Toward a General Model of Portfolio Decision-Making Effectiveness

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Abstract

We develop a general model of how new product development portfolio decisions are made based on four diverse case studies. Previous research has investigated portfolio decisions as individually discrete decisions. We find that portfolio decision-making has to be considered as an integrated system of domain-based processes that produce evidence-, opinion- and power-based informational inputs. The data further suggest that these processes are influenced by the level of trust, collective ambition, and leadership style. The ultimate objective of a firm is to achieve a portfolio mindset to focus effort on the right projects, and to be agile in their decision-making capabilities.

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INTRODUCTION

In today's competitive environment, continuous innovation is necessary to sustain firm success and long term business growth (Hauser, Tellis, & Griffin, 2006). "Continuous innovation" implies that the firm or business unit has multiple products in development at any point in time, as most firms have multiple product lines simultaneously on the market. Ongoing success is contingent upon investing appropriately in product renewal and product line extensions within these product lines, as well as investing in expanding these lines to new market spaces. However, funds are limited, and thus the firm must determine which products to invest how much in at what point in time – in other words, they must make decisions concerning the overall portfolio of product development projects that they will execute, across what time periods, to maximize their overall success. Long term success depends upon having effective decision-making processes concerning the entire portfolio of opportunities.

Today's successful companies across many industries recognize the importance of proficient portfolio management and emphasize it in their business visions. For instance, the CEO of Atari North America recently explained in an interview *"We are very focused on how we continue to grow as a best practice company- how we take a look at the portfolio of products we have and how we maximize that portfolio"* (Brightman, 2008). After experiencing a year of challenges Sara Lee stated in their 2005 annual report: *"Our course is clear. We are aligning more closely with our customers and consumers, focusing our business portfolio and fostering collaboration throughout Sara Lee to become more efficient and more productive".* The annual reports of the

following years presented fast growth based on strong portfolios *"The company has one of the world's best-loved and leading portfolios with its innovative and trusted food, beverage, household and body care brands"* (Sara Lee annual report 2008).

However, if not managed proficiently and in line with the firm's strategy, the negative impact of poor portfolio decisions on performance can be significant (Cooper, Edgett, & Kleinschmidt, 2001b). Recent examples of firms losing money due to poor portfolio management decisions prevail in the American car industry. Bill Ford acknowledged in 2006 that it was due to the failure of management to make the right portfolio decisions that Ford Motor declined into financial trouble. At the same time, General Motors witnessed their US market shares go down from 53% to 20% over the past four decades, while continuing to build cars that people did not want to buy (George, 2008). Forced to refocus their efforts in the midst of the economic recession, the three largest car manufacturers Ford, General Motors and Chrysler announced at the beginning of 2009 a complete change in product strategy following their better performing competitor Toyota by building portfolios of fuel efficient cars (Fujimura, 2009).

Recent research finds two systematic problems that have arisen with new product development (NPD) portfolios. First, within many firms the NPD focus has shifted from radical to more incremental innovation, with the result that some portfolios have become unbalanced and no longer align to the firm's strategic direction (Barczak, Griffin, & Kahn, 2009; Cooper, Edgett, & Kleinschmidt, 2004a, 2004b, 2004c). Second, many NPD project portfolios have become overloaded, leading to situations such as fire fighting (Repenning, 2001), in which portfolio managers are constantly occupied resolving urgent problems, thereby losing the 'big picture' of where efforts should be directed for highest success. The result of these challenges is that many firms face reduced overall success due to their inability to make effective NPD

portfolio decisions and execute against them.

There have been regular calls in the literature to attend to developing effective portfolio management processes (Cooper, Edgett, & Kleinschmidt, 1999, 2004a, 2004b, 2004c; Hauser et al., 2006). However, to date, academic focus has primarily been on methods for individual NPD project selection (Blau, Pekny, Varma, & Bunch, 2004; Cooper, Edgett, & Kleinschmidt, 2001a; Englund, & Graham, 1999) and on investigations into the role of human limitations in termination decisions (Balachandra, Brockhoff, & Pearson, 1996; Biyalogorsky, Boulding, & Staelin, 2006). Insights that prevent or resolve challenges in the daily practice of overall portfolio decision-making are scarce. This is unfortunate as it is a far bigger challenge to maintain an overview of the entire portfolio and to make decisions from a strategic perspective than to make individual project selection and termination decisions one by one (Cooper, Edgett, & Kleinschmidt, 2000).

The present research project aims to address a part of this gap in the extant literature. The purpose of this research is to investigate portfolio decision-making processes in their entirety. It uses a grounded-theory, multiple case study approach to develop a general model of portfolio decision-making effectiveness in firms. The objective is to determine what must be managed in firms for effective portfolio decision-making in the long run.

The next section reviews the literature on portfolio decision-making and presents our research question. After that, the methodology is presented. The next section presents our results, starting from delineating what defines effective portfolio decision-making. The article closes with a discussion of managerial implications, limitations and future research.

LITERATURE REVIEW

This literature review begins with the existing streams of research on individual project

selection and termination decisions, noting that researchers have approached these decisions from different perspectives. It then presents what is empirically known about managing new product portfolios. The section closes by summarizing gaps in the literature and presents the research questions addressed here.

Project selection: A focus on quantitative modeling methods

The NPD project selection literature primarily has focused on developing and investigating sophisticated quantitative modeling methods. This stream of research predominantly approaches these decisions from a rational perspective embedded in financial and operations research theories (Camillus, 1982). Methods commonly used to facilitate NPD project selection decisions can be classified as financial and mathematical optimization methods (Cooper et al., 2001b; Dickinson, Thornton, & Graves, 2001). The common denominator of these methods is to ultimately present the decision as a rational, evidence-based rigorous comparison of numbers.

Although the majority of financial and mathematical optimization methods are theoretically well justified, they have been subject to extensive criticism. Researchers have argued that NPD project data are often speculative until market launch (or even until well after market launch); hence, the absence of accurate data can make the outcomes of these methods unreliable, even though they are presented as "objective" (Blau et al., 2004; Linton, Walsh, & Morabito, 2002; Poh, Ang, & Bai, 2001; Repenning, 2001). In response to this criticism, even more sophisticated methods have been developed, which are commonly classified as probabilistic financial methods, such as real options (Cooper et al., 2001b). Real option methods follow the principles of buying options in the stock market to compensate for the associated risks of innovation (Janney, & Dess, 2004; McGrath, 1997). Although real option methods can help obtain realistic risk and reward calculations, they are not user friendly, and thus are more academically than practically

interesting.

Benchmark studies conducted by Cooper and colleagues (Cooper et al., 2004a, 2004b, 2004c) showed that companies that relied solely on financial methods in project selection decision making performed the worst of all companies in their research. However, financial methods are still the most popular methods for facilitating project selection decisions in portfolio management (Blau et al., 2004; Cooper et al., 1999; Poh et al., 2001).

Project termination: Human behavior in decision making

Termination decisions are a critical facet of portfolio management as these decisions stop projects that either are not expected to provide sufficient profit for the firm, or are no longer aligned with firm strategy. Termination decisions free up resources to create room for other, hopefully more lucrative, NPD opportunities. However, the decision to terminate an ongoing project is not an easy one. In fact, project termination is cited as one of the most difficult decisions to make in business practice (Balachandra et al., 1996; Balachandra, & Friar, 1997; Calantone, Di Benedetto, & Schmidt, 1999). To illustrate this, imagine a project manager who has devoted substantial time and effort to an NPD project that they believe is truly innovative and highly relevant for the future of the company. Let us assume that the success of the project is also decisive for the project manager's prospective bonus. However, after several months or even years, new data indicate that the project has a low probability of success and should therefore be discontinued. It is understandable that the project manager in this situation would perceive the termination of their project as a personal failure (Boulding, Morgan, & Staelin, 1997; Schmidt, & Calantone, 1998). "Individuals get emotionally involved in the project and are very reluctant to terminate it, even if there are many clear signals that the project is not going to be successful" (Balachandra, & Friar, 1997: 92).

The source for this "escalation of commitment" is usually seen in initial personal involvement with the project, and could therefore hypothetically be avoided if termination decisions were made by those not involved in the project. However, recent findings indicate that biased belief updating; i.e., the distorted valuation of new information in relation to initial beliefs, also plays a substantial role in the development of escalation of commitment situations (Biyalogorsky et al., 2006). This finding implies that even if those making portfolio management decisions have not been involved in the start-up of a project, they still may be influenced by subjective feelings that can lead to an overly positive evaluation of the project's future.

Empirical Research on Managing NPD Portfolios

To summarize the research on individual project decisions, project selection research primarily focuses on quantitatively-based methods for selecting the projects that can be expected to optimize the value of the project portfolio in development. Termination research to date investigates how individuals deal with termination decisions, assuming that human beings are rationality bounded, and finding that in reality, they are not (Eisenhardt, & Zbaracki, 1992; Simon & Newell, 1960). However, these literatures have not yet connected individual selection and termination decisions with how to create more successful portfolios or manage portfolios overall more effectively. Indeed, only three pieces of research have investigated empirically performance aspects of new product portfolios. Two smaller empirical studies investigated two different contexts, and one more general study has been carried out.

First, using data from mutual funds, Eggers (2006) found that "using a scattershot approach to investigate a multitude of new product arenas at one time would actually be detrimental to the firm." Fund managers who focus their attention on making decisions about what new products to commercialize in just one area (fund) perform better than those who dilute their attentions across

multiple funds, each of which typically has different growth and income goals.

In a different context, Voss, Montoya-Weiss, & Voss (2006) used data from the Theatre Communications Group, the largest service organization to the nonprofit professional theater industry, to investigate the relationship between theater success and portfolio innovativeness. Theater success was operationalized as total-year subscriber ticket revenue. Portfolio innovativeness was operationalized as the percentage of theatrical offerings during the year that were new-to-the-world, or those that have not been produced before, in comparison to those that had previously been produced elsewhere (e.g., a contemporary Broadway success or a classic, such as a Shakespearian play). They found that the relationship between innovativeness and year-total revenues was curvilinear, a skewed inverted U, with peak revenues at about 25% of the offerings at a theater being new-to-the-world.

The largest project investigating new product portfolios empirically was conducted by Cooper et al. (1999, 2000 2001a, & 2001b). This study collected survey data from 205 diverse businesses on six blocks of variables: portfolio management importance, portfolio management methods, management's satisfaction with portfolio methods, performance of the business's portfolio management method, characteristics of the portfolio management approach employed, and general demographics. The main purpose of this descriptive research was to benchmark current practices concerning the use of evaluation and management methods (such as financial methods, strategy alignment methods, bubble diagrams, scoring models, and checklists) and to develop an initial understanding of some of the differential results achieved with different methods used to evaluate portfolios. On average, this research found that the portfolio evaluation and management methods used by these firms were not particularly efficient, user friendly, realistic in capturing key facets of the decision problem or even well understood by senior

management (Cooper et al., 1999).

