



# Continuous Planning and Forecasting Framework (CPFF) for Agile Project Management: Overcoming the "Agilefall"-Budgeting Trap

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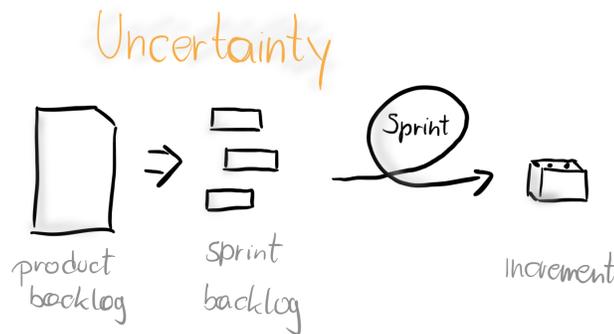


Figure 1: Uncertainty in "agilefall" environments?

## ABSTRACT

Despite the many problems the COVID-19 pandemic creates in the economies worldwide, recent research in academia tries to find new ways to support enterprises and companies counteracting the crisis. This study discusses the question of how an agile project budgeting resp. The Continuous Planning and Forecasting Framework (CPFF) for agile project management can be used to support teams working in an "agilefall" (the in-between state of traditional and agile) environment to reach a certain level of certainty under uncertain conditions. This contribution refines the first drafted Continuous Forecasting Framework, presented on the Software Engineering 2020, incorporating feedback from academia and practitioners using agile methods. For readers who have never worked in a real

agile environment, it is often difficult to grasp why getting off the strict path following an iterative beyond budgeting approach could increase certainty. Therefore, the authors depict the framework by applying it to specific problems within traditional project boundaries focusing on elements that could help teams overcoming the "agilefall"-budgeting trap.

## CCS CONCEPTS

- **General and reference** → Performance.

## KEYWORDS

Continuous Planning and Forecasting Framework (CPFF), agile project management, agile project management framework, continuous forecasting, beyond budgeting, agilefall environments

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# 1 INTRODUCTION

The COVID-19 pandemic has changed the way we work tremendously. Teams are dislocated, the labor market is unstable, and prosperity is declining. Hence, the shortcomings of classical budgeting approaches increasingly gain relevance and unveil in real-life project settings. Figure 2 is inserted to provide background information on the COVID-19 pandemic and the effects and consequences on the labor market in Austria from April to May 2020<sup>1</sup>.

As defined in the COUNCIL REGULATION (EU) 2020/672(7) of 19 May 2020 "Short-time work schemes are public programmes that in certain circumstances allow businesses experiencing economic difficulties to temporarily reduce the hours worked by their employees, who are provided with public income support for the hours not worked." [6]

The bar chart shows the labor market in Austria per sector. On the left-hand side are the sectors and on the right-hand side the bar is divided into four colors: blue represents how many of hundred percent (total) are still employed, red represents how many of hundred percent are in short-time-work (Kurzarbeit), green represents how many of hundred percent have been unemployed since March, and purple represents how many of hundred percent had been unemployed already before March. On 3/11/2020, the WHO firstly announced the COVID-19 virus as worldwide pandemic<sup>2</sup>. Figure 2

shows that the COVID-19 pandemic has a significant impact on nearly all sectors. Considering that for IT/IS/software projects qualified staff (developers, researchers, consultants) has already been scarce before, the problem of running low on human resources ascends. This increases uncertainty in complex settings. As a natural reaction to environment's high variability [26] states "[...] in C-19 situation, organizations also tend to adopt 'temporary adhocracies' which function with the sole purpose of innovating. Such adhocracies would require specialists, [...] be drawn together for a scrum-like project [...]" [26]. Another important point is to understand and review projects and not using agile as an all-in-one solution suitable

