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**Corporate Capital Budgeting –
Success Factors from a Behavioral Perspective**

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Success Factors from a Behavioral Perspective

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List of Abbreviations

ARR	Accounting Rate of Return
CAPM	Capital Asset Pricing Model
CEO	Chief Executive Officer
NPV	Net Present Value
IRR	Internal Rate of Return
WACC	Weighted Average Cost of Capital

1 Introduction

Capital budgeting or investment decisions have an essential influence on companies' long-term performance.¹ They are fundamentally based on projections / assumptions on market developments and other factors, on which the decision makers only have limited direct control. Instead of a rational choice, capital budgeting might even be regarded as a process of reality construction.² Research suggests that decision makers have only limited control over their own perception biases in this construction process.³ Post-completion auditing of capital investments is reported to be common in large companies and to serve mainly organizational learning purposes.⁴ Its mere existence, however, might be interpreted as the response to a recurring number of unsatisfactory decision results.

Behavioral research focuses on how individuals make decisions and influence other individuals.⁵ One particular form of this research area consists of studying systematic biases in decision making,⁶ developing links between decision making, cognitive science and management / finance / accounting⁷ and depicting heuristics presented under the titles of behavioral accounting or finance.⁸

It is in this perspective that this paper intends to answer the following research question: What are behavioral determinants for a successful capital-budgeting decision process?

In order to answer the research question capital budgeting will be defined against the backdrop of the body of literature of behavioral accounting and behavioral finance. For reasons of analysis, the capital budgeting process is divided into five different stages, for which insights from behavioral corporate finance and implications on budgeting from the behavioral accounting view will be synthesized. Consequently, the authors identify and discuss three behavioral success factors (reflective prudence, critical communication and outcome independence) for the five stages of the capital budgeting process.

¹ Cf. Eggers, J. (2012).

² Cf. Morgan, G. (1988).

³ Cf. Russo, E. / Schoemaker, P. (1992), p. 8-10.

⁴ Cf. Huikku, J. (2008), p. 140.

⁵ Cf. Birnberg, J. / Ganguly A. (2012), p. 1.

⁶ Cf. Kahneman, D. / Tversky, A. (1973).

⁷ Cf. Peters, J. (1993).

⁸ Cf. Lingnau, V. (2004), p. 731 for a German Management Accounting («Controlling») concept informed by cognitive sciences; cf. Gerling, P. (2007) and Lingnau, V. / Walter, K. (2011) for a German perception on psychological paradigms in German Management Accounting research.

2 Definition of Key Terms in the Literature

2.1 The Behavioral Finance and Behavioral Accounting Research Areas

Two main schools of thought influence the area of behavioral capital budgeting: behavioral finance and behavioral accounting, since capital budgeting is part of both, accounting and finance (corporate finance) areas as illustrated in figure 1.

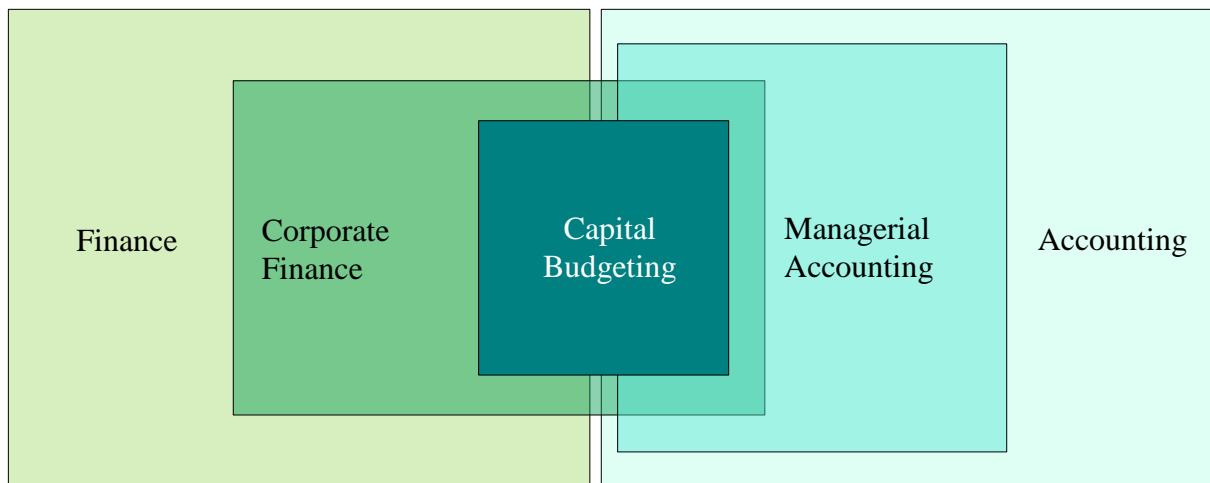


Figure 1: Capital budgeting as intersection of finance and accounting

Behavioral finance examines the influence of psychology on financial decision making of human beings in households (individuals), markets (investors), and organizations (managers).⁹ A part of it, behavioral corporate finance, researches irrational investors and especially, irrational managers.¹⁰

In opposite to modern (or neoclassical) finance prevailing since the 1950s, behavioral finance does not assume actors to be “100% rational 100% of the time”,¹¹ neither in developing beliefs nor in decision making.¹² Moreover, it does not expect markets to be efficient.¹³ Instead, it assigns importance to the institutional environment ignored by neoclassical finance and recognizes that decisions are biased by cognitive, emotional, and social factors. The findings

⁹ Cf. De Bondt, W. et al., S. (2008), p. 8.

¹⁰ Cf. Baker, M. / Ruback, R. / Wurgler, J. (2007), pp. 147 et sq.

¹¹ Cf. Brealey, R. A. / Myers, S.C. / Allen, F.(2011), p. 355.

¹² Cf. Baker, M. / Ruback, R. / Wurgler, J. (2007), p. 168.

¹³ Cf. Shefrin, H. (2009), p. 158.

of this area can be organized accordingly into three classes: personal (catalogue of biases), market (speculative dynamics of asset pricing) and organizational (effects of decision process on decision outcome). Furthermore, behavioral finance has three main building blocks: sentiment / beliefs, behavioral preferences, and limited arbitrage.¹⁴

Before the term “behavioral finance” was defined as such, some (mis-)behavioral aspects have been incorporated in modern finance to a certain extent through the notion of the agency problem where the egoistic benefit seeking goals of agents (managers) conflict with the benefit seeking of the principals (shareholders).¹⁵ Obviously, agency problem is a behavioral one since managers cognitively value their personal well-being over that of shareholders.

However, corporate finance research was affected by behavioral science only in the middle of the 20th century¹⁶ and it was not until the late 1970s that scientists in finance and psychology started collaborative research.¹⁷ By that time, the development produced extensive debate,¹⁸ most probably because it provided evidence for market inefficiency, thus shaking the, until then, fundamental pillar of finance.

The second stream of research considered is behavioral (managerial) accounting since it is concerned with analysis, planning, and budgeting processes.¹⁹ Consequently, most of the initial research addressed budgetary slack. Budgetary slack “involves deliberate distortion of input information”, mostly to adjust payoffs towards own profit through understating of sales and revenues and overstating of cost.²⁰

The research on human problems with budgets and resulting budgetary slack has already started in the 1950s.²¹ As a conclusion Argyris arrived at the following statement:

*“Our findings indicate that, first of all, more instruction in human relations need to be given to students of cost accounting and budgeting at the college level”.*²²

Management accountants and academics seem to have recognized the importance of behavior in their profession,²³ especially concerning the budget, because of the latter’s duality as a

¹⁴ Cf. De Bondt, W. et al. (2008), pp. 8 et sq.

¹⁵ Cf. Brealey, R. / Myers, S. / Allen, F. (2011), p. 319.

¹⁶ Cf. Gervais, S. (2010), p. 3.

¹⁷ Cf. De Bondt, W. et al. (2008), p. 7.

¹⁸ Cf. Thaler, R. (1999), p. 12.