The research identified three wide-ranging goals for obtaining strong portfolios: *achieving strategic alignment;* i.e., the alignment between the firm's business strategy and NPD efforts; *maximizing portfolio value;* i.e., the optimal ratio between resource input and return; and *achieving balance;* i.e., a harmonious portfolio with respect to specific parameters (e.g., incremental versus radical innovation or risk versus reward characteristics). Cooper et al. (2001b) found that firms with the best performing portfolios (self-stated ratings) against these goals were more likely to use an explicit, established evaluation method with clear rules and procedures that management supported, that was applied consistently across all appropriate projects and that considered decisions about all the projects in the portfolio simultaneously. The results suggested that business strategy alignment methods of evaluating the portfolio were better at achieving some of the above goals than financial methods, but were not significantly better than any of the other evaluation and management methods.

Interestingly, the Product Development & Management Association's third New Product Development Best Practices study provides corroborating evidence for two of Cooper's findings (Barczak et al., 2009). This study of over 400 firms' wide-ranging approaches to NPD found that "the Best" firms – the top 21% in terms of overall NPD performance as defined across three dimensions – were more likely to use a well-defined and structured portfolio management process (65%) than were the rest of the firms (51%), and that they also were more likely than the rest to use the "strategic buckets" business strategy alignment portfolio management method.

Gaps in the Literature

Managing the NPD portfolio to provide the firm with an ongoing stream of successful new products is crucial to the firm's long-term existence. Clearly, doing that requires that firms make

NPD portfolio decisions effectively and efficiently. However, the extant research to date on this topic has provided little understanding in how these decisions are made on an ongoing basis. Research on individual project selection and termination decisions provides little or no information about effective decision-making for the NPD portfolio overall. The conclusions from the two smaller empirical studies are merely that strategic focus matters in choosing the set of projects, and that there is an optimal level of innovativeness (which may vary by industry context). Although Cooper et al.'s (1999, 2000, 2001a, 2001b) research aimed at uncovering which portfolio evaluation and management methods were associated with better performing portfolios, their research came up with somewhat different conclusions than initially expected. Rather than finding "the one best method" for evaluating portfolios, their research suggested that there were a number of practices associated with how various evaluation methods and criteria were established, applied in making decisions and culturally supported by management that mattered. Similarly from the PDMA study (Barczak et al., 2009), although the differences in method use between the Best and the Rest were statistically significant, the magnitude of the differences in use between the two groups is not large, again suggesting that it is not a particular method that is employed in evaluation that is important, but other, supporting processes and capabilities that are. Because Cooper et al. (1999, 2000, 2001a, 2001b) started from an evaluation methods focus, they came up with some capabilities that seem to be important in effectively managing NPD portfolios; however, it is unlikely that their research fully uncovered all the issues associated with the underlying culture and decision-making processes that are associated with effective NPD portfolio decision-making. Across all of the published literature, there still remains a large gap in understanding what constitutes effective NPD portfolio decision-making in firms.

Research question

The main objective of our research project was therefore to identify more completely how firms approach NPD portfolio management decision making: that is their project selection, management and termination decisions across projects and over time; what cultural and procedural challenges they encounter in making these decisions efficiently and effectively; why those challenges occurred; and how they were overcome. To investigate this research question, we conducted a series of exploratory case studies investigating how product development personnel and senior managers manage NPD portfolios in multiple firms. Our objective was to build theory for this important and broadly scoped, phenomenon-driven research question (Eisenhardt, & Graebner, 2007) because prior research on this topic using other methods has not been able to do so.

METHODOLOGY

Research strategy

Due to the complex nature of portfolio management, it could only be meaningfully investigated in its organizational context using a qualitative research approach to identify firm capabilities, process patterns and their systematic implications. A multiple case study was seen as the most suitable research method because contextual conditions are important, the boundaries between phenomenon and context are not clearly evident, and the research requires multiple sources of evidence (Yin, 2003). Including multiple cases from different industrial contexts, different geographical locations, and different technology orientations strengthens the external validity and enhances the generalizability of the conceptual model developed (Yin, 2003).

Sample

Our unit of analysis is the strategic business unit of a large firm or a medium sized company that operated as a single strategic business unit. To increase generalizability, we purposively sampled across multiple dimensions: quality of portfolio management capabilities, geography, and industry. As we required access to highly sensitive information, we believed that organizations would be more likely to participate if no competitors were present in the sample.

The Kalypso Consulting Firm's 2007 report "How World-Class Companies Handle Portfolio Management" identified more and less mature industries in terms of portfolio management maturity. According to their report, the least mature industry they found was packaged consumer goods. Two of the most mature industries were financial services and pharmaceuticals/medical. Using external benchmark reports (The Booz Allen Hamilton Global Innovation Reports, 2006, 2007) we identified two firms they included in their High-Leverage Global Innovators: one in financial services in Europe, and one in the medical device arena in the US, to approach as potential research sites. Both firms agreed to participate. To sample at the least mature portfolio management extreme, two firms (again, one US, one European), were sought who produced consumer packaged goods. Both firms, from different parts of the packaged food industry, had participated in other research at the US and European academic institutions previously, and agreed to participate in this new project. Non-disclosure agreements were signed with all participating companies. Table 1 presents an overview of the case sample.

Insert Table 1 about here

Data collection: a multi method approach

In each case, we used three methods to collect data: company documents, semi-structured

interviews and observations of portfolio decision-making meetings. Using multiple methods in case studies helps to better understand complex phenomena and to enhance triangulation of data and theory (Cassell, & Symon, 2004; Eisenhardt, 1989; Yin, 2003). We used the different methods of studying documents, conducting interviews and observing meetings in an iterative fashion throughout the case study investigation as is visually presented in Figure 1. The iterative manner in which the data were collected helped enhance data depth and quality (Yin 2003).

Insert Figure 1 about here

Data collection resulted in a total of 1,750 pages of company documentation, 75 semi-structured interviews equaling 4,598 minutes of recorded material, and 13 meeting observations equaling 49 hours (meetings lasting from 2 to 8 hours). Table 2 presents an overview of the collected data per case company.

Insert Table 2 about here

Analysis of company documents. Company documents provided insights into the formal processes in place for portfolio management decision making and familiarity with company-specific jargon, the organizational structure and strategic vision. The study of meeting minutes helped prepare for meetings attended later. We studied the following types of documentation:

- organizational charts
- strategy process documentation
- NPD process documentation
- portfolio management documentation (portfolio database management system documents, charts, excel spread sheets)

- board presentations
- internal benchmark reports
- annual reports
- minutes of meetings

Semi-structured interviews. Semi-structured interviews with senior managers from multiple disciplines provided in-depth information from different perspectives on the formal and informal portfolio decision making processes embedded in the organization. This method encouraged interviewees to openly express their viewpoints on the way portfolio decisions were made in their company. Important guides in deciding how many interviews to conduct were the studies of Kvale (1996), who found that the common number of interviews in qualitative studies is 15 ± 10, and of Griffin and Hauser (1993), who calculated that 20 interviews obtained 91% of the theoretically available information. Table 2 presents the number of interviews conducted by case.

The interview guide helped structure the interview and made sure that all topics of interest were covered. The main themes in the interview guide were:

- organizational context and processes (e.g., aspects of governance, (in)formal processes, and culture);
- uncertainty and complexity in portfolio decisions (e.g., what were the firm specific complexities in portfolio decision making and how did the firm handles these);
- individuals in portfolio decision making (e.g., how did the individuals in the firms make decisions, what kind of information did they require and how were they motivated).

Prior to each interview, interviewees were informed about the purpose of the research and granted anonymity. All interviews, each lasting approximately one hour, were digitally recorded.

Meeting observations. Portfolio review meeting observations provided information about how portfolio decisions were actually being made (as opposed to how the documented processes indicated that they would be made, or how people said they were made) within the specific organizational context. It also provided an opportunity to observe the dynamics between the decision makers in the actual practice of portfolio decision-making. Where possible, we digitally

recorded the meetings. However, due to the sensitivity of the information under discussion, permission to record was not always granted. In that case, extensive notes were taken.

Data analysis

Each interview and all field notes were transcribed to allow for a detailed coding procedure as described by Strauss and Corbin (1990). The interviews were coded and cross-checked by at least two authors to assure consistency and reliability of the coding. Following a grounded theory approach different levels of open coding were applied at different levels of analysis.

First, detailed coding was used in a descriptive manner to summarize pieces of text under descriptive labels. This procedure resulted in about 500 descriptive codes from just the first three interviews of the first case. These descriptive codes then were grouped into a smaller number of second level codes, which were more interpretative in nature, reflecting emerging themes. This process was repeated after every two interviews for this case. The analysis of the first case resulted in a general outline of themes with detailed codes under each to explain and illustrate the interpretation. Firm documents, meetings and observations were used to corroborate and further explain themes and to provide additional insights.

The coding processes of the second, third and fourth cases used the previously developed code book as the starting point with additional first- and second-level coding for newly emerging themes or for complementing existing themes. At the end of each case more depth and structure were added to the code book and a clearer picture emerged of how the concepts and themes related to one another conceptually. Throughout the intensive coding process, the authors repeatedly reflected upon the emerging themes during case analysis meetings. Finally, all results were presented to the participating companies and the feedback was used to improve the model.

RESULTING MODEL

In this section we present the general model of portfolio decision making effectiveness that was derived from the data analysis. We will first explain the construction of the general model, after which the underlying definitions of the constructs will be explained and supported with examples from the data, presented in italics.

General Structure of the Model

While the majority of the previous literature treats portfolio decisions as discrete, we found that a systems approach was required to conceptualize the interconnectedness of effective portfolio decision-making. We identified three dimensions along which portfolio decision-making effectiveness is evaluated: the extent to which the decision-making system produces a portfolio mindset in the firm, i.e., that decision-makers always have an overview of the projects in the portfolio and of their alignment to the firms' strategy; decision-making agility; and providing effort focus. Portfolio decision-making effectiveness was achieved through balancing evidence-based, opinion-based, and power-based decision-making processes. These three decision making processes impact portfolio management effectiveness differentially, in isolation and through their interactions. The three processes are fueled by several distinct decision inputs. Market immersion, critical thinking, and cross-functional collaboration processes resulted in evidence that firms used in making their decisions from more objective inputs. Intuitive inputs result in opinions that also could influence decision outcomes. Finally, political processes resulted in making decisions from the power bases in the firm, rather than from evidence or intuition. The relative balance between the three decision-making processes (i.e., evidence-, opinion-, and power- based) depended upon the influence of three cultural factors: the extent and nature of (dis)trust in people's expertise and motivation; the strength of their collective ambition,

i.e., the extent to which people across domains and across levels share company goals and values; and whether the leadership style of the strategic business unit of the firm is an autocracy or a meritocracy. Figure 2 presents the general model developed from analyzing the case data.

Insert Figure 2 about here

Dimensions of Portfolio Management Effectiveness

Firms judged their portfolio decision-making effectiveness across three major dimensions. Truly effective new product development portfolios achieve all three goals simultaneously. Good portfolio decision-making imbues a portfolio mindset to the firm's personnel; allows the firm to be agile; and enables the firm to translate long-term strategic goals into a more near-term focused set of projects that will address these goals.

Imbuing a Portfolio Mindset. A portfolio mindset means that the firm's decision-making processes have produced a complete understanding of all of the projects in the portfolio, and that the projects in the portfolio are aligned with the firm's strategy. An effective portfolio management process provides an ongoing overview of all of the projects being considered, all those underway, where each of those projects is currently positioned in the NPD process, and when each is expected to launch into the marketplace. Among other things, this overview allows management to determine if there are bottlenecks in the NPD process that may be slowing project development down. *In the medical devices company, senior management had an excellent overview of their projects in the short term, allowing them to quickly intervene when bottlenecks arose in various areas, such as prototyping. However, they were unable to connect their projects to a long term strategic vision, which impeded developing higher impact projects*

that were needed to grow the division in the long term. Having a portfolio mindset also means that every project in development fits the firm's long term strategy. *In the financial services company, senior management maintained a continuous overview of their portfolios in relation to the (long term) strategic vision, while middle management had an overview of how individual projects connected to detailed market needs. A transparent top-down and bottom-up communication system helped create a portfolio mindset on all levels in the business unit.*

Agility in Decision-Making. Firms with effective portfolio decision-making practices need to be agile. They can make decisions quickly when needed. For example, if a major technology is invented that allows them to improve their solution to a target market problem, or if a competitor unexpectedly changes direction, their decision-making processes should allow them to address those opportunities in a proactive, rather than reactive manner. *The US food company kept decision-making lines short, which in combination with having in-house pilot and production facilities, gave them the ability to execute decisions within a very short time frame. Although this company lacked a clear strategic vision, they were capable of bringing new innovations to the market very fast, with their agility giving them advantages over their competitors.*

Focused Effort. Good portfolio management processes should keep the firm's efforts focused on only those short-term actions that will enable them to achieve their long-term goals. This effort prevents teams and product line managers from just chasing innovation in an opportunistic manner. *The European food company originally concentrated on launching a high output of innovations on the market without connecting them to a long-term strategy. When the market environment changed, with increasing competition, shorter product life cycles and higher legislation demands, they were forced to think more carefully about where to focus their efforts. At the time of data collection this company was in the midst of redefining their (general)*

corporate strategy into more detailed brand strategies that could help steer the focus of efforts in portfolio decisions.

Decision input generating processes

Five decision input generating processes emerged from the case study analysis: cross-functional collaboration, practices of critical thinking, practices of market immersion, the use of intuition in generating decision input, and politics.

Cross-functional collaboration. Cross-functional collaboration has both formal and informal process aspects. The basic premise of a cross-functional collaboration process is having extensive informal cross-functional communication networks that are easily accessed and used by people across functions. Short communication lines are seen as key to cross-functional communication and (deliberate) co-location of different disciplines involved can lower the hurdles of approaching someone who operates in a different functional area.

People across functions also were brought together formally and collaboration supported through cross-functional meetings and decision procedures that required input and sign offs from different domains. *For example, the board of the financial services firm required cross-functional unified argumentation to back each decision, which was then signed off by members of all the different domains. On the other hand, in the European food firm, decisions were formally the domain of marketing and required no official input from R&D, which frequently slowed the process as decisions often had to be revised or stopped because important decision inputs from R&D had not been taken into consideration.*

A clear division of responsibilities was found to help different functions to build domain specific expertise, which was brought together and shared in formal meetings to arrive at a unified decision rationale supported by all functions. Team-based or product-group-based

incentives were used to motivate people to seek each other's expertise and advice and work together to achieve the desired outcome. The opposite of cross-functional collaboration processes could probably be found in political maneuvering, which will be addressed as politics in the non-evidence-based decision input generating processes.

Practices of critical thinking. Practices of critical thinking build an evidence-based decision rationale. Factual evidence should steer in-depth discussions in which the focus is on what the data mean and how they can be used to understand the problems and risks at hand. Problem solving was found to be fundamental to the process of critical thinking and actively promoted by top management who would ask critical questions and demand evidence-based argumentation for each proposed decision. These critical questions generally were asked in formal meetings and documentation requirements, but also were posed in informal settings. Critical thinking practices could be further enhanced by formal post launch reviews and the evaluation of customer complaints. People were encouraged to learn from their mistakes by analyzing the reasons for failure and understanding how this could help them improve future decision making. *In the European food firm the norm was to take "facts" presented by one or another function for granted without discussion. If the rationale by which the facts were derived was faulty, this resulted in decisions that were not well thought through.* The opposite of critical thinking is probably intuitive thinking, which we deal with as a separate process in the non-evidence-based decision input generating processes.