<sup>1</sup>The asterisk labeling is described as follows:  
 \* for example travel agencies, building management, tour operators.  
 \*\* due to seasonal effects, unemployment in these sectors has been falling since March. The unemployment figures here, therefore, reflect the overall level at the end of April.  
 \*\*\* for example, legal advice, research, architects, managing directors.  
<sup>2</sup>Refer to <https://www.tagesschau.de/inland/coronavirus-317.html>

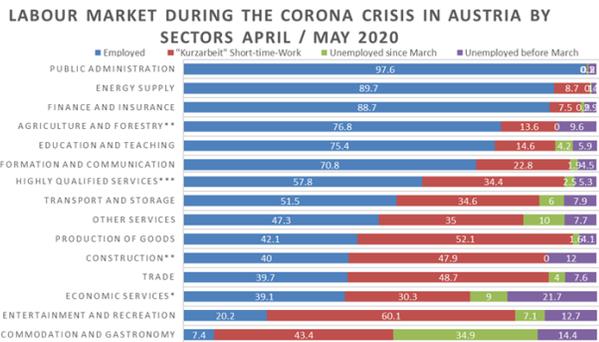


Figure 2: Labour Market in Austria, April-May 2020, translated selected sectors from [2]

for every purpose. E.g., if the technological realization and the requirements are known so to say in simple projects agile might not be reasonable [22] and thus, could increase uncertainty. See Figure 3 from [22] who adapted it from the original "Stacey Matrix" [24]. The adapted "Stacey Matrix" [22] helps deciding, taking requirements and technological realization into account, if agile is feasible. There exist different other influential factors on uncertainty resulting from virtual team settings [14] alike technical debt [25] or social debt [28] mentioned by [15].

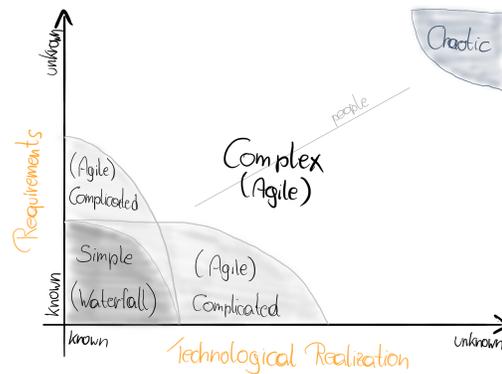


Figure 3: Stacey Matrix (Own illustration from [24] adapted by [22] to software development) Source: [22]

The first idea of a continuous forecasting framework was presented on the SE2020 [23]. Subsequently, the authors incorporated the interview from Jason Miller [19], who talked about digital transformation and the fact that many agencies are still not fully transformed into agile organizations. Moreover, they are in between waterfall- and agile software development: "We see much usage of agile in the language in solicitations, but if you read them closely, you can pick up whether they truly get it or not. They may say we do agile, but a year-long Microsoft project schedule has to be maintained. That is agilefall." [19]

In a similar way, [16] define the mix of agile- and traditional methods: "A hybrid software development approach is any combination of agile or traditional (plan-driven or rich) approaches that an organizational unit adopts and customizes to its own context needs (e.g., application domain, culture, processes, project, organizational structure, techniques, and technologies)." [16] Thus, we are using the term "agilefall" to coin the in-between state of today's project management practices.

With the Continuous Planning and Forecasting Framework (CPFF) for agile project management, this research tries to overcome the barrier of leading teams in an "agilefall" environment, having increased uncertainty e.g., running low on human resources. The researchers had the opportunity to discuss inputs concerning the problems firsthand with the Head of Global CRM & Customer Engagement at Swarovski, who considers himself working in an "agilefall" environment.