¹⁹ Cf. Hofstedt, T. (1976); San Miguel, J. (1977); Colville, I. (1981).

²⁰ Cf. Belkaoui, A. (1985), pp. 112 et sq.

²¹ Cf. Argyris, C. (1953).

²² Cf. Argyris, C. (1953), p. 109.

planning *and* control instrument which can be abused by the very same who are supposed to be controlled on its basis.²⁴

Budgetary slack can arise in every kind of organization no matter what the structure.²⁵ The factors influencing the building of budgetary slack are among others self-esteem, low self-esteem leading to more slack; design of compensation schemes, those mainly based on budget motivating managers to incorporate more slack; and attitude of top managers towards slack, the toleration of reasonable levels of which leads to less slack, higher effort, and a higher corporate performance as argued among others by Bart²⁶ and Schatzberg and Stevens.²⁷ André et al.²⁸ provide contradicting evidence for capital budgeting stating that the more delegation of authority and the less control by the top management exist the higher the slack (i.e. higher investment expenditures) tends to be, especially in the beginning of project implementation.

Capital budgeting tends to be behaviorally influenced rather in the way of behavioral finance, with behavioral problems in accounting being quite contrary: In capital budgeting, forecast biases lead to cost incurred being “more than double the initial estimates”²⁹ whereas in budgeting, costs tend to be over- and sales underestimated since the budget often serves as the basis for management compensation schemes.³⁰ However, psychological insights from the area of budgeting should not be ignored but instead carefully employed, where applicable, to the capital budgeting process. Encouraged by previous research,³¹ the authors synthesize the insights of the mentioned areas in order to learn about behavioral success factors in capital budgeting hence being able to provide concerned practitioners with practical recommendations.

2.2 Capital Budgeting and the Capital Budgeting Process

Capital budgeting shall be defined as “the process in which a business determines whether projects... are worth pursuing”.³² Therefore, in a first step, a project’s future expected cash

²³ Cf. Zünd, A. (1977), p. 4 or Gerling, P. (2007), pp. 1-3.

²⁴ Cf. Beddington, R. (1969), p. 54; Belkaoui, A. (1985), p. 112.

²⁵ Cf. Belkaoui, A. (1985), pp. 112 et sq.

²⁶ Cf. Bart, C. (1988), pp. 289 et sq.

²⁷ Cf. Schatzberg, / Stevens, (2008), pp. 78 et sq.

²⁸ Cf. André, J. / Bruggen, A. / Moers, F. (2011), p. 23.

²⁹ Cf. Baker, M. / Ruback, R. / Wurgler, J. (2007), p. 172.

³⁰ Cf. Walker, K. B. / Johnson, E. N. (1999), p. 24 et sq.

³¹ Cf. Gervais, S. (2010), p. 3.

³² Cf. Brealey, R. / Myers, S. / Allen, F. (2011), p. 269.

inflows and outflows are estimated. Afterwards, they are examined to see whether the project will create value after cost expenditure above a certain benchmark. That is important because only such projects should be pursued. However, around 70% of firms accept investment proposals not meeting the required hurdle rate, e.g. for strategic considerations³³ or legal constraints.

The purpose of capital budgeting is to identify all value adding investment opportunities such as mergers and acquisitions, or real investment, and, due to capital constraints from the market or top management, to choose those adding the highest value.³⁴ These projects are then listed in an annual capital budget which must also reflect the strategic goals of a company since most capital budgeting decisions affect a company in the long run.³⁵

There is no universal view on the stages of the capital budgeting process. Some researchers define three stages while others call for up to five stages.³⁶ However, most authors generally identify the same critical phases but separate them slightly differently. Thus, in the following, a five-stage approach will be used with stages identified by the authors as identification and filtering; selection; authorization; implementation; and control, cf. figure 2.

Identification & Filtering	Rough filtering for strategy, hurdle rate, risk, feasibility
Selection	Details: cash flow, risk, capital, staff, implementation; Instruments: mostly NPV, IRR, payback period
Authorization	Capital rationing & targets; Ranking (strategy, return, risk)
Implementation	Implementation plan set-up: responsibilities, milestones, expenditure ceilings, meetings
Performance Measurement & Control	Before and after start, during implementation, after implementation (post-audit)

Figure 2: Overview of the stage of the corporate capital budgeting process

To make a small interdisciplinary digression, the authors would like to hint at a potential comparison between the defined capital budgeting process and the problem solving process of

³³ Cf. Kalyebara, B. / Ahmed, A. (2011), p. 69.

³⁴ Cf. Pike, R. (1983), p. 663.

³⁵ Cf. Brealey, R. / Myers, S. / Allen, F. (2011), p. 269.

³⁶ Cf. Burns, R. / Walker, J. (2009); Ducai, M. (2009); Kalyebara, B. / Ahmed, A. (2011).

cognitive psychologists: The 5 stage capital budgeting process interestingly resembles the 7 stage problem solving process as defined by cognitive psychology, cf. figure 3.³⁷

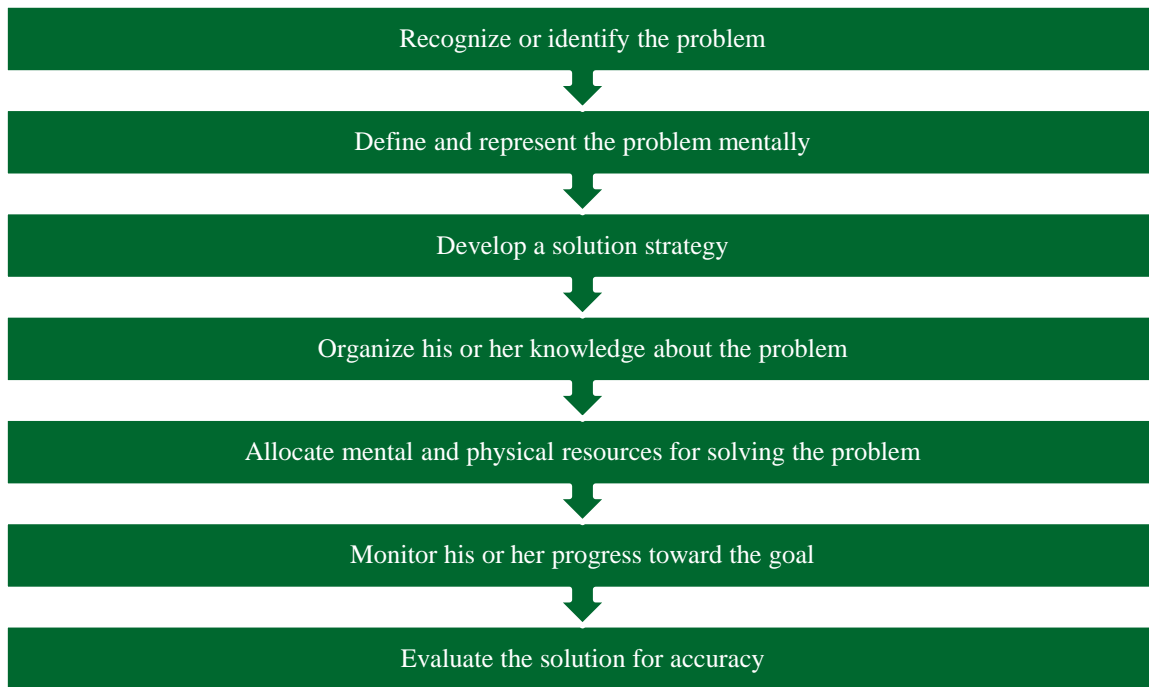


Figure 3: The 7 stage problem solving process in cognitive psychology³⁸

Therefore, the whole capital budgeting process might be interpreted as problem solving process and analyzed from a psychological paradigm.³⁹ However, since the expected reader of this paper is more familiar with the capital budgeting vocabulary, the following discussion will be framed around the 5 stage capital budgeting process as depicted by finance and accounting theory.