Practices of Market Immersion. The firm uses practices of market immersion to engage in both proactive and reactive market research activities to understand customers and other stakeholders and to identify their (latent) needs. Various activities may be undertaken to understand the customer and user environments. *The medical devices company always carefully*

selected the appropriate market research method based on the issue that required investigation: they used large scale survey studies to identify general trends or problem importance, and focus groups and interviews to obtain more in-depth insights of customer needs. But above all, this company highly valued cross-functional field observations and had individuals from all domains and all levels in the strategic business unit make regular field trips to understand customers and obtain a complete picture of the use environment and other stakeholders involved. Practices of market immersion mean that people are actively involved in market research and seek personal contact with customers to get a full understanding of their target group. Market research reports are thoroughly analyzed across functions (not just marketing) and in the case of ambiguities, complemented with studies from other sources. The proactive aspect of market immersion is about finding problems or needs that can be solved with new products that complement the portfolio. The reactive aspect of market immersion is to test concepts. Market immersion should be embedded in the organization and no decision should be made without market input. *The medical devices company even had their own in-house market research facilities, which not only gave them the opportunity to conduct studies on a frequent basis at relatively low costs, but also to cross-functionally engage in research projects, providing all team members with first hand input on customer needs.*

Intuition. Intuition is defined here as the input generating process of forming an opinion based on past experience and feelings. Intuition may help an individual form an initial opinion about a situation, but provides no grounds for objective argumentation and therefore can lead to subjective decision-making if no evidence is used later in the decision-making process. The absence of concrete measures or evidence requirements may encourage the generation of intuitive decision making input. *For example, in the US food company the management board*

predominantly made decisions based on "me-marketing", relying on personal feelings and experiences, rather than seeking evidence-based market input. Unfortunately, since these managers seldom fit the target population, decisions based on their own preferences most frequently did not lead to significant new product lines. In the financial services company, people also relied strongly on their past experience and feelings in evaluating new opportunities and forming initial opinions. However, this initial opinion was then tested with additional people across multiple other functions and backed-up with data to obtain grounds for further argumentation. In general across these firms, it seemed that the larger the complexity of the decision issue, the larger the role of intuition in generating decision inputs.

Politics. Politics are the informal processes of influence, persuasion, and negotiation that people use to gain personal support for decisions. These processes may not be based on facts but are driven by the personal interests or motivations of individuals or groups. Typical outcomes of political maneuvering were the manipulation of numbers in financial methods used for making portfolio decisions (analytical knowledge), and the building of social relationships to gain support and consensus. An unclear evidence-based decision structure or location of decision making authority could encourage politics and the building of social relationships merely to influence decision outcomes, rather than to share experiences and collaborate. *For example, in the European food company, middle level management could not get a decision approved without engaging in individual political persuasion with their senior counterparts.*

A highly centralized decision making structure may give people little room to argue their ideas based on facts and may force them to informally sell their ideas from the bottom up using political influence tactics. Decentralization of decision making processes in the strategic business units can lead to fewer politics in the process as decision making transparency improves. *The*

financial services company decentralized their portfolio decision making based on the monetary impact of the decision. The smaller the impact of the decision, the fewer facts were required and the lower down in the organization the decision was made. This system provided people on both middle- and senior-management level transparency.

Decision inputs derived from these input generating processes

The decision input generating processes resulted in evidence and non evidence-based decision inputs. The evidence-based inputs are: multiple perspectives and shared experience, analytical knowledge, and market knowledge.

From cross-functional collaboration: Multiple perspectives and shared experience. Cross-functional collaboration provides an understanding of the different underlying assumptions (interpretations) of the numbers that are generated as evidence by each function. Multiple perspectives and shared experience comprise a joined knowledge of technology data, financial data, and market data, and the meanings of each data type.

From critical thinking processes: Analytical knowledge. Critical thinking is about understanding the technical and financial risks of the decision, resulting in analytical knowledge with quantitative expressions of technical information and of the financial ramifications of potential decisions. For example, critical thinking processes provide estimates of returns on investments and probabilities of technical success for various different possible technical avenues. The best of those processes even provide risk-adjusted estimates of these values, and scenario-based ranges of these estimates.

From market immersion: Market and customer knowledge. Market immersion provides a thorough understanding of both the individual target customer(s) and the market in aggregate. Target customer knowledge includes a detailed knowledge of customer needs, as well as the

importance of each need and trade-offs that customers are willing to make between solutions to different needs or different features. Aggregate market knowledge includes general trends and information about market sizes, market potential, growth rates, competitors, competitor shares, and price points.

From intuition: Subjective opinion. Intuition generates subjective decision inputs. These subjective decision inputs are usually not backed up by argumentation, as feelings and conclusions from experience can be hard to argue other than by anecdote. The rationale behind intuitive decision inputs is either completely absent or concealed by general statements such as "strategic importance". These are so called "must-do" projects for which senior management does not provide middle management with any decision rationale for "why" they must be done. *In the European food company, middle management was regularly told by senior management to pursue a project on the basis of "strategic importance," even though middle management had already suggested canceling these projects based on other evidence-based decision input that suggested that.*

From political processes: Power by individual or subgroup. Unequal power in the decision input by various individuals or subgroups is usually the result of political processes in which some person or group of people are able to possess control of a decision through the informal processes of influence, persuasion, and negotiation. Politically obtained power by individuals or subgroups can be a threat to decision quality as the attention is no longer on the objective rationale of the decision but rather on personal aspects that may have nothing to do with the facts and risks of the actual decision. *The European food company had a strong consensus driven culture with little encouragement for critical thinking. People did not dare to step on each other's toes in official meetings even though they knew from their domain-specific evidence that*

some decision options had a low likelihood of success. This encouraged political maneuvering to influence the decision making outside official meetings. On top of this, the marketing function had the dominant decision making power, which contributed to a lack of cross-functional critical thinking in the organization and increased the politics.

Power struggles also can negatively influence cross-functional collaboration in the organization. *The medical devices company had been very strong on cross-functional critical thinking and evidence-based decision making, but a conflict in the management board was about to jeopardize this more objective decision-making style. Fortunately, the VP trying for a political coupe whereby his functional area would dictate the projects to be undertaken, was not successful and the division returned to their more collaborative and evidence-based decision-making process.*

Decision making processes

The case data revealed that portfolio decision-making effectiveness was achieved through balancing evidence-based, opinion-based, and power-based decision-making-processes. We will discuss each of these decision making processes more in detail.

Evidence-based decision making processes. Evidence-based decision making processes argue about the detailed assumptions behind the technical, financial, and market facts that are derived from processes of cross-functional collaboration, critical thinking and market immersion. *The medical devices company had regular cross-functional meetings in which the management board asked the middle-level and project managers critical questions about the assumptions underlying the presented evidence to come to a decision. The management board had the reputation of not accepting any poorly argued answers, causing everyone in the company to do their utmost best to fully understand and ground their domain-specific evidence in fact.*

Opinion-based decision making processes. Opinion-based decision making processes deal with the evaluation of holistic subjective opinions, which originate from intuitive processes that are based on overall feelings and personal experience rather than facts. *In the US food company portfolio decisions were usually made based on the subjective opinion of the CEO or management board members without evidence-based input. Discussions evolved primarily around people agreeing or not with the overall opinions until the CEO finally made a decision. This sometimes left the other board members with feelings of frustration.* Conflicts can easily arise in opinion-based decision making processes because there is no basis for argumentation about specific pieces of evidence that underlie various options.

Power-based decision making processes. Power-based decision making processes are centered on power struggles which come forth from political processes in which the goals of individuals or subgroups dominate other individuals or subgroups or even company goals. Personal or group gains and losses dominate the decision-making process over evidence-based argumentation. The decision process is usually not transparent as the actual decisions are often made in informal settings and not at the official decision making meetings. *In the European food company people who were new to the organization found it very hard to get decisions approved because they did not know how the decision-making game worked. Individuals needed to learn who to approach and how to sell their ideas in an informal setting before the formal decision making meetings would take place.*

Cultural factors that influence the decision-making process balance

Analyzing the contextual environment of each of the case firms, we identified three prevailing cultural factors: the extent and nature of (dis)trust between people in the firm; the degree of collective ambition (shared company goals and strategies); and the leadership style (autocratic or

meritocratic). We found that these cultural factors influenced the extent to which the firms relied on evidence-, opinion- or power-based processes in their portfolio decision making.

Trust. Trust determines the extent to which people are comfortable with the underlying assumptions of evidence-based input from other functional domains. A lack of trust can shift the decision process balance depending on the nature of the distrust. If the distrust is about trust in each other's cross-functional expertise, then people are more likely to discount even explicitly articulated facts, shifting the balance toward power- and opinion-based decision making. *The European food company implemented a portfolio database management system with scorecards for each project to make better-informed and more objective portfolio decisions. It turned out, however, that people did not trust the project scores presented because they did not trust their peers to fill in the scores objectively and with knowledge of the business.* If the distrust is about the motivation behind the assumptions underlying the evidence-based input then this may evoke political behavior and shift the balance toward power-based decision making.

Collective ambition. Collective ambition is the extent to which people across domains and levels share the same company goals and buy into the same strategies. The stronger the collective ambition, the more readily people believe each others' subjective opinions because they know everyone is working for the same cause, leaving little room for inter-group politics. *The strong level of collective ambition in the financial service company helped them to avoid and solve cross-functional conflicts because they knew everyone was on the same page and working in the best interest of the company. If conflicts did aris,e they could easily be solved by providing additional evidence-based argumentation for the different sides of the issue.* A lack of collective ambition can induce personal- or group-based goals and can lead to political behavior. Misalignment of goals in the management board can cause severe conflicts and move the balance

toward power-based decision making.

Leadership. An autocratic leadership style in which one or few persons have the dominant decision making authority will most likely shift the decision making balance toward power-based and opinion-based decision making. In an autocratic setting decision-makers can make decisions without providing thorough argumentation to their peers from other domains or to the people in lower management levels. *In the US food company decisions were predominantly made by the CEO with input from the members of the management board. Because this CEO operated on the basis of intuition and his own experience, the decision-making balance shifted toward opinion and power-based decision making.*

A meritocratic leadership style, however, demands evidence-based decision inputs by setting formal requirements and fulfilling an exemplar role for objective decision-making. Specifically, meritocracy drives critical thinking throughout the company, shifting the balance toward evidence-based decision making. *The medical devices company fostered critical thinking through regular cross-functional meetings to derive argumentation behind the facts, formal documentation requirements for obtaining evidence-based knowledge and their argumentation, and by constantly being on guard for political maneuvering. Projects moved forward based on merit.*

DISCUSSION

Unlike most research on portfolio management, which has focused on isolated aspects of NPD portfolio decision making, our aim with this research was to study portfolio decision making effectiveness from an integrated perspective. Using an in-depth qualitative case study research of four medium or large companies across different industries and geographic locations helped us identify a number of interrelated constructs that describe the systemic nature of portfolio

management more aptly and comprehensively than previous work. Our findings illustrate that treating portfolio decisions as discrete decisions implies a mechanistic view, dividing the entity of interest into simple component parts that are then investigated separately (Phillips, 1972). A systems view, however, argues that the whole is greater than the sum of its parts and that the whole cannot be understood from the properties of its parts alone (Checkland, 1999). The properties of a system thus arise from the interfaces of its parts: a change in one element affects the whole system (Kast and Rosenzweig, 1972).

Our research has resulted in a general model of portfolio decision making effectiveness. In this model we conceptualize portfolio decision making effectiveness in terms of three major dimensions:

1) Imbuing a portfolio mindset: a mindset aimed at an ongoing overview of the projects in the portfolio and their alignment to the firms' strategy;

2) Agility in portfolio decision making: the firm can make portfolio decisions quickly and is flexible in the implementation of the decisions; and

3) Focused effort: the firms' efforts are focused on those short term actions that will allow them to achieve their long-term strategic goals.

The model proposes that certain input generating processes generate input for portfolio decision making, and that these information sources can be based on evidence, subjective opinions and power. An appropriate balance between these three decision making processes is required, which according to our findings is influenced by three cultural components of the organization (i.e., trust among individuals in the firm, the strength of their collective ambition and the leadership style). Based on our data, we expect that an absence of evidence-based decision-making produces room for opinions as well as politics to affect decision-making. We also expect a positive correlation between the extent to which decision inputs are generated from intuition and the degree of politics in an organization. When a firm strongly promotes critical

thinking through a meritocratic leadership style, it probably also fosters cross-functional collaboration, as this typically leads to more critical inputs.

Most importantly, our data suggest several relationships between the three decision-making processes and portfolio decision-making effectiveness. Evidence-based decision processes are proposed to positively impact decision-making effectiveness whereas power-based processes are hypothesized to decrease effectiveness. It is unclear how opinion-based decision processes impact effectiveness. On the one hand, when individual opinions are actually derived from significant and deep personal knowledge, it may be possible to have successful outcomes. On the other hand, if the opinions are based on "me marketing" and the decision-makers differ from those in the target market, as was the case for the US food firm, then opinion-based decisions are not likely to result in successful outcomes. However, firms that combine evidence-based decision processes with intuition based on experience may outperform other organizations that mostly rely on intuition and politics: we propose that the interaction between these two decision-making processes is positive. These proposed relationships should be tested in a larger scale quantitative study before we can derive any firm conclusions.

Our research opens a new direction for portfolio management research but it also has its limitations. The findings are based on only four companies, although the case sample was carefully chosen and balanced. It is likely that some of the findings would generalize to other industries and other companies but as of yet this is not possible to determine. A further corroboration and confirmation of the model by other researchers and with another case sample would be desirable.

Notwithstanding its preliminary character, the model still holds important practical and theoretical implications. Understanding what the relevant elements in the portfolio decision-

making system are, how these are interrelated, how their balance is determined by which factors and how this balance affects portfolio decision making effectiveness will help senior managers understand which strings to pull to achieve portfolio management effectiveness. Being aware of the strengths and weaknesses of the company's culture and decision processes can help managers to direct their efforts. For example, an over-reliance on subjective opinion in portfolio decision-making and the absence of mechanisms to generate more evidence-based inputs, in combination with an autocratic leadership style will almost certainly lead to problematic and inappropriate portfolio decisions. By implementing methods of market immersion, defining long term company goals and strategic arenas companies could shift their decision process balance more toward evidence-based decision making and simultaneously work on developing a portfolio mindset, improving their portfolio decision effectiveness and, hopefully, their long term business success. It is the role of senior management to recognize these cultural components and their own contribution to the extent to which decision-making is based on evidence, subjective opinion or power.

In terms of theoretical development, we feel that systems theory provides a promising avenue to further investigate portfolio decision making. The constructs of the general model and their relationships should be explored further as a system to arrive at a detailed understanding of how senior managers can influence different aspects of the system to achieve portfolio decision making effectiveness. More specifically, research should investigate further the interrelationships between the different constructs and identify potential other determinants, interactions and moderators influencing the balance between decision making processes and their effects on portfolio decision-making effectiveness. Finally, it will especially be of interest to practitioners if research could identify the mechanisms by which managers can achieve changes in the specific

parts of the portfolio decision making system to improve their portfolio decision effectiveness.

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TABLE 1

Case sample

Industry	Location	Size	Technology orientation
Packaged consumer goods	United States (US)	Medium	Low-tech
Medical devices	United States (US)	Large	High-tech
Financial services	Europe (EU)	Large	Low-tech
Packaged consumer goods	Europe (EU)	Large	Medium-tech

TABLE 2

Collected data

Industry	Size	Nr. of interviews	Nr. of meetings
US			
Medical devices	Large	23	2
Packaged consumer goods	Medium	13	5
Europe			
Financial services	Large	13	1
Packaged consumer goods	Large	26	5

FIGURE 1
Data collection structure

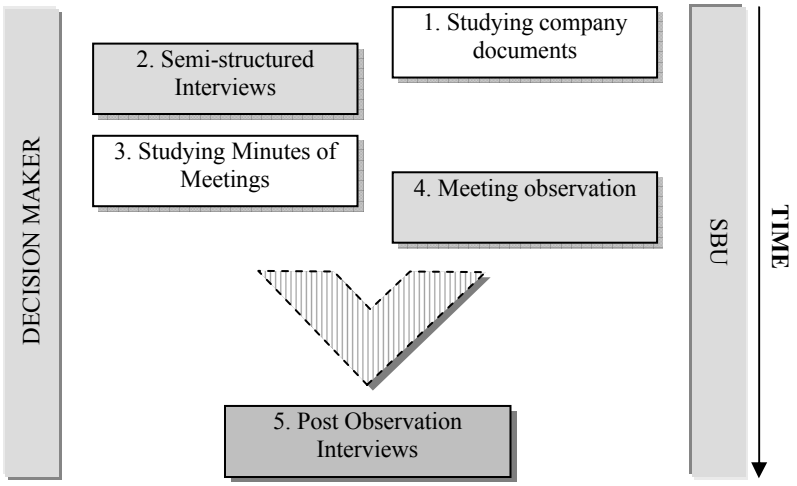

FIGURE 2

The general model of portfolio decision making