced course on environmental management at the Technical University of Dresden during the winter term 2003/2004. The **first design** "Mental Exercises" tests the willingness to pay for deceleration in a competitive environment where participants could win money by successfully solving a series of mental exercises under time pressure. The individual pay-off of each participant depended on both her individual score rank and her speed rank. After each one of the six mental exercises every participant could individually decide to continue immediately, or take a break with free refreshments, snacks, and soft drinks offered by the experimentator team. The **second and third** experiment "Life Cycles of Personal Computers" and "More Stress for Higher Income" were designed as questionnaires. The participants had to imagine a virtual decision situation which was characterized by a trade-off between deceleration on the one hand and income, or technological progress and

[10] The authors gratefully acknowledge financial support by the "Förderverein der Fakultät Wirtschaftswissenschaften der Technischen Universität Dresden" and thank Yvonne Gerschwitz for support in the realization of the experiments and preparing the diagrams.

comfort, on the other hand. Of course, we did not communicate the names of our experiments to the participants before or during the experiments.

We will proceed now in the following way. For each one of the three experimental settings its experimental design is first described in greater details (subsection 1), then the empirical findings of the experimental runs are reported. We will present the data as well as quantitative evaluations of the data (subsection 2), and finally we will comment on the experimental evidence (subsection 3). In a résumé we finally will summarize the conclusions from the experiments.

Experiment 1 "Mental Exercises"

5.1.1 Design

The participants got the following **Instructions:**

"We will now give you a sequence of six mental exercises - one after the other - each of which yields a certain number of scores which are written on the sheet. After each exercise you can choose to continue immediately with the next one, or take a refreshment break during which we will offer you coffee, tea, cold soft drinks, and snacks for free. After finishing your exercises we will offer you no more refreshments.

Your final pay-off will depend on both the scores you will receive and your speed rank as follows:

Score rank pay-off:

1 – 3: Euro 4; 4-6: Euro 3; 7-9: Euro 2; 10 – 12: Euro 1.

Speed rank pay-off:

1 – 3: Euro 2; 4-6: Euro 1,50; 7-9: Euro 1; 10 – 12: Euro 0,50.

Your total pay-off will be calculated as the sum of the pay-offs from your score rank and your speed rank. Thus your maximum possible individual total pay-off is Euro 6, the minimal is Euro 0."

5.1.2 Empirical findings and results

The experiment was conducted in January 2004 with 21 students from an advanced course on environmental management at the Technical University of Dresden. A pilot experiment with 23 students of an advanced course on experimental economics at the Technical University of Dresden had been conducted in December 2003 with a slightly different design (cartoons instead of refreshments during breaks, higher possible maximum pay-offs, different pay-off tables) and had shown qualitatively similar evidence (cf. Table 4 and Figure 6 below). We took care not to mention the issue of deceleration during the course work in the weeks before each experiment.

In the following analysis we will confine ourselves to the January 2004 experiment. On the basis of our empirical findings we are going to analyze the following question which is central to our approach: Is there a willingness to pay for deceleration in the subject pool observable?

The following three tables give a complete account of the empirical observations in this experimental design.

speed rank	score rank	total pay-off	number of breaks
1	5	5	2
2	15	2	1
3	19	2	2
4	16	1,5	1
5	13	1,5	1
6	1	5,5	1
7	4	4	1
8	6	4	1
9	18	1	0
10	14	0,5	1
11	2	4,5	1
12	11	1,5	2
13	12	1	2
14	7	2	2
15	9	2	2
16	8	2	1
17	10	1	1
18	21	0	5
19	17	0	3
20	3	4	0
21	20	0	2

Table 1

score rank	speed rank	total pay-off	number of breaks
1	6	5,5	1
2	11	4,5	1
3	20	4	0
4	7	4	1
5	1	5	2
6	8	4	1
7	14	2	2
8	16	2	1
9	15	2	2
10	17	1	1
11	12	1,5	2
12	13	1	2
13	5	1,5	1
14	10	0,5	1
15	2	2	1
16	4	1,5	1
17	19	0	3
18	9	1	0
19	3	2	2
20	21	0	2
21	18	0	5

Table 2

total pay-off rank	speed rank & score rank	total pay-off
1	6 & 1	5,5
2	1 & 5	5
3	11 & 2	4,5
4a	7 & 4	4
4b	8 & 6	4
4c	20 & 3	4
5a	2 & 15	2
5b	14 & 7	2
5c	16 & 8	2
5d	3 & 19	2
5e	16 & 9	2
6a	4 & 16	1,5
6b	5 & 13	1,5
6c	12 & 11	1,5
7a	9 & 18	1
7b	13 & 12	1
7c	17 & 10	1
8	10 & 14	0,5
9a	19 & 17	0
9b	21 & 20	0
9c	18 & 21	0

Table 3

To analyze our central question of whether there is a willingness to pay for deceleration in the subject pool observable from the data, we have first to interpret this question in the context of the observable data. Since the number of breaks taken by a subject naturally influences her speed rank more or less negatively, we interpret the number of breaks taken by a subject as revealing her preference for deceleration. To be more precise, we

interpret taking one more break as exhibiting a certain willingness to pay for a worse speed rank and consequently a smaller total pay-off. Thus the central question of our analysis reads as: How do a subject's breaks correlate with her total pay-off?

Let us proceed step by step. In a first step we study how the speed rank correlates with the number of breaks. Figure 3 below gives a linear regression estimate for this question.

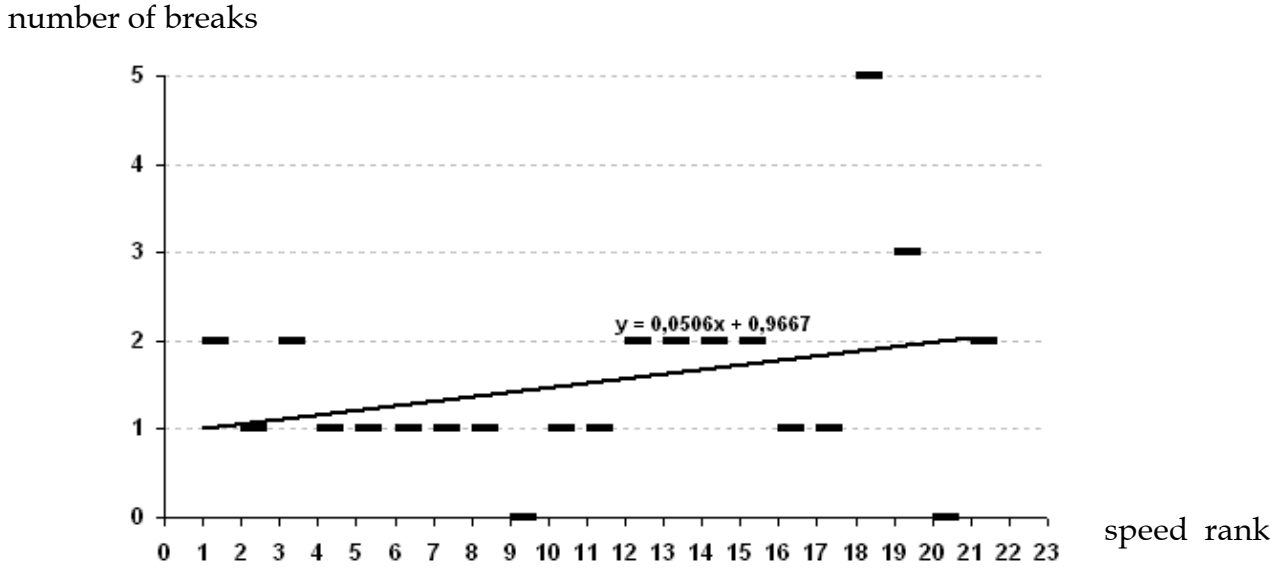


Figure 3

The correlation coefficient r is 0.2915, the standard deviation S_x = 6.06 and S_y = 1.05 (x speed rank, y number of breaks).

Figure 4 shows a linear regression between the speed rank as the independent variable and the total pay-off as the dependent variable.

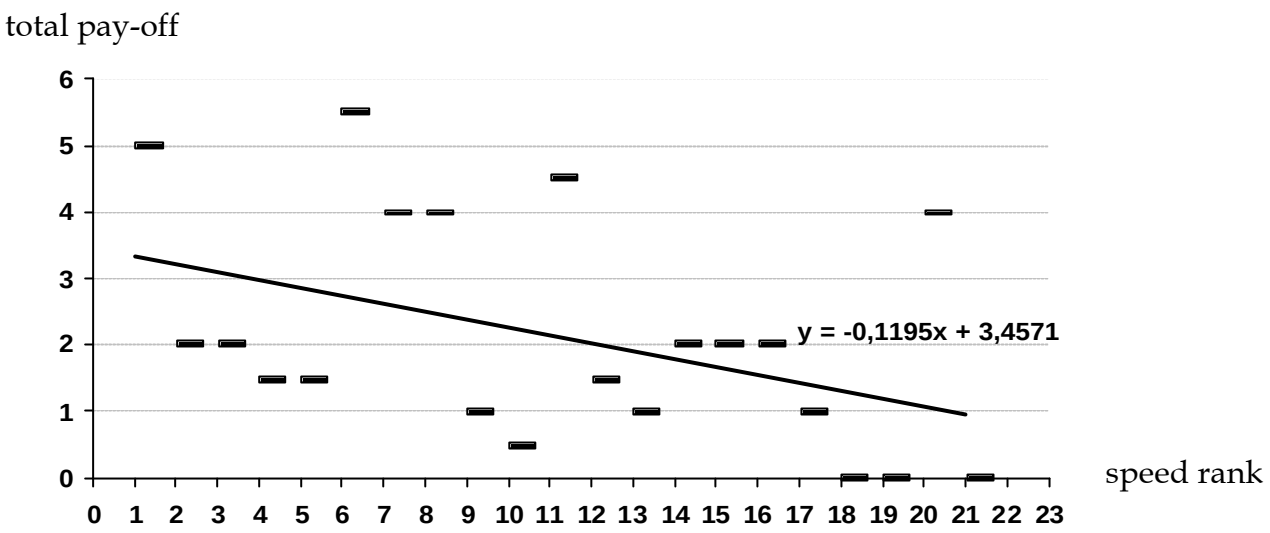


Figure 4

The correlation coefficient is –0.44, the standard deviation S_x = 6.06 and S_y = 1.65 (x speed rank, y total pay-off).

For the sake of completeness Figures 5 and 6 and Table 4 show the correlation between the observed score ranks, breaks, and total pay-offs.

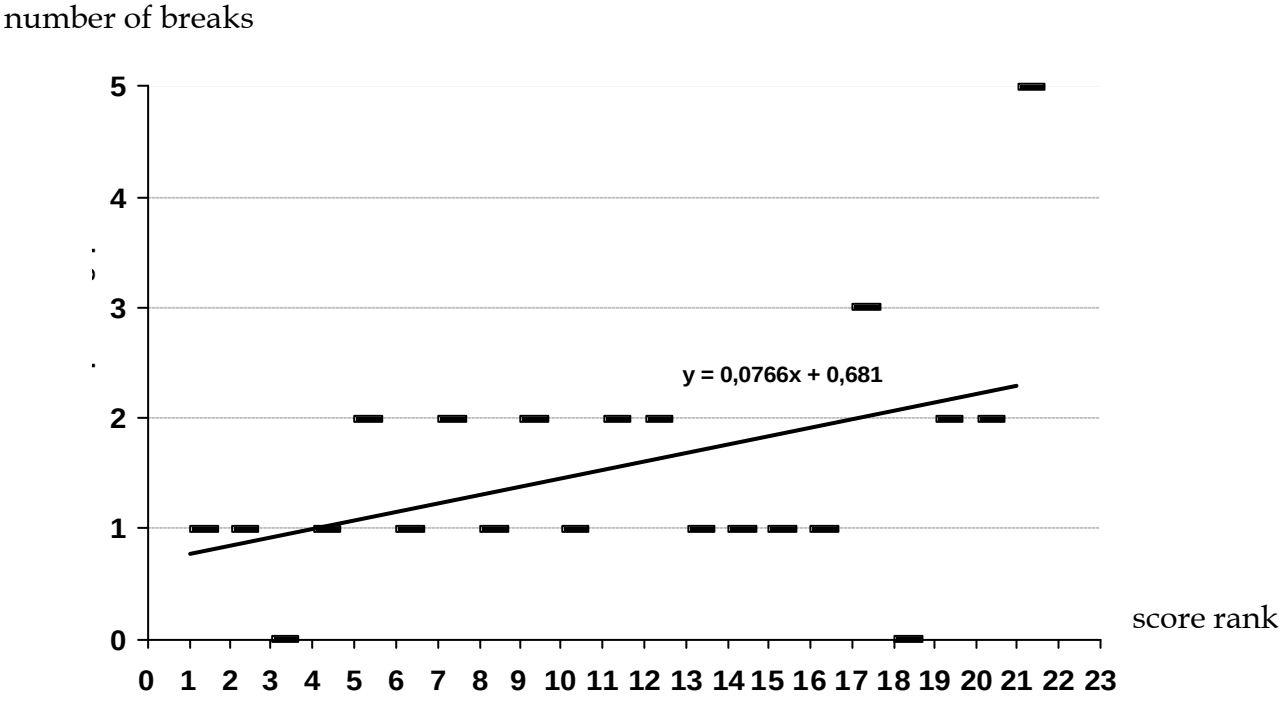


Figure 5

The correlation coefficient is 0.44, the standard deviation S_x = 6.06 and S_y = 1.05 (x score rank, y number of breaks).

score rank	Total pay-off	
	December 2003	January 2004
1	**4**	**5,5**
2	**8**	**4,5**
3	**7**	**4**
4	**6**	**4**
5	**5**	**5**
6	**6**	**4**
7	**4**	**2**
8	**2**	**2**
9	**3**	**2**
10	**3**	**1**
11	**1**	**1,5**
12	**1**	**1**
13	**0**	**1,5**
14	**0**	**0,5**
15	**0**	**2**
16	**0**	**1,5**
17	**4**	**0**
18	**1**	**1**
19	**1**	**2**
20	**0**	**0**
21	**0**	**0**
22	**4**	**-**
23	**0**	**-**

Table 4

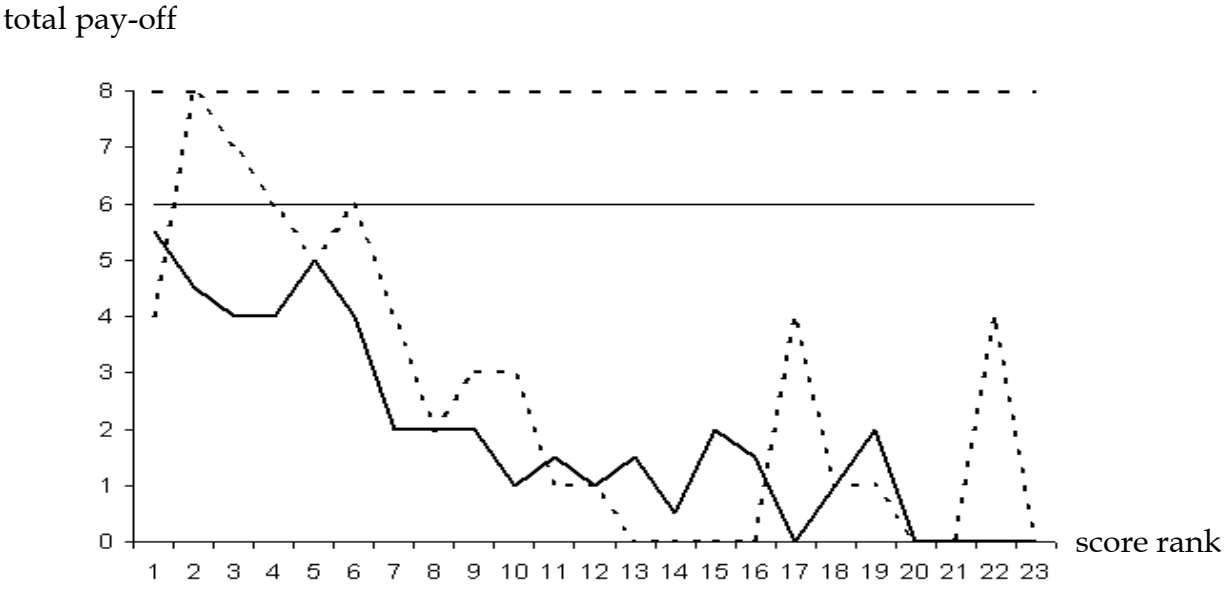


Figure 6

The unbroken line maps the data from the January 2004 experiment, the unbroken horizontal line indicates the maximum limit of the total pay-off of 6. The dotted lines indicate the corresponding data for the December 2003 experiment with a modified design as mentioned above.

5.1.3 Comments

Experiment 1 was an interactive group experiment where the outcome of a participant's decision was dependent on the decisions of the other participants. Let us look closer now to the central question of how conclusions can be drawn from this design and its empirical evidence about the subjects' possible willingness to pay for deceleration. At first sight the answer seems to be clear: From the pay-off rule in the instructions it follows that a lower speed rank yields a lower pay-off. Furthermore, a subject's speed rank is naturally negatively influenced by the number of breaks she takes. Thus one might conclude from this that the more breaks a subject takes the larger is her willingness to pay for deceleration.

Looking at the regression diagram of Figure 3, the idea that a subject's speed rank is negatively influenced by the number of breaks she takes is in fact (weakly with r = 0.291) supported. The problem with the argument of the previous paragraph is, however, that it is not clear from the outset that a worse speed rank caused by a larger number of breaks actually is positively correlated with a lower total pay-off over the whole empirical data set. This comes from the fact that a subject's total pay-off is composed of two components – the speed rank pay-off and the score rank pay-off. There might be some other effects interfering with the negative pay-off effect of a larger number of breaks so that in the data there is no positive correlation between a larger number of breaks and a smaller measurable pay-off. Moreover, it is not even clear that a worse speed rank is in fact correlated with a larger number of breaks. It might be the case that the undeniably negative influence of a larger number of breaks is overcompensated by an increased speed of the subject in the succeeding exercise rounds.

This means we have to investigate whether there is a positive correlation between a larger number of breaks and a smaller pay-off. For our later conclusions, however, the following statement is important: It appears to be plausible to assume that subjects *expect* that a larger number of breaks causes a smaller total pay-off. Consequently, a larger number of breaks

taken by a subject exhibits her *self-perceived* willingness to pay for deceleration.

Figure 4 shows that this in fact has been a meaningful assumption: From correlation analysis it follows that a worse speed rank is also, in the whole data set, positively correlated with a lower total pay-off (correlation coefficient r = -0.44). Thus we can conclude that in the subject pool there are participants with a preference for deceleration for which they are willing to forego a better performance in speed, and thus forego parts of their possible pay-off.

But how can we measure the willingness to pay for deceleration? A simple idea is to count the numbers of individually taken breaks. Then we get the following result: From the maximum possible 5 x 21 = 105 breaks, the participants in total realized 32, i.e. approximately 30% or almost one third. Only two of the 21 participants took no break at all. 10 subjects took one, 7 two, 1 subject took three, and 1 subject took five breaks during the whole session. From the snacks offered, the sweets were favoured by the subjects, hot drinks such as coffee, or tea, were less consumed, probably because it took a longer time to drink them than to eat a snack. 17 subjects commented positively on the breaks, 5 subjects had fun with the experiment, 12 wrote that they “felt well”, but all subjects emphasized in their comments that the mental exercises meant stress for them.

This evidence is reinforced by the fact that there is not only a positive correlation between a worse speed rank and a larger number of breaks, but also a positive correlation between a worse score rank and a larger number of breaks a subject took as Figure 5 shows. An explanation for this could be a negative effect of breaks on a subject’s concentration and ambitious attitude towards the whole experiment. The other direction of causality may also be true, which means that there is a self-preselection effect of subjects with low ambition which is coupled with a greater inclination to take a break. In any case, though this result actually reinforces the negative influence of breaks on the performance and thus on an individual’s total pay-off, this correlation cannot be assumed to be part of the subjects’

expectations so that it does not play a role in the analysis of the question of whether subjects have a preference for deceleration, or not.

Experiment 2 "Life Cycles of Personal Computers"

5.2.1 Design

The participants got the following **Instructions:**

"Imagine you need a PC/laptop of a middle technological quality for professional reasons and you have to pay for it from your private money. Which one of the following two technological development scenarios A and B for PCs/laptops of a middle technological quality in the following diagram would you prefer?

scenario A = full lines

scenario B = dotted lines

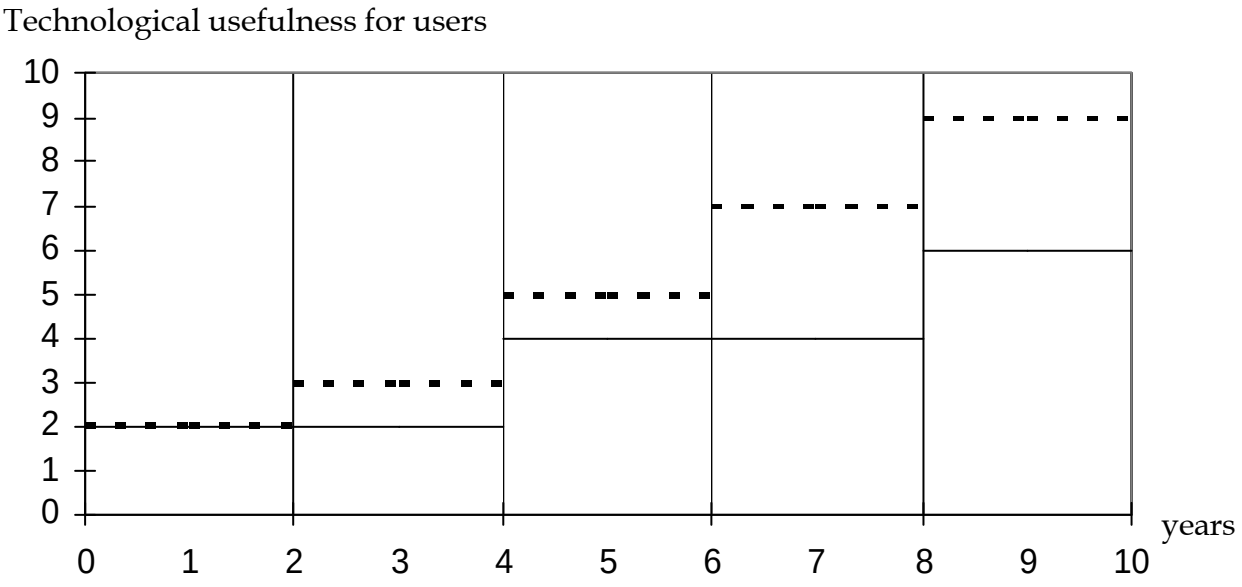


Table 5

Please, describe the reasons for your decision."

5.2.2 Empirical findings and results

The experiment was conducted in January 2004 with 21 students from an advanced course on environmental management. Scenario A stood for the decelerated, scenario B for the accelerated case. The empirical findings were as follows:

No. of subject	chosen scenario	
1.		B
2.		B
3.		B
4.		B
5.	A	
6.		B
7.		B
8.	A	
9.	A	
10.	A	
11.	A	
12.	A	
13.	A	
14.	A	
15.	A	
16.	A	
17.		B
18.		B
19.	A	
20.	A	
21.	A	

Table 6

Thus the distribution of absolute numbers of choices looks like Figure 7.

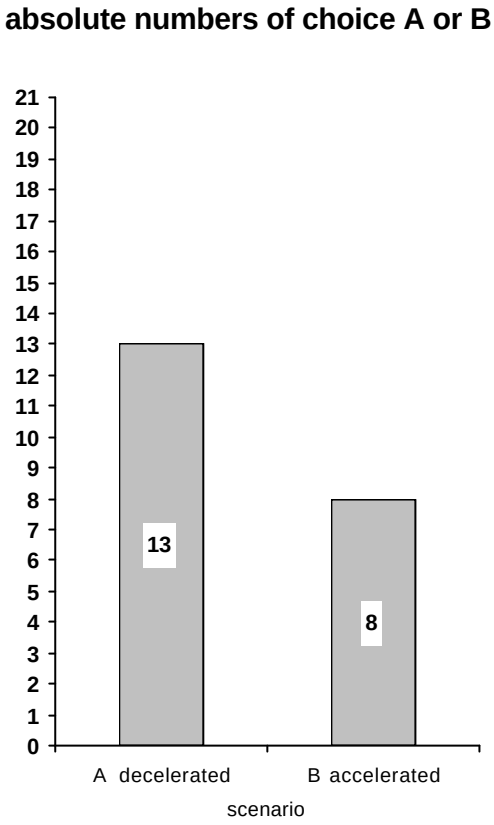


Figure 7

The distribution of relative numbers (percentages) of choices is shown by Figure 8.

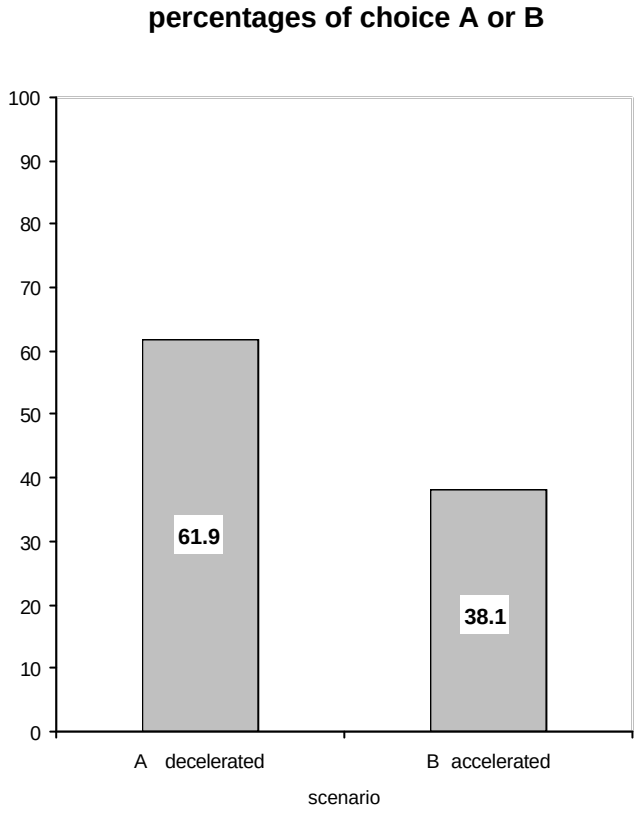


Figure 8

5.2.3 Comments

Experiments 2 and 3 were not interactive group experiments like experiment 1, but questionnaires. In experiment 2 our findings show an even stronger preference for deceleration than in experiment 1: almost two thirds (61.9%) of the subjects chose the decelerated scenario.

From the answers to the last question asking why the participants chose scenario A, or B, respectively, we have learnt the following: Most participants had understood the decision situation properly and commented on their individual decision in a comprehensible way as expected: A-type subjects preferred fewer changes of their laptop over the course of time and were not interested in accelerated technological progress since, in their opinion, many functions of a computer are not used by normal users. B-type subjects on the other hand stressed the necessity of a high technological standard of a laptop deployed for professional use. In both the A-choice- and the B-choice-

party there were also some subjects who did not comply with the instructions, but referred to considerations which were not included in the instructions. Typically subjects of this type choosing the accelerated scenario B argued that they would prefer to lease the laptop/PC instead of buying it as the instructions say. Subjects of this erroneous type who chose the decelerated scenario A typically argued that they would use a laptop for private purposes only, though in the instructions we clearly told them that the laptop was needed for professional reasons.

In the design of Experiment 2 we deliberately did not speak about prices for PCs or laptops. In a former pilot experiment of this type we found that if we did speak about prices, the participants primarily calculated their monetary advantage from the slower or faster development scenario. The aspect of deceleration became secondary in their decision. This might be interpreted as a low significance of the deceleration issue in the eyes of subjects. Following another interpretation, which in our eyes is more relevant, one could argue that students of business administration are specially trained in calculating monetary advantages. Thus they perceived our decision situation as one of optimizing the monetary payoff instead of taking the "soft" criterion of deceleration into account.

Experiment 3 "More Stress and Higher Income"

5.3.1 Design

The participants got the following **Instructions:**

"Imagine you have successfully passed the exam at the Technical University of Dresden and you have already applied for a professional position in several firms. Two firms A and B will accept you:

1. Firm A primarily expects you to be flexible and not geographically restricted, to accept irregular working hours, including being available to

work also at Sundays and holidays if necessary, to be flexible with your holidays and always to accommodate to the firm´s requirements.

2. Firm B primarily expects you to be flexible and open minded for further qualification and offers you regular working hours. You can furthermore plan your holidays in coordination with your colleagues in advance.

Which one of the two firms A and B will you choose in the each one of the following three cases?:

(1) You will earn Euro70.000,- per year in firm A, and Euro40.000,- in firmB.

(2) You will earn Euro60.000,- per year in firm A, and Euro40.000,- in firmB.

(3) You will earn Euro50.000,- per year in firm A, and Euro40.000,- in firmB.

Please, write down the reasons for your decision."

5.3.2 Empirical findings and results

The experiment was conducted in January 2004 with 24 students from an advanced course on environmental management. Firm A stood for the accelerated, firm B for the decelerated case. The participants answered in the following way:

Running number of participant	Case		
	1	2	3
1.	B	B	B
2.	B	B	B
3.	B	B	B
4.	B	B	B
5.	A	A	A
6.	A	A	B
7.	A	A	A
8.	A	B	B
9.	A	A	B
10.	A	A	B
11.	B	B	B
12.	A	B	B
13.	B	B	B
14.	A	A	B
15.	B	B	B
16.	A	A	B
17.	B	B	B
18.	B	B	B
19.	A	A	B
20.	B	B	B
21.	A	B	B
22.	B	B	B
23.	A	A	B
24.	A	A	B

Table 7

This means there were four different patterns of answers observable in our experiment:

(1) A - (2) A - (3) A; A-A-B; A-B-B; B-B-B

Thus the empirically observed answer patterns are “monotonic” with respect to the intruding of “B” from the right end of the triple. However, further non-monotonic patterns are logically possible such as BAB, or BBA, for instance. Why did they not occur in the empirical findings? The answer is clear: Due to the given sequence of the three possibilities (1) – (2) – (3) in the experimental design, any answer exhibiting a non-monotonic pattern like BAB or BBA would be inconsistent and irrational since the incentive to choose the lower income firm B is the greater the smaller is the income difference, i.e. the higher is the case number.

The percentage of each one of the four observed patterns is presented in Figure 9:

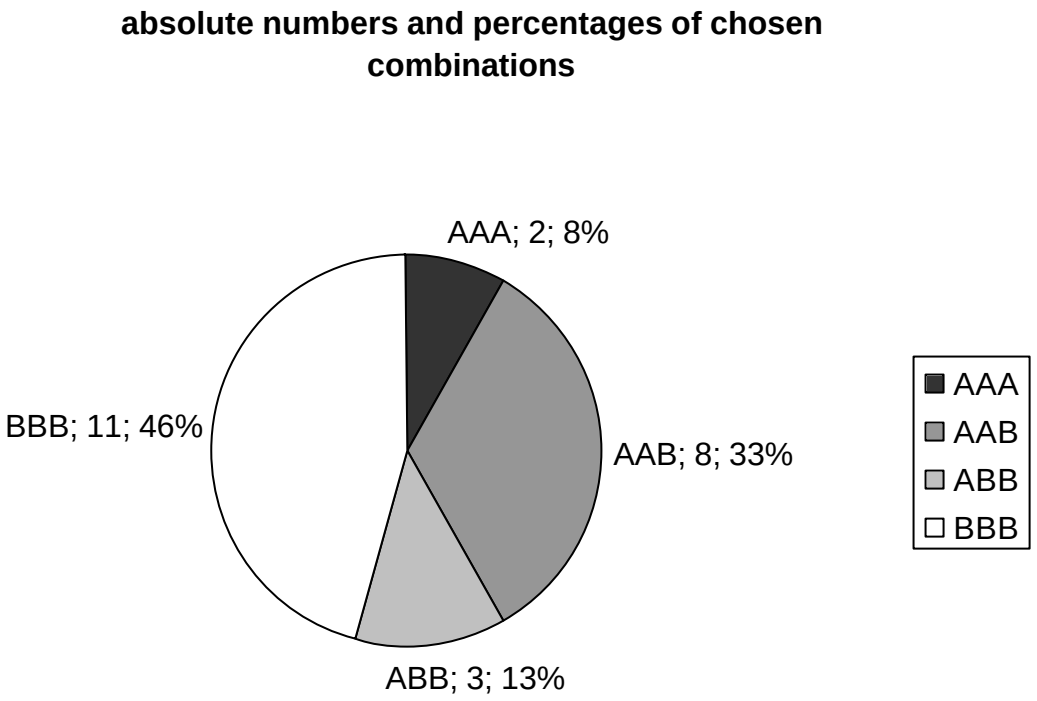


Figure 9

The percentages of firm A choices or firm B choices in each of the three cases (1) to (3) are presented in the following Tables 8 and 9 and the Figures 10 and 11:

	Percentage		
Firm	Case 1 30,000	Case 2 20,000	Case 3 10,000
A	52.02	39.92	8.06

Table 8

	Percentage		
Firm	Case 1 30,000	Case 2 20,000	Case 3 10,000
B	23.39	29.98	46.63

Table 9

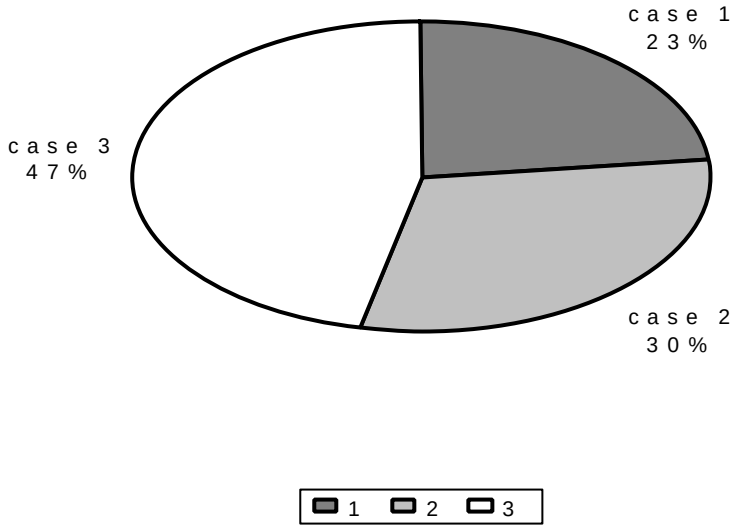


Figure 10

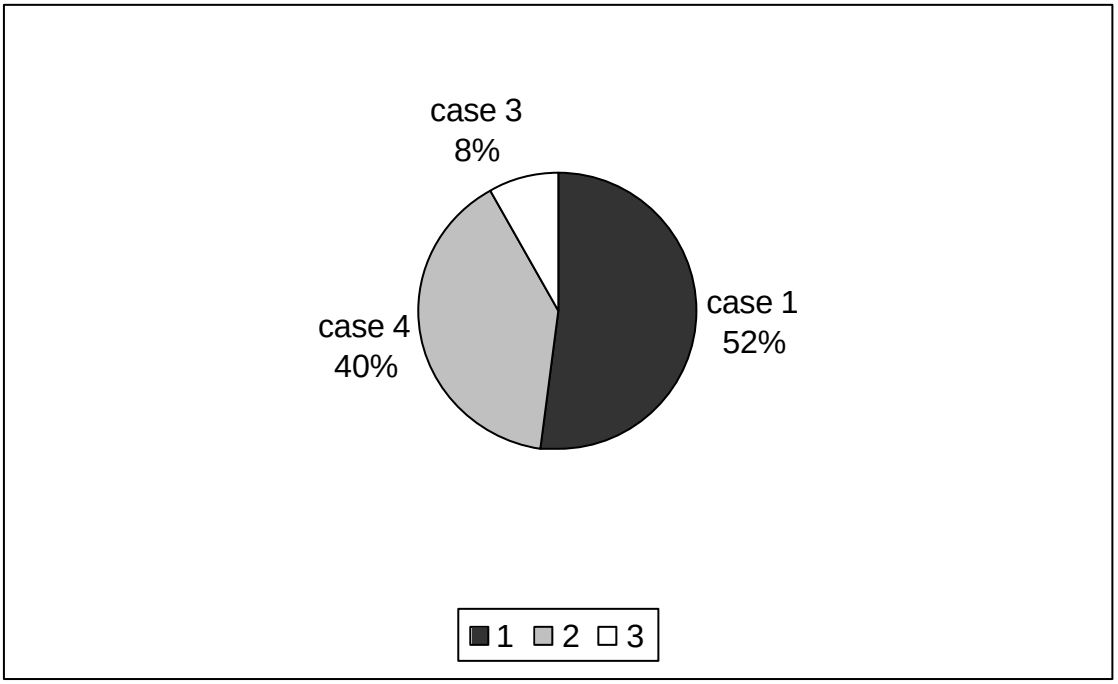
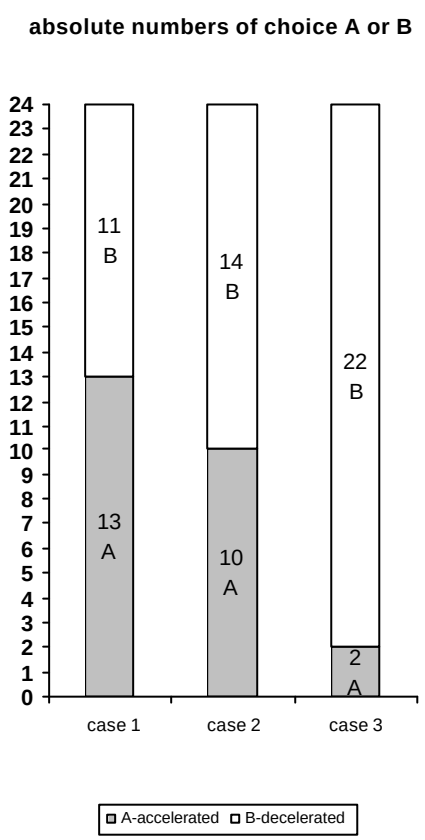


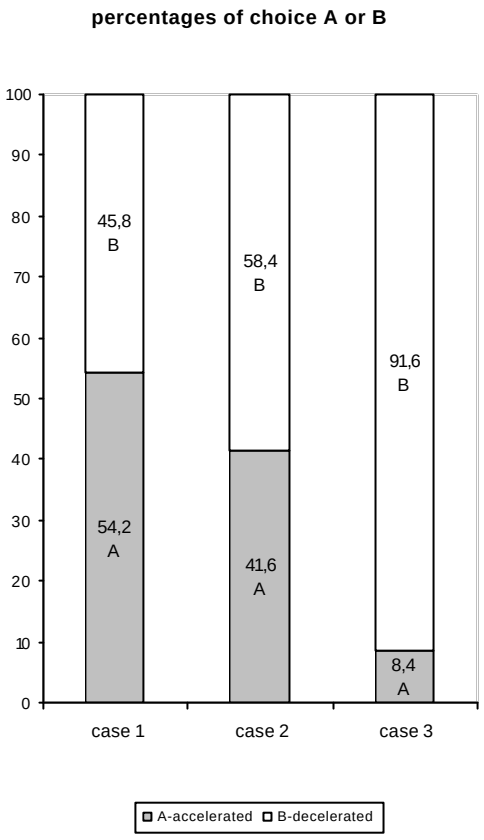
Figure 11

Figures 12 and 13 show a different representation of these empirical findings:



Absolute number of choices A or B

Figure 12



Percentage of choices A or B

Figure 13

5.3.3 Comments

In this experiment we also see that participants have a clear preference for deceleration. Almost half of the subject pool (46 %) chose the decelerated working conditions of firm B in all three relative income cases. In two of three income scenarios the majority chose alternative B – foregoing a significantly higher amount of income (□10,000 or □20,000 p.a.). Even in the first case where the distance between income in the accelerated and the decelerated scenario is □30,000 the number of A- and B-choices is almost equal (54.2% chose the accelerated scenario A) whereas in the case with the smallest income difference of □10,000 p.a. almost all subjects chose the decelerated scenario (91.6%). This means a notably high willingness to pay for deceleration which, moreover, increases with lower opportunity costs.

The comments by the participants illustrate and corroborate this revealed monotonically increasing willingness to forego the higher income alternative A for the alternative B, the smaller was the income difference between the two alternatives. As expected the main reasons for choosing the decelerated alternative B were more leisure time and more time for family and social activities, less working stress, and better chances for further education.

5.4 Résumé of the experimental evidence

We have designed and conducted three laboratory experiments for a better understanding of whether subjects have a preference for deceleration at all, and if so, how the preference for deceleration can be measured. We tried to analyze these questions by confronting subjects with different trade-off situations between an accelerated and a decelerated alternative and different kinds of opportunity costs of the decelerated alternative. Only the first one of our three experimental settings was an interactive group experiment where the personal outcome of each participant was interdependent of the decisions of all other subjects. Experiments 2 and 3 were conducted using questionnaires.

However, as we have seen in our findings in all three of our experimental settings, we observed a clear preference by the subjects for deceleration. As could be expected, the subjects throughout all of our experiments showed a preference for deceleration with an increasing willingness to pay with decreasing opportunity costs. These opportunity costs were: a possible higher speed and score rank and accordingly a higher monetary pay-off in the first experiment, a more quickly increasing technological usefulness of PCs/Laptops in the second, and a higher income in the third experiment. Deceleration was represented by refreshment breaks in the first, a slower increase of technical usefulness for users of a new technology application in the second, and more comfortable time management and conditions on the job in the third experiment.

Usually criticisms of laboratory experiments in social sciences pertain to the choice of the subject pool. In our experiments the subject pools indeed were formed somewhat selectively by students from an advanced course on environmental management at the Technical University of Dresden. The criticism consequently might be that young people without job and family responsibilities will, of course, have a greater willingness to pay for a more decelerated way of living than people with a job and people raising kids, for instance. Or in other words, students normally experience a phase of their lives in which the social obligations are particularly low compared with later life phases, and thus may tend to underestimate income and to overestimate own well-being.

We are certainly well aware of the fact that the selection of our subject pool might have had a biasing effect in the direction of greater willingness to pay for deceleration than subject pools from other parts of the population, but we are convinced that, in any case, it is interesting to see what young people who are passing academic studies and consequently have a great chance of later belonging to the elite of the society think about the question deceleration. Nevertheless, it is desirable to repeat the experiments with subject pools selected from other parts of the population, for instance parents, workers, employees, independent business men and women, and also high school pupils. The latter group is of particular interest since they,

like university students, will carry over their present preferences with respect to acceleration/deceleration in some way or other to the future and will accordingly shape the future societal and working reality.

Summary and outlook on future research

The central aim of our present study has been to verify that deceleration is not only a fashionable issue of current public discussion, but also a real measurable phenomenon. In our study we show two results by conceptual considerations and empirical findings: Deceleration is a win-win strategy for sustainable management, and furthermore there is significant experimental evidence of a preference for deceleration in the society. Companies will have to face the challenge to merge time targets of consumers and the environment with their own targets to reach time target optimization. Besides theoretical analyses concerning the implementation and the effects of deceleration, empirical studies will become more relevant. Together with case studies, experiments that allow the analysis of effects in laboratories - so to say "under a magnifying glass" - will become more important. Due to the rapid development of experimental economics and existing strategic games, science is well prepared for this new task. For this the vital field of experimental economics and the older business planning games provide a research infrastructure, which, however, to our knowledge has not previously been used for analyzing the issue of deceleration.

The experimental evidence we have found here must, however, be corroborated by later repetitions of our experiments using different subject pools and probably also new treatment variants. We can, however, already conclude from our experiments here that there is a significant preference for deceleration in the society which manifests in quite different contexts, i.e. experimental settings, and which can furthermore be measured by the agents' willingness to pay in trade-off-situations where more deceleration has certain opportunity costs. By this we mean values which are generated by acceleration: more income, faster technological development, less

production time, more output, and so on. It has been the main concern of this study to analyze whether a continual increasing and intensifying of these traditional targets truly generate increased utility and wealth, which they are assumed to do. In fact, our findings strongly support the argument from the discussion on the topic of happiness that traditional economic targets like those just mentioned must be reinterpreted more comprehensively to maintain their function as meaningful notions of human life.

This article shall end with a legend about Pablo Picasso. Being asked by a collector to paint a picture for him, Picasso drew some strokes within one hour and said: The price is $100,000. The collector thought this to be impertinent and complained: “For one hour of work that much money?” But Picasso replied: “That didn´t me take one hour, but 80 years.” And he was correct. He collected 80 years of experience and created a brand that maintains its high value even now.

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