**Table 1: An overview of budgeting methods: Translated from [29]**

Features / Approaches	Better Budgeting	Advanced Budgeting	Beyond Budgeting
Objective	Optimisation of individual areas of planning	Optimisation of the entire planning system	Optimisation of the entire management system
Main focus	Improvement of selective weaknesses in planning	Use of new instruments, thereby increasing the quality of planning with less planning effort and decreasing importance of budgets	Abolition of rigid budgets that function as fixed service contracts; reconsideration on employee-oriented / participative management concepts
Planning	Simplification and concentration on success-critical processes; increased consideration of strategic content in operational planning	Simplification and concentration on success-critical processes; increased consideration of non-monetary variables; integrated operational and strategic planning	Rolling, monetary and non-monetary core values focused planning; integrated operational and strategic planning; decentralisation of planning
Motivation	Market-oriented objectives	Self-adjusting market-oriented objectives	Self-adjusting objectives relative to internal/external benchmarks
Control	Third party control	mostly third party control	mostly self control
Coordination	Central coordination via plans	Partially decentralised coordination via plans	Decentralised market-like coordination; support by central offices

## 2 AGILE PROJECT MANAGEMENT

This chapter outlines SCRUM, the most frequently used agile development practice, and delimits agile from traditional methodologies.

### 2.1 Traditional Methodologies

Since the early beginnings of software development, practitioners have adopted effective project management methodologies to ensure meeting organizational needs. While some of those traditional software development methodologies were based on the idea of iterative and incremental developments [17], many followed a linear, sequential process splitting parts into phases ("waterfall"-approach). Already in 1988, Boehm [3] proposed a risk-driven iterative spiral model for software development. Despite the visual commonalities Boehm’s spiral model substantially differs from the CPFF e.g.:

- Boehm’s spiral model increases over time, due to its focus on risk-driven cumulative costs contrasting the CPFF, which declines over time, due to its focus on project uncertainty.
- Boehm’s spiral model’s traditional focus splits the development process into dedicated phases building up on each other, contrasting the CPFF, which incorporates agility in every iteration.
- *"An important feature of the spiral model, as with most other models, is that each cycle is completed by a review involving the primary people or organizations concerned with the product."*[3] clearly indicates its plan-driven rigid nature contrasting the CPFF using beyond budgeting elements supporting the project lead.

According to [13], traditional models require accurately knowing the project’s requirements, solutions, and goals right from the beginning - a precondition that typically is not fulfilled. As the models did not cover changes in requirements, every detour became a complicated and expensive endeavor. As a result, many tried to

overcome this obstacle - and methods like Extreme Programming, Scrum, Crystal, or Feature Driven Development arose. Moreover, [16] show in their overview of the development approaches applied in practice that for example Boehm’s spiral model is hardly used (1.4 %) in today’s hybrid development settings. The authors assume that the CPFF taking agility into account, during its development, has the possibility to be implemented in today’s hybrid development settings.

### 2.2 Agile Methodologies

It has been the Snowbird Skiing Resort in Utah, where 17 people met in 2001 to find common ground in the above mentioned new methods: The Agile Manifesto was born. Among those 17 persons were Extreme Programming pioneers Kent Beck, Ward Cunningham, Ron Jeffries, and Scrum creators Jeff Sutherland, Ken Schwaber, and Mike Beedle. They formulated the following four guiding principles:

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

Among the mentioned methods, Scrum has shown to be the predominantly used methodology [1].

### 2.3 Scrum

[27] describes Scrum as a lightweight, easy to understand yet challenging to master framework that is particularly effective in iterative and incremental knowledge transfer. As explained in their Scrum Guide, the idea itself is based on empirical process control theory that states that knowledge comes from experience *and* making decisions based on what is known. Subsequently, Scrum was built on the following three pillars [27]: transparency, inspection,

and adaption. In an iterative approach, Scrum is heavily centered around the concepts of time-boxing, self-organization, and role separation. A dedicated team (Scrum Team) is working on dedicated work packages (Backlog Items) within a dedicated time frame (Sprints) (Figure 1). A set of predefined Scrum Events facilitates knowledge transfer within the development team (Sprint Planning, Daily Scrum) as well with other stakeholders (Scrum Review) and helps to manage expectations and to add clarity (e.g., Definition of Done, Sprint Goal). Active client participation is encouraged.