³⁷ Cf. Pretz, J./Naples, A. / Sternberg, R. (2003), p. 3.

³⁸ Source: based on Pretz, J. / Naples, A. / Sternberg, R. (2003), pp. 3 et sq.

³⁹ Cf. Gerling, P. (2007), pp. 204-219 for an example of how cost accounting can be interpreted under the problem solving process paradigm.

Stage 1: Identification and filtering of investment proposals

This stage is seen by many practitioners as the most critical one.⁴⁰ Project ideas can be developed in two ways: first, ideas can emerge bottom-up or top-down and, second, they can be driven by an opportunity or by a need for an investment.

The bottom-up investment ideas mirror the opportunities discovered by operations managers. Thereby, middle management cannot be expected to suggest strategic proposals.⁴¹ Instead, such ideas for strategic investments with high value will rather come from senior management having an overview of the company and its development. Furthermore, investments need to be made e.g. for replacement or expansions to new markets. Both investment opportunities and needs can originate both ways, top-down or bottom-up (cf. table 1).

	Opportunities	Needs
Top-down	Low motorization rate and growing gross domestic product per capita in India	Securing market share in a growing market
Bottom-up	Purchasing a bankrupt supplier's Premises	New conveyor belts due to obsolescence of the present ones

Table 1: Fictitious examples of investment proposals of an automotive manufacturer

After the identification of proposals these undergo a preliminary screening and filtering among others for inconsistencies with strategic goals (if originated bottom-up), inadequate hurdle rate, risk levels, and feasibility. Here, the data-gathering efforts of the company are crucial i.e. whether accounting or cash-flow methods are used, the state of the decision support system⁴² as well as how senior management deals with forecast bias.

Stage 2: Selection

In this stage, survived proposals are thoroughly examined including projection of cash flows (which is perceived as the most difficult part), risk, demand for, and cost of capital, timing of investments, personnel involved, and a first implementation plan.⁴³ As a result, the best projects are selected and forwarded to top management for approval and authorization.

The mostly used algorithms for evaluation are the net present value, followed by internal rate of return and payback period, weighted average cost of capital for determination of the cost of

⁴⁰ Cf. Kalyebara, B. / Ahmed, A. (2011), p. 67.

⁴¹ Cf. Brealey, R. / Myers, S. / Allen, F. (2011), p. 269.

⁴² Cf. Burns, R. / Walker, J. (2009), p. 83.

⁴³ Cf. Burns, R. / Walker, J. (2009), p. 83; Kalyebara, B. / Ahmed, A. (2011), p. 60.

capital or hurdle rate⁴⁴, with capital asset pricing model for determination of the cost of equity.⁴⁵ As this paper concentrates on *behavioral* aspects of capital budgeting, it is limited to an overview of the instruments in table 2.

Instrument / method	Description / use	Advantages	Disadvantages
Net present value (NPV)	Sum of discounted cash flows minus the initial investment.	Based on profitability, time value of money and cash flow measures	Uncertainty / bias in predictions of cash flows and discount rate; no rigorous consideration of risk and return volatilities
Internal rate of return (IRR)	The discount rate that makes the net present value of the project equal to zero: $IRR >$ required rate of return: invest	Based on profitability, time value of money and cash flows; rather easily understandable	Uncertainty / bias in predictions of cash flows and discount rate; no rigorous consideration of risk and return volatilities
Payback method	Time until recovery of investment: amount invested divided by expected annual cash flow; the shorter the better	Ease to calculate and understand; based on cash flows; acknowledges risk (the shorter the payback, the lower the risk)	Ignores the time value of money, profitability, cash inflows after investment recovery
Weighted average cost of capital (WACC)	Blended cost of debt and cost of equity set in proportion of the two to each other	Includes cost of all capital, not just debt or just equity and accounts for the tax shield	Rather complicated calculation
Capital asset pricing model (CAPM)	Needed for calculation of WACC; estimates the cost of equity according to market return	Reflects market value of company's common stock	Errors in estimations of CAPM's components
Sensitivity Analysis	Calculation of possible misestimated cash flows after identification of key variables effecting them	Greater caution due to identification of key variables; help in detection of inappropriate forecasts	Ambiguous estimations and results; underlying variables often interconnected; no recognition of real options
Scenario Analysis	A variation of sensitivity analysis with a limited number of consistent sets of variables	Easier to forecast values under scenario analysis than absolute pessimistic / optimistic values	Ambiguous, subjective estimations and results
Monte Carlo Simulation	A variation of sensitivity analysis considering all possible sets of variables	Inspection of entire distribution of project outcomes	Ambiguous estimations; difficult to explain and calculate; no recognition of real options
Real options / decision trees	Options to modify projects, such as expand or abandon a project; calculated by adding up net present values with assigned probabilities	Flexibility; reduces the escalation of commitment to failing projects when used in the selection phase	Ambiguous estimations
Accounting rate of return (ARR)	$(\text{annual net cash inflow} - \text{annual depreciation on asset}) / (\text{amount invested in asset} + \text{residual value})/2$	Ease of calculation and investment decision (if $ARR >$ required rate of return \rightarrow invest); based on profitability	Uses accounting income measures; ignores the time value of money
Profitability index	Expresses the relative profitability of the investment during its entire life time; the higher the better, indifference at 1; Profitability index = $NPV/\text{investment}$	Help in decision making in situations of capital constraint	Subject to problems in estimation of cost of capital and cash flows

Table 2: Overview of instruments and methods of capital budgeting⁴⁶

⁴⁴ Cf. Bruner, R. et al. (1998), p. 26.

⁴⁵ Cf. Gitman, L. / Vandenberg, P. (2000), p. 67; Kalyebara, B. / Ahmed, A. (2011), p. 66.

⁴⁶ Source: based on Burns, R. / Walker, J. (2009), pp.83 et sq., Denison, C. (2009), pp.135-150; Brealey, R. / Myers, S. / Allen, F. (2011), pp.129-154 and pp. 269- 295.

Stage 3: Authorization

Given capital constraints of companies, at this stage capital rationing and previously defined capital budgeting targets eventually decide which projects are realized.⁴⁷ Therefore, the capital demand of the proposals is compared with the company's internal and external sources of capital supply such as depreciation reserves and retained earnings, and loans, corporate bonds and shares, respectively. The crucial factor here is the cost of capital – e.g., companies cannot control their cost of debt because it is influenced by financial market conditions.⁴⁸ After solving the question of financing, projects are ranked by e.g. strategic importance, return, and risk. A number of risks such as general risks (market risk, inflation, interest rate, foreign exchange rate risk etc.) and specific risks i.e. those inherent to a particular project must be assessed. That can be done e.g. by means of sensitivity analysis or a risk map ranking the risks by their impact and probability. Then, corresponding risk responses (e.g. risk adjusted discount rate or cash flows) for the setup of a risk management system can be provided. Finally, after answering the questions of financing, prioritization, and a first implementation plan, projects perceived as the best are authorized for implementation.

Stage 4: Implementation

In the implementation phase, a detailed implementation plan is set up and cascaded down the organization since the implementation itself is essentially the task of operations management while it is up to senior management to monitor it. This stage can follow the common practice of project management. That means, first a work breakdown structure has to be installed. It breaks up the project into work packages and individual activities or tasks to be performed. Then, for each of the tasks a responsible person as well as time frames and a budget are assigned. Finally, milestones, meaning meetings or deadlines until which certain deliverables have to be performed, are set.⁴⁹ Mostly, a project management committee is created in charge of planning, implementation, and reporting.⁵⁰

Stage 5: Performance measurement and control

Three kinds of measurement of a project's performance exist. First, monitoring shortly before and after the start of implementation to detect and counteract previously unforeseen problems.

⁴⁷ Cf. Shimizu, N. / Tamura, A. (2012), p. 46.

⁴⁸ Cf. Dean, J. (1951), p. 60.

⁴⁹ Cf. PMBok Guide 2008.

⁵⁰ Cf. Kalyebara, B. / Ahmed, A. (2011), p. 65.

Second, monitoring during the implementation in order to oversee overruns in timing and expenditures and to adequately meet problems. And finally, after the completion of the project (post-audit), mainly to gather lessons for the coming projects but also, in a limited way, to examine the quality of forecasts made by project initiators.⁵¹ To audit the results, usually, estimates are compared to actual results such as profits, costs (initial expenditure or operating cash outflows), volumes, time, or rates of return, respectively.⁵²

Even though the importance of performance measurement and control may seem obvious, surprisingly little is being done in this area. Gordon and Myers found in 1991 that, although 76% of their survey respondents performed post-audits, those were neither regular, nor risk-adjusted or thoroughly documented thus not being a standard capital budgeting procedure.⁵³

⁵¹ Cf. André, J. / Bruggen, A. / Moers, F. (2011), p. 24.

⁵² Cf. Kalyebara, B. / Ahmed, A. (2011), p. 67.

⁵³ Cf. Gordon, L. / Myers, M. (1991), pp. 39-42.

2.3 Literature Overview

In order to perform an integrated analysis, literature from the following fields was analyzed: behavioral (corporate) finance, behavioral accounting, and explicitly behavioral aspects in capital budgeting. The key insights are shown in table 3.

Source	Insights	Research area
Argyris (1953)	Budgets can have negative impact on human employees which in return negatively influences overall work efficiency in the long run.	Behavioral Accounting
Bart (1988)	Set up of performance measurement criteria without impact on budgeting slack; reward system influences behavior more than oral orders; attitudes of senior managers relate to scope of slack and to overall corporate performance.	Behavioral accounting
Belkaoui (1985)	Negative and inaccurate feedback of self-esteem increases distortion of input information and creation of slack.	Behavioral accounting
Schatzberg / Stevens (2008)	Budgetary slack as a form of public opportunism; public and private opportunism can improve firm performance; power to reject the budget, permission of slack by higher managers and commitment to company produce less slack and higher effort.	Behavioral accounting
Walker / Johnson (1999)	Estimations distortion due to introduction of incentive plan; organizational norms can reinforce biases.	Behavioral accounting
André et al. (2011)	Delegating authority and lower control over a project increases total investment sum, especially escalating in the beginning of project implementation.	Behavioral capital budgeting
Bardolet et al. (2011)	Partition dependence bias: companies allocate internal capital toward equality over the number of business units of the firm.	Behavioral capital budgeting
Biondi / Marzo (2011)	Analysis of capital budgeting and suggestions of alternatives in cognitive (representativeness, availability), organizational (optimism, overconfidence, escalation of commitment), and institutional (hurdle rates, payback period, multiple discount rates) dimensions.	Behavioral capital budgeting
Denison (2009)	Use of real options in initial project evaluation decreases the escalation of commitment to failing projects more than use of net present value alone. This effect is due to the consideration of project abandonment already before its authorization and implementation establishing acceptance of the possibility of project failure from the beginning on.	Behavioral capital budgeting
Gervais (2010)	Seldom and non-qualitative feedback hinders managers to overcome their overconfidence; they tend to overinvest, initiate more mergers, invest in more new products, and commit for too long to failing projects; learning, inflated hurdle rates and contractual incentives are possible mechanisms to reduce overconfidence.	Behavioral capital budgeting
Malmendier / Tate (2005)	Measures overconfidence of chief executive officers (CEOs) based on their perception by the outsiders: press portrayals and investment decisions (e.g. holding or selling of own company's stock).	Behavioral capital budgeting
Pike (1983)	Capital rationing in large companies is rather a self-imposed constraint than a market-imposed one; it leads to simple reducing of a number of projects, especially when used together with payback period rule, instead of choosing the best projects.	Behavioral capital budgeting

Shimizu / Tamura (2012)	Comparison of strategic types of firms with their investment decisions. Results: correlation between investment purpose and the degree of project evaluation and post-audit.	Behavioral capital budgeting
Statman / Caldwell (1987)	Commitment can be motivation (higher effort and achievement) and entrapment (failing projects). Control for entrapment: periodic reviews of milestones by managers; project audits by finance staff and outside consultants; takeovers as last resort to terminate projects.	Behavioral capital budgeting
Baker et al. (2007)	Managers are not rational in beliefs and decision making: They overestimate revenues and underestimate time and cost. Corporate governance matters.	Behavioral corporate finance
Shefrin (2009)	Behavioral finance transforms finance theory to incorporate more realistic insights about managers and investors who are not fully rational and informed.	Behavioral finance
De Bondt et al. (2008)	Understanding of finance is shifting to incorporation of insights of behavioral finance; behavioral finance still lacks a unified theoretic framework. Provide an overview of behavioral biases.	Behavioral finance
Thaler (1999)	Behavioral finance no longer extraordinary; prediction that finance and behavioral finance merge since there cannot be non-behavioral finance.	Behavioral finance
Burns / Walker (2009)	Identification and selection phase most researched; post-audit rare in companies; many firms using net present value calculation but also accounting methods extensively.	Capital budgeting
Ducal (2009)	Overview of capital budgeting techniques; conclusion: only net present value fully accepted by theoreticians but it also has shortcomings such as e.g. investments perceived irreversible and the "now or never" approach (as opposed to real options).	Capital budgeting
Kalyebara / Ahmed (2011)	Most firms would accept projects with negative net present value and lower than required rate of return; post-audit phase rather neglected; cash flow estimation is the most difficult task in capital budgeting.	Capital budgeting
Brealey et al. (2011)	Methods of capital budgeting; agency theory; overview of behavioral finance.	Corporate finance

Table 3: Overview of examined literature for behavior in budgeting and capital budgeting

It goes without saying that this subjective selection of articles does not represent the full body of literature on the topic. Notably, no articles from psychology or cognitive sciences were selected. However, many articles refer heavily to these sources.

3 Capital Budgeting Process: Behavioral Implications and Success Factors

3.1 Overview of Behavioral Implications in Capital Budgeting

The capital budgeting approach has recently been extensively challenged by calls for alternatives incorporating the cognitive, organizational, and institutional dimensions of decision making.⁵⁴ One of the reasons for this is the desire of scholars to elaborate a method of prediction of future cash flows which mirrors the complex adaptive economic world of today better as the traditional approach.⁵⁵ Agency theory can be seen to a certain extent as a predecessor of behavioral finance in that it incorporates the *egoistic* profit seeking *behavior* of managers. Particularly important in the stages of identification and selection is the fact that especially the bottom-up originating ideas can be subject to seeking of benefits or a fast career growth. Pruitt and Gitman found that 80% of top executives spotted upward biases in revenues forecasts and more subtle downward ones in cost forecasts. Two third of them felt the biases were introduced either intentionally or through a lack of experience.⁵⁶ Others studies associated such biases with inaccurate information from top management and unintentional and often unperceived inadequate managerial behavior⁵⁷ thus confirming the bounded rationality of the neoclassical view itself.⁵⁸ Furthermore, a growing number of researchers indicate limits of the “unconstrained opportunism assumption” of the agency theory: reciprocal behavior and self-imposed opportunism restraints to achieve fair outcomes.⁵⁹

Contrarily to behavioral accounting, where the fear of subjective budget reductions by top management during the year creates budgetary slack, in capital budgeting, the same fear might create elevated revenue forecasts to bring to the executives’ attention an “even more promising project”. A company’s formal and informal performance appraisal schemes combined with the manager’s overconfidence might also lead her to predict elevated profits / short

⁵⁴ Cf. Gervais, S. (2010); Biondi, Y. / Marzo, G. (2011).

⁵⁵ Cf. Mouck, T. (2000).

⁵⁶ Cf. Pruitt, S. / Gitman, L. (1987), p. 47.

⁵⁷ Cf. Belkaoui, A. (1985); Bart, C. (1988); De Bondt, W. et al. (2008).

⁵⁸ Cf. De Bondt, W. et al. (2008), p. 8; Gerling, P. (2007), pp. 81-96.

⁵⁹ Cf. Schatzberg, J.W. / Stevens, D. E. (2008), p. 78-80.

implementation time, especially easily so with new products. Thereby, the effect will stay the same regardless the degree of formality.⁶⁰

The by far biggest part of the literature on the topic of behavioral corporate capital budgeting inspects the bias of overconfidence and biases related to it in different types and stages of projects.⁶¹ These will be explored in more detail in chapter 3.2.; chapter 3.3. will shed light onto one of the most important and quite widely spread effects: the escalation of commitment to failing projects. An overview of behavioral biases is presented in table 4.

	Reason (bias)	Definition	Results
Sentiment / beliefs	Over-confidence	Overestimation of own knowledge, abilities (e.g. to control risk), possibilities, precision of information, value of own company; Underestimation of risk (highest in the least equity dependent firms) – in capital budgeting, essentially the same as optimism.	<ul style="list-style-type: none"> • Overinvestment (high degree of influence) due to understatement of project cost and time and overstatement of revenues • More rapid investment of free cash flow • More mergers and acquisitions initiations and bidding mistakes due to over-evaluations • More investment into new projects, products and markets • Entrepreneurship • Preference for internal over external financing and for debt over equity • Escalation of commitment (i.e. failure to ignore sunk cost hence holding on to (overvalued) projects / stocks / options for too long beyond optimal point of time)
	Optimism	Belief that favorable future events are more likely than they really are (highest in the least equity dependent firms) – in capital budgeting, essentially the same as overconfidence.	<ul style="list-style-type: none"> • Overinvestment (marginal degree of influence) • Self-fulfilling prophecy: dedication to making the project meet expectations which gets manager closer to these expectations even if they do not meet them
	Pessimism / low self-esteem	Belief that favorable future events are less likely than they really are; Underestimation of matters perceived as positive and overestimation of unfavorable events.	<ul style="list-style-type: none"> • Increased risk aversion • Negatively distorted forecasts (sales too low, costs too high etc.) • Underinvestment
	Anchoring	Belief relying on one (first) piece of information without adjustment afterwards.	<ul style="list-style-type: none"> • Decision making based on partially / wholly wrong information
	Representativeness	Overreliance on stereotypes and / or recent time-series or events.	<ul style="list-style-type: none"> • Decision making based on partially / wholly wrong information
	Availability bias	Overweighting of easily accessible information.	<ul style="list-style-type: none"> • Decision making based on partially / wholly wrong information

⁶⁰ Cf. Bart, C. (1988), p. 286-288.

⁶¹ Cf. e.g. Malmendier, U. / Tate, G. (2005); Baker, M. / Ruback, R / Wurgler, J. (2007); De Bondt, W. et al. (2008); Gervais, S. (2010); Biondi, Y. / Marzo, G. (2011).

	Self-attribution / self-serving bias	Attributing success to own skills, while blaming negative outcomes on outside sources / effects.	<ul style="list-style-type: none"> Disabling oneself from learning from past events
	Bounded rationality	Selective intake and processing of information influenced by personal characteristics.	<ul style="list-style-type: none"> Decision making based on partially / wholly incorrectly processed information
Behavioral preferences	Loss aversion	Reluctance to realize losses (weighting losses about twice as much as gains of similar magnitude).	<ul style="list-style-type: none"> Inconsistency towards risk: avoid risk to protect wealth but assume risk to avoid losses Procrastination to postpone the pain from the loss
	Risk aversion	Unwillingness to engage in risky or uncertain situations	<ul style="list-style-type: none"> Missing profitable investment opportunities Saving behavior instead of investment behavior
	Mental accounting / (narrow) framing (prospect theory)	Categorization and valuing of financial outcomes	<ul style="list-style-type: none"> Ignorance of sunk cost Tendency to treat a new risk separately from existing ones Three mental incomes: current income, current wealth, future income
	Myopic loss aversion	Combines time horizon based framing and loss aversion	<ul style="list-style-type: none"> The shorter the time horizon, the higher the aversion to risk
	Self-control	Control of own impulses	<ul style="list-style-type: none"> Saving behavior Escalation of commitment Procrastination when failing self-control and thus, reluctance to loss realization
	Regret aversion	Assuming a possible ex-post regret of wrong investment	<ul style="list-style-type: none"> Escalation of commitment “Betting” on good assets (“herding behavior”) Procrastination and reluctance to loss realization
	Partition dependence	Allocating available corporate funds rather equally over the business of the firm	<ul style="list-style-type: none"> Escalation of commitment Subsidizing poorly performing or non-profitable divisions

Table 4: Overview of biases in behavioral corporate capital budgeting⁶²

3.2 The Bias of Overconfidence and Related Biases

Overconfidence is defined as the overestimation of own knowledge, abilities (e.g. to control risk), possibilities, precision of information and value of own company as well as the underestimation of risk.⁶³ It occurs more often before the implementation of the project, thus in the stages of identification / filtering, selection, and, partially, authorization.⁶⁴ Especially with projects financed from free cash flow, overconfident managers are found to overinvest due to

⁶² Source: based on Statman, M. / Caldwell, D. (1987), p. 11; De Bondt, W. et al. (2008), pp. 11 et sq.; Gervais, S. (2010), p.7, p. 11 and p. 18; Bardolet, D. / Fox, C. / Lovall, D. (2011), p. 1475; Brealey, R. / Myers, S. / Allen, F. (2011), pp. 340-368.

⁶³ Cf. De Bondt, W. et al. (2008), p. 8.

⁶⁴ For measures of overconfidence cf. Malmendier, U. / Tate, G (2005), especially pp. 652 et sq.; Gervais, S. (2010), especially p. 10.

overestimation of cash inflows and underestimation of project time and cost.⁶⁵ Furthermore, they tend to engage more in mergers and acquisitions and strategic alliances than more rational managers. The managers especially do so if they feel that their firm has benefited from such, or their, actions in recent past, thus being victim of the **representativeness** (reliance on recent information) and **self-attribution** biases (attributing successes to self while blaming failures on circumstances).⁶⁶ Meanwhile, there is robust data indicating that acquisitions tend to diminish the value of the acquiring firm, at least as measured by the share price.⁶⁷ Since capital budgeting occurs infrequently, rare and often non-qualitative feedback reinforces the attribution bias preventing managers from learning from their mistakes.⁶⁸

Perceiving their company as undervalued, overconfident CEOs seldom issue equity thus contributing to a less costly financing.⁶⁹ This has also been found to be the main reason for capital rationing.⁷⁰ Also, Gervais⁷¹ and Brealey et al.⁷² suggest overconfidence to contribute positively to internal company processes through raised “effort, commitment, and persistence” which goes with the self-fulfilling prophecy, the fact that overconfidence motivates to work harder leading to achievement of goals which would otherwise have not been achieved, cf. table 4.

Overconfidence might be higher in the beginning stages but it certainly influences the whole capital budgeting process. Moreover, it is interrelated with many other biases whereby they often reinforce each other mutually. Mirroring it, **pessimism**, **low self-esteem** or negative self-esteem feedback might induce overestimation of cost and underestimation of sales, possibly through increased **risk aversion**, leading to underinvestment and missing of opportunities.⁷³ That points to the importance of adequate performance appraisal towards colleagues and subordinates.

Following Gervais’ call for more research on the correlation between managerial traits and companies’ investment policies,⁷⁴ Shimizu and Tamura⁷⁵ conducted an analysis and found the

⁶⁵ Cf. Baker, M. / Ruback, R / Wurgler, J. (2007); Gervais, S. (2010).

⁶⁶ Cf. De Bondt, W. et al. (2008), p. 11.

⁶⁷ Cf. Gervais, S. (2010), pp.12 et sq.

⁶⁸ Cf. Gervais, S. (2010), pp. 20 et sq.

⁶⁹ Cf. Heaton, J. (2002), p. 38.

⁷⁰ Cf. Mukherjee, T. / Hingorani, V. (1999), p. 14.

⁷¹ Cf. Gervais, S. (2010), p. 24.

⁷² Cf. Brealey, R. / Myers, S. / Allen, F. (2011), p. 270.

⁷³ Cf. Belkaoui, A. (1985), p. 120.

⁷⁴ Cf. Gervais, S. (2010), p. 24.

⁷⁵ Cf. Shimizu, N. / Tamura, A. (2012).

following: (1) Companies investing primarily to produce new products and to enter new markets tend to not perform thorough post-audits; (2) Those companies investing primarily to improve their cost competitiveness undertake a profitability check after the implementation; (3) Companies not strongly practicing capital investment due to their prudence tend to have continuous evaluation.⁷⁶ Not surprisingly, heavily investing companies (1) earn the highest returns, followed by those with continuous evaluation (3) and those primarily re-investing (2).⁷⁷ Since managing new markets and products is a lot riskier than reinvestment, the findings are consistent with Gervais in that overconfident managers are more likely to experience outstanding successes, e.g. with innovative products, but that they also are more likely to suffer great failures,⁷⁸ one reason for which can also be the lack of learning effects due to the absence of proper post-auditing.

Communicated importance of fast payback or quick returns corresponds to the **availability bias** when easily accessible or imaginable information is treated as too important.⁷⁹ Thus, it induces the proposal of fast payback projects which often are too risky, have a negative net present value, or are put forward on the expense of other, more long-term projects with higher net present value.⁸⁰ As a company will maximize its value by taking only projects with positive net present value, top management needs to ensure that only such investments are being proposed. However, also the upper echelons can be biased or behave intentionally incorrect.

Arriving at the stage of authorization, an investment proposal already has been formed and ideally, thoroughly thought through. However, this also suggests an accumulation of biases occurred in previous stages (unless they are eliminated). Here, biases concerning the capital rationing and risk assessment are the most pronounced ones.

The bias of overconfidence can occur again at this stage. Since overconfident managers perceive their company as undervalued, they are hesitant in issuing equity. Thus, they tend to finance their projects from internal equity reserves which in turn can be the reason for the rationing of capital. Another effect of overconfidence is that in many projects, the risks tend to be understated.⁸¹ Moreover, the degree of everyone's personal risk-seeking or risk-aversion differs thus influencing the perception of a risk's impact and probability crucial for assess-

⁷⁶ Cf. Shimizu, N. / Tamura, A. (2012), pp. 51-54.

⁷⁷ Cf. Shimizu, N. / Tamura, A. (2012), p. 55.

⁷⁸ Cf. Gervais, S. (2010), pp. 16-17.

⁷⁹ Cf. De Bondt, W. et al. (2008), p. 11.

⁸⁰ Cf. Brealey, R. / Myers, S. / Allen, F. (2011), p. 270.

⁸¹ Cf. Brealey, R. / Myers, S. / Allen, F. (2011), p. 270.

ment and anticipation of risks and creation of risk responses. Nevertheless, many managers were found to be risk averse. They applied capital rationing to be able to reject projects they perceived as too risky.⁸² Furthermore, Bardolet et al. found that within a company, allocation of capital (e.g. to projects from different divisions) is subject to partition dependence, that is, that the “allocations are biased toward equality over the business units” of a company⁸³ which can arguably subsidize unprofitable divisions.

The strategic importance and thus, ranking of projects can similarly be affected by personal preferences leading to possible distortion or the authorization of a set of projects which is less profitable than another possible set of projects would have been.

3.3 The Effect of Escalation of Commitment to Failing Projects

Another costly failure of managers widely examined is the **escalation of commitment** i.e. holding on to not profitable projects for too long, observable in the implementation and control stages. Statman and Caldwell showed that **mental accounting / framing**⁸⁴ and **loss and regret aversions** are important reasons for “throwing good money after bad” to save poorly performing projects. Mental accounting or framing means that managers do not treat sunk cost as sunk but want, in their mental accounts, to offset them by project revenues so that they can “close” the account at least at zero, and not at a loss, to not be disappointed.⁸⁵ Loss aversion is the unwillingness to realize losses while regret aversion is an ex-ante assumption of a possible ex-post regret of a wrong investment.⁸⁶ In other words, individuals do not want to make decisions by the outcomes of which they might be disappointed in the future. Thus, they try to “even out” losses by further investing in the project. The two latter are closely interrelated reinforcing the former.

The escalation of commitment strongly contradicts the rule that all selection, continuation, and termination decisions must be based on the project’s net present value. Furthermore, investors’ positive reactions to announcements of cancellations of bad projects⁸⁷ must be another hint to managers to quit rather earlier than later.

⁸² Cf. Mukherjee, T. / Hingorani, V. (1999).

⁸³ Cf. Bardolet, D. / Fox, C. / Lovall, D. (2011), p. 1476.

⁸⁴ Cf. Fennema, M. / Perkins, J. (2007), p. 226.

⁸⁵ Cf. Statman, M. / Caldwell, D. (1987), p. 8.

⁸⁶ Cf. De Bondt, W. et al. (2008), pp. 11 et sq.

⁸⁷ Cf. Statman, M. / Caldwell, D. (1987), p. 8.

More often than not, escalation of commitment leads to even higher losses as managers turn less risk averse in order to save the project in turn becoming more optimistic than they should. This leads them to act highly irrationally initiating further expenditures on the failing project. One could argue that overconfidence reinforces the regret and loss aversions thus contributing to the escalation of commitment. The partition dependence can produce another form of it – commitment to badly performing divisions instead of their liquidation.

Yet again, commitment has other, positive, effects such as motivation to work more thus achieving more than would have been achieved otherwise (cf. self-fulfilling prophecy and overconfidence, table 4). Thus, commitment can motivate but also entrap managers into irrational pursuit of loss-making projects.⁸⁸ Correlated with it is the disposition effect by Shefrin and Statman whereby investors tend to sell winning stocks too early while holding the falling ones for too long.⁸⁹

To conclude, table 5 shows examined biases according to capital budgeting process stages.⁹⁰

Bias / (effect)	Stage	Identification	Selection	Authorization	Implementation	Control
Availability bias		✓				
Overconfidence		✓	✓	✓	✓	
Representativeness bias		✓	✓	✓	✓	
Self-attribution		✓	✓	✓		
Pessimism / low self-esteem		✓	✓			
Agency problem / egoism		✓	✓			
Risk aversion		✓	✓	✓	✓	
Regret aversion			✓	✓	✓	✓
Loss aversion				✓	✓	✓
Mental accounting / framing					✓	✓
(Escalation of commitment)					✓	✓

Table 5: Stages of capital budgeting process and their behavioral implications

It is debatable how far one can go in transferring the behavioral insights of budgeting on capital budgeting. One can imagine that e.g. a certain acceptance of over- or underestimations can result in smaller extent of wrong estimation and even in a higher performance, as it was found

⁸⁸ Cf. Statman, M. / Caldwell, D. (1987), p. 11.

⁸⁹ Cf. Shefrin, H. / Statman, M. (1985).

⁹⁰ Cf. Gerling, P. (2007), p. 109 for a table showing biases along the stages of the problem solving cycle.

to be with budgetary slack.⁹¹ Nevertheless, in practice of capital budgeting it would probably lead to more (over-)confidence with its implications discussed above. On the contrary, the feeling of being trusted by top management is likely to lead to motivating commitment. Also, top management might rather accept the optimistic assumptions of proposers if they suggest them within strategically important areas.⁹²

⁹¹ Cf. Bart, C. (1988), p. 289.

⁹² Cf. Bart, C. (1988), p. 286.

4 Discussion, Recommendations, and Critical Assessment

4.1 Discussion: Behavioral Success Factors of the Stages of Capital Budgeting Process

The overall goal of the capital budgeting process is the best possible decision making in order to realize investments increasing the value of the company. Critical success factors when existent prevent the failure of the capital budgeting process (and, possibly, the company with it). When a company neglects to establish one of them, it might result in a malfunctioning capital budgeting process, possibly leading to problems on the corporate level in case the investment in question is large enough.

The aforementioned negative behavioral implications are the starting point of the identification of behavioral success factors. Consequently, following condensed three success factors diminishing the negative impacts of aforementioned behavioral biases can be identified:

- Reflective Prudence
- Critical Communication
- Outcome Independence

4.2 Reflective Prudence

Reflective or self-reflective prudence in capital budgeting means on the one hand to be aware of the classical decision biases everyone is subject to and, on the other, to diligently generate the data needed for the decision making. This reflective prudence should best be institutionalized and framed into a standard procedure.

Dealing with predictions of future cash flows of projects is not an exact science. The transformation of lofty visions and ambitious plans under uncertainty into cash in- and outflows with a defined risk profile remains the Achilles' heel of every capital budgeting project, since it is filtered through the above mentioned biases. Being aware of the different subjective bias traps provides a certain level of self-critical reflection which in the end might lead to more

reasonable projections. Some managers might even improve their decision making skills by the **creation of awareness** for psychological biases alone.⁹³

It is advisable to perform **special training** with investment project participants to partially remedy the cognitive biases and develop good meta-knowledge, which is according to Russo and Schoemaker a “teachable and learnable” skill.⁹⁴ Fennema and Perkins found that factors such as training and experience positively influence managers in their investment decisions which involve sunk cost considerations. Training meant in that case a sufficient amount of managerial accounting courses while experience was adequate professional experience in working with investment projects involving sunk cost principles.⁹⁵ Fennema and Perkins suggest that individuals with either one or both preconditions are more likely to make investment decisions leading to satisfactory financial results.

Reflective Prudence also manifests itself in a **diligent data gathering and assumption clarification** phase. Gathering, filtering, analyzing, and applying adequate information for decision making is crucial. In capital budgeting process, it is imperative in the stages of identification and especially selection of investment proposals. This should include sensitivity analysis, break-even calculations, risk mapping and scenario development.⁹⁶ This phase should not be regarded as a way to generate an objective truth about the future, but merely to avoid various personal biases. For instance, the estimation of cash flows is perceived to be the most difficult task in the capital budgeting process.⁹⁷ Thus, Reflective Prudence counteracts the availability and representativeness bias during identification and assessment of investment proposals. Moreover, it has an effect during implementation and controlling of investments. Clear instructions and standard operating procedures represent institutionalized meta-knowledge.

Finally, Reflective Prudence institutionalizes areas of **self-reflection within the capital budgeting process**: A critical self-assessment with a standard set of questions such as ‘What are reasons that my assumptions might prove incorrect? Which are potential roadblocks? What are scenarios, in which the prospective project will not work out?’ might be a productive way to enhance the personal bias management. The potential list of cognitive control

⁹³ Cf. Russo, E. / Schoemaker, P. (1992), p. 13.

⁹⁴ Cf. Russo, E. / Schoemaker, P. (1992), pp. 10 et sq.

⁹⁵ Cf. Fennema, M. / Perkins, J. (2008).

⁹⁶ Cf. Burns, R. / Walker, J., (2009), pp. 83-85.

⁹⁷ Cf. Kalyebara, B. / Ahmed, A. (2011), p. 67.

techniques for the overconfidence has been explored before by Russo and Schoemaker.⁹⁸ Furthermore, e.g. through the instrument of feedback, overconfidence and self-attribution could be lowered leading to less biased decision making for future projects bringing reflective prudence to the control stage as well.

4.3 Critical Communication

Communication is a multidimensional phenomenon. It should start with training about the investment process and meta-knowledge about classical decision biases. Since objectivity is hardly to achieve, inter-subjective story development becomes key. The danger of closed loops and groupthink might trade individual biases with even more dangerous group biases.⁹⁹ Even emotional group dynamics might negatively affect capital-budgeting decisions.¹⁰⁰

The critical communication about the potential investment project should include extensive and comprehensive communication in form of standardized reports and review and feedback-meetings. The communication of the potential pitfalls and risks involved and a reflected statement about the **self-assessment of cognitive biases** would most certainly enrich the project selection and decision process. The simple comparison of NPVs does, from a behavioral perspective, not suffice to decide on an investment project. Critical Communication provides transparency about the actions of the project co-workers and the reasons for them. Top management should refrain from communicating hurdle rates or short payback periods even though it is found to be common in striving to reduce overconfidence.¹⁰¹ Brealey and Myers' suggest that elevating hurdle rates will neither diminish the number of proposals nor correct for biases, but encourage project proposers to "sell" their ideas over-enthusiastically.¹⁰² Instead, senior managers should ask the proposers for justification of their proposals, i.e. explanation of their judgment through thorough calculation as well as literal description since this practice has been found to make decision makers and proposers more self-critical about their judgment process and, as a result, to lead to more adequate and less biased decision making.¹⁰³ It endorses individuals' orientation and understanding of processes thus contributing to efficient processes. Encouraging, feedback and appropriate performance measurement and

⁹⁸ Cf. Russo, E. / Schoemaker, P. (1992), pp. 12-14.

⁹⁹ Cf. Eisenhardt, K. / Kahwajy, J. / Bourgeois, L. (1997); Horton, T. (2002).

¹⁰⁰ Cf. Kida, T. / Moreno, K. / Smith, J. (2001), p. 480.

¹⁰¹ Cf. Pruitt, S. / Gitman, L. (1987); Gervais, S. (2010).

¹⁰² Cf. Brealey, R. / Myers, S. / Allen, F. (2011), p. 270.

¹⁰³ Cf. Fennema, M. / Perkins, J. (2008), p. 232.

compensation schemes should be installed. The system has to reward only the behavior benefiting the company and be best oriented on net present value instead of book values as well as some non-financial indicators such as personal development and training of assistants.¹⁰⁴ Thus, a reward system should first and foremost reward the provision of correct information by the manager, and reward its early disclosure over a late one. Furthermore, while negative feedback can also be motivating, one has to use it with great caution as e.g. negative feedback on self-esteem was found to distort the assumptions and estimates of the concerned person.¹⁰⁵ Feedback must be performed on a regular basis, also anonymously by means of software thus increasing the honesty, especially from subordinates towards superiors.

4.4 Outcome Independence

The best way to avoid individual and group biases is to integrate independent views into the project assessment and decision team. A rather large **heterogeneous group** would probably provide more safeguard against biases. However, processes of such a team might be not as efficient as those of a small homogeneous group. Hence, personal, cultural, and professional backgrounds of the members must be considered. Besides, team members' and designated project managers' overconfidence can be measured based e.g. on Malmendier and Tate.¹⁰⁶ Consequently, the right mix of (behavioral) competencies for the implementation and supervision of the project can be provided. Internal or external auditors might for example enrich the team. Due to their business focus on fraud and errors, they tend to have a rather conservative judgment.¹⁰⁷ A special committee in charge of assumption evaluation and feasibility analysis of investment proposals including finance or managerial accountant staff might enhance transparency and provide another layer of rationality and objectivity correcting for proposers' overconfidence biases.

Furthermore, it is advisable to agree on a set of goals to be reached within e.g. the next six months. Both behavioral finance and behavioral accounting scholars agree on the **controllability principle**: managers should not be held answerable for performance that is subject to factors outside of their control.¹⁰⁸ Statman and Caldwell empirically found that escalation of

¹⁰⁴ Cf. Bart, C. (1988), p. 290.

¹⁰⁵ Cf. Belkaoui, A. (1985), p. 120.

¹⁰⁶ Cf. Malmendier, U. / Tate, G. (2005).

¹⁰⁷ Cf. Russo, E. / Schoemaker, P. (1992), p. 10.

¹⁰⁸ Cf. Bart, C. (1988); Atkinson, A. et al. (1997).

commitment is less expressed when the subjects do not feel anxious due to the possibility of punishment by upper management for inappropriate performance of the project.¹⁰⁹

Escalation of commitment is the main danger when implementing investment projects since it aggravates the failure of a project thus possibly threatening the very existence of the company. Real options are found to provide better decision making than net present value alone due to increased flexibility and quality of information.¹¹⁰ Furthermore, they are found to decrease the escalation of commitment¹¹¹ since managers are confronted with the abandonment option already in the selection stage. Thus, real options should become an integral part of the capital budgeting process.

A problem of self-control explains aversion to termination of failing endeavors. And even though rules are a good means of counteraction, since their implementation or obedience would again fall to the biased manager, distinct organizational structures are needed to fight overinvestment and escalation of commitment.¹¹² Such structures can be benchmarks of losses that trigger the termination nearly automatically. One benchmark can be present termination value equal to sunk cost. Mentally, the account then closes at zero without loss making it easier for the concerned person to cope with. For assessment of the present termination value regular net present value reconsiderations must be introduced by not personally responsible personnel,¹¹³ e.g. from internal auditing department. Financial manager should be empowered to enforce project termination by the project manager.

Moreover, emphasizing the gains from termination over its losses might as well help in termination. And finally, providing information on mental accounting and differences between commitment and entrapment to the staff will make them more rational in their decisions due to the awareness to own biases.

Not enough attention is being paid to project evaluation altogether, especially to **post-audit**.¹¹⁴ Thus, the first recommendation here is to actually make it a standard behavior. The control stage is about gathering, analyzing, and providing objective information for “poten-

¹⁰⁹ Cf. Statman, M. / Caldwell, D. (1987), p. 13.

¹¹⁰ Cf. Denison, C. (2009), p. 134.

¹¹¹ Cf. Denison, C. (2009), p. 148.

¹¹² Cf. Statman, M. / Caldwell, D. (1987), pp. 11-14.

¹¹³ Cf. Statman, M. / Caldwell, D. (1987), p. 10.

¹¹⁴ Cf. Statman, M. / Caldwell, D. (1987), p. 14; Burns, R. / Walker, J. (2009), p. 86; Denison, C. (2009), p. 149; Kalyebara, B. / Ahmed, A. (2011), p. 67.

tially unpopular decisions” now and in the future.¹¹⁵ Hence, information support systems must be established. However, not only information technology, but also interpersonal communication is helpful. Personal, formal and informal meetings between project manager and financial controller are advisable for their general understanding. Nevertheless, the controller has to retain her neutrality. Furthermore, the threat of detection of deliberate capital budgeting slacks in the post-audit phase can reduce them.¹¹⁶

Overall, adequate corporate culture could provide consistency which is found to be socially desirable.¹¹⁷ Trust, collaboration, feedback and “intrapreneurship” should be encouraged. On the other side, irrational managers can only impact an organization with weak corporate governance.¹¹⁸ The establishment of strong corporate governance is thus important at all process stages. However, it is especially important in the authorization stage to provide transparency and to enforce reflective prudence and critical communication.

4.5 Critical Assessment and Limitations

Even if the *principles* of capital budgeting investment are the same worldwide, the behavior of individuals conducting it is altered by their background, and so are their assumptions and estimates. Most empirical evidence on behavior in capital budgeting comes from Anglo-Saxon or western countries. Thus, it is itself subject to cultural biases because the respondents have a very similar cultural background. For example, risk-aversion is treated in finance as a rational feature. However, the degree of risk-aversion varies highly between nations. Furthermore, the influences of gender and professional background are neither treated in the literature. Also, these traits as well as neutrality of the researchers can generally be questioned as well.

The mostly used techniques of capital budgeting are not flawless, they all have their limitations. E.g. With the net present value, the investments are considered irreversible and the approach is “now or never”.¹¹⁹ The use of and research on real options is very limited¹²⁰.

¹¹⁵ Cf. Burns, R. / Walker, J. (2009), p. 87.

¹¹⁶ Cf. André, J. / Bruggen, A. / Moers, F. (2011), p. 24.

¹¹⁷ Cf. Statman, M. / Caldwell, D. (1987), p. 11.

¹¹⁸ Cf. Baker, M. / Ruback, R. / Wurgler, J. (2007), p. 168.

¹¹⁹ Cf. Ducai, M. T. (2009), p. 182.

¹²⁰ Cf. Denison, C. (2009), p. 134.

Furthermore, the research concentrates mostly on large listed companies (Australian Securities Exchange Index 500, Fortune 500 and 1000 etc.) thus excluding the small and medium-sized enterprises and in so doing, biasing the research for the component of corporate size and culture of large companies. Additionally, the specific limitations of this paper are the absence of an empirical part and the exclusive use of English literature. Moreover, due to limits of this paper and the concentration on the topic of capital budgeting, the corresponding areas of behavioral accounting and behavioral finance could not be treated in depth thus possibly unintentionally missing some minor factors.

5 Conclusion and Outlook

The presented paper strives to provide capital budgeting practitioners with behavioral success factors and recommendations for the stages of capital budgeting process. Therefore, in chapter 2, the term capital budgeting was defined and the different stages of the capital budgeting process were identified, namely identification, selection, authorization, implementation, and control; the underlying areas of behavioral finance and behavioral accounting were contrasted, and finally, an overview of the surveyed literature was provided. Chapter 3 discussed the behavioral implications on capital budgeting such as the reasons for overinvestment and escalation of commitment to failing projects. Subsequently, the behavioral success factors for the previously identified stages were isolated, that is, motivation, objectivity, rationality, prudence, information, and transparency. Chapter 4 discussed the key success factors reflective prudence, critical communication and outcome independence and provided practical recommendations for capital budgeting practitioners. It ends with a discussion of the limitations of the article.

In 1999, Thaler argued that in the near future, finance and behavioral finance will have merged into one respected domain since there cannot be “non-behavioral” finance.¹²¹ However, ten years later, even though behavioral finance is not as disputed, it still lacks a generally recognized definition, a unified framework and a theoretical core.¹²² This presents a wide-ranging ground for exploration efforts. Lingnau and Gerling provided in 2004 and 2007, respectively, first bridges from the international managerial and cognition theory and cognitive psychology to the German management accounting (“Controlling”) discussion.¹²³ Internationally “neuro-accounting” academics have formed a niche group, so far, waiting for a bigger share of attention.¹²⁴ This interdisciplinary field apparently offers further research potential.

Behavior in capital budgeting is a relatively new area hence offering a broad field of research. Possible streams of investigation can be empirical studies of influences on capital budgeting processes by factors such as culture (on a broad international scale), size of the company (e.g. survey of small and medium-sized enterprises), and gender (contrasting implications of gen-

¹²¹ Cf. Thaler, R. H. (1999), p. 16.

¹²² Cf. De Bondt, W. et al. (2008), p. 15.

¹²³ Cf. Lingnau, V. (2004); Gerling, P. (2007).

¹²⁴ Cf. Birnberg, J. / Ganguly A. (2012), p. 10.

der-biased behavior such as e.g. degrees of overconfidence). Also, studies on the subject performed within companies might provide results well mirroring the corporate reality. Moreover, further investigations on biases which have not yet received considerable attention such as representativeness, availability, anchoring, narrow framing,¹²⁵ managerial traits¹²⁶ and real options or opportunity cost in case of project cancelation could be undertaken.

Any capital-budgeting process deals with the construction of future scenarios under uncertainty and assessment of potential success and failure of future projects. The defined (or any other) success factors cannot guarantee successful investment projects. However, the practical recommendations to implement the principles of reflective prudence, critical communication and outcome independence could diminish the effect of cognitive and emotional biases and thus address a root cause of wrong investment decisions.

Integrating the views of the managerial and organizational cognition theory and findings of cognitive psychology should further contribute to theory building and empirical insights for a successful business practice.¹²⁷

¹²⁵ Cf. Baker, M. / Ruback, R. / Wurgler, J. (2007).

¹²⁶ Cf. Gervais, S. (2010), p. 24; Shimizu, N. / Tamura, A. (2012), p. 45.

¹²⁷ Cf. Gerling, P. (2007), pp. 227-229.

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