### 3 BUDGETING

The following section provides insights into the different budgeting methods which have been researched in academia over time. In general, those models differ in dynamics and complexity. The four predominant approaches resp. traditional budgeting, better budgeting, advanced budgeting, and the highest abstraction layer beyond budgeting are juxtaposed in opposition (Table 1). As a result, the beyond budgeting approach is mostly applicable for CPFF.

#### 3.1 Traditional Budgeting

To understand recent developments in the area of budgeting, it is vital to start with traditional budgeting which is often also referred to as conventional budgeting [9]. *What is budgeting?*: The controlling department, which is often in charge of planning and forecasting, tries to minimize uncertainty with the concept of planning. Consequently, the monetary component of planning is budgeting [29]. Planning the future is very vague, and we do not grasp and predict the future with all its influences or certain events. Traditional budgeting procedures try to overcome that with rigid structures, hierarchies, fixed targets, and strict rulings. [20] pointed out that traditional budgeting procedures are too time-consuming, costly, and unresponsive for today's environment. Further, "horse-trading", "gaming" or "perverse" (dysfunctional) behavior are problems which could arise [20]. If you think about the problem that unused budgets are often shortened at the end of the period: "December fever"[7] / budget wasting / "full disbursement of budget funds by the end of the year"[8] becomes prevalent or managers try to shift their budgets to other cost centers or objects to keep budgets somehow on the same level. In the following, the problems of traditional planning and budgeting are listed based on [29] and extended by [10, 20].

- The (implicit) premise that future developments are readily foreseeable and estimable [29]
- The parties concerned must have all the necessary information at their disposal [29]
- Increased discontinuity, complexity, and dynamics [10]
- Imperfect or incomplete information [29]
- The criticism of the contents and the process of budgeting mainly comprises the following points [29]:
  - Level of detail and completeness [29]
  - Monetary focus, ignoring, e.g., customer base or intellectual capital [29]
  - Budgets concentrate on cost reduction and not on value creation [20]
  - Budgets strengthen vertical command and control [20]
  - Internal guidelines in the focus (missing environmental and market requirements) [29]

- Budgets reinforce departmental barriers [20]
- Updating of previous periods (accumulation of costs) [29]
- Lengthy coordination processes [29]
- Budgets constrain responsiveness and flexibility and are often a barrier to change [20]
- Budgets are developed and updated too infrequently [20]
- Budgets are based on unsupported assumptions and guesswork [20]
- Strategy vs. one-year focus [29]
- Dysfunctional behaviour through coupling of forecasting/planning and motivation [29]
- Lack of involvement of those concerned in the budget process [29]
- Lack of utilization of the potential of the employees [29] or make people feel disdained [20]
- Budgets add little value and they tend to be bureaucratic and discourage creative thinking [20]

As a result of all these problems, [29] formulated in a consistent and all-encompassing way the: *"Planning paradox: The more complex the environment and the greater the uncertainty, the more planning is needed to cope with it, but also the greater the probability that planning is not relevant."* The following adaptations are discussed with the primary aim, not to increase the accuracy of predictions, but to be able to react faster and flexibly.

#### 3.2 Better Budgeting

Better budgeting is not a method or an approach that can be started at once, but it subsumes different approaches and techniques which try to aid improved budgeting and future planning. [20] stated five techniques that can be linked to the section "better budgeting". Those are

- Activity based budgeting
- Zero base budgeting
- Value based management
- Profit Planning
- Rolling budgets and forecasts

#### 3.3 Advanced Budgeting

Already in 1995, [5] researched on the concept of advanced budgeting as wider frameworks contrasting classical budgeting concepts were necessary. The authors focused on the problems of traditional budgeting and came up with five objectives for the new approach:

- Driving activity plans coherently from business strategies [5]
- Linking resource consumption to process outputs [5]
- Supporting continuous improvement, both incremental and breakthrough [5]
- Building and maintaining congruent behaviour [5]
- Adding real value through planning and budgeting [5]

In general, it can be said that the advanced budgeting concept has never aimed to abandon the whole budgeting process at all, like beyond budgeting does; however it tries to increase efficiency and effectiveness of planning and budgeting. This said, it is a redesign of traditional budgeting with strong involvement of the controlling department [12].

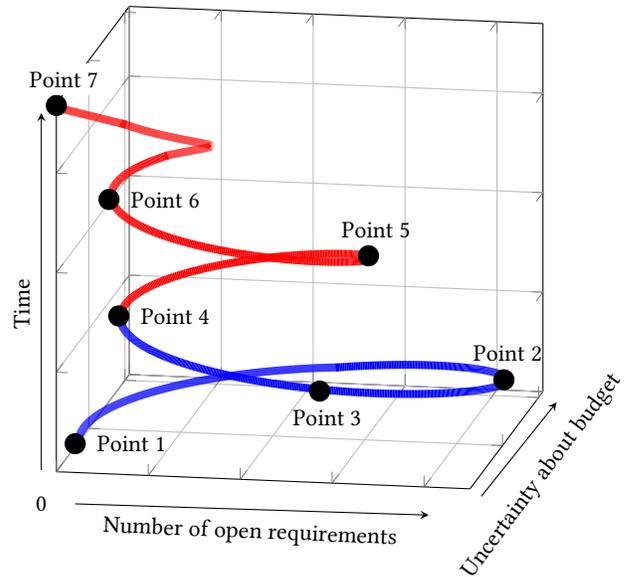
### 3.4 Beyond Budgeting

The most abstract and radical change towards a "non-budgeting" environment is beyond budgeting. The most relevant differences to the mentioned budgeting approaches are outlined in Table 2.

**Table 2: Beyond Budgeting: 12 principles Source: Tabulated from [23] on the basis of [11]**

Leadership Principles	Management Processes
<ul style="list-style-type: none"> <li>• Purpose - Engage and inspire people around bold and noble causes NOT around short-term financial causes</li> <li>• Values - Govern through shared values and sound judgment NOT through detailed rules and regulations</li> <li>• Transparency - Make information open for self-regulation, innovation, learning and control NOT restricting it</li> <li>• Organization - Establish a strong sense of belonging and organize around accountable teams NOT going for hierarchical control and bureaucracy</li> <li>• Autonomy - Trust people with the freedom to act NOT punishing everyone if someone should abuse it</li> <li>• Customers - Connect everyone's work with customer needs NOT going for conflicts of interest</li> </ul>	<ul style="list-style-type: none"> <li>• Rhythm - Organize management processes dynamically around business rhythms and events NOT around the calendar or planning cycles only</li> <li>• Targets - Set directional, ambitious and relative goals NOT go for fixed and cascaded targets</li> <li>• Plans and forecasts - Do planning and forecasting of lean and unbiased processes NOT rigid and political exercises</li> <li>• Resource allocation - Foster a cost-conscious mindset and make resources available as needed NOT through detailed annual budget allocations</li> <li>• Performance evaluation - Evaluate performance holistically and with peer feedback for learning and development NOT based on measurement only and NOT for rewards only</li> <li>• Rewards - Reward shared success against competition NOT against fixed performance contracts</li> </ul>

For such a radical change, trust is crucial. None of the team members works jointly towards the year's targets by ignoring the monthly results having a classical control structure in mind [20]. Only a handful of companies were able to eliminate budgeting at once [21]. [4] explore the implementation of beyond budgeting by focusing on the supply and demand for managerial information. The authors demonstrated that specifically, unraveling target setting, forecasting, and dynamic resource allocation could help for strategy-oriented decisions in situations that require certain negotiations or learning. For further guidance concerning beyond budgeting, the authors refer to [9]. [20] stated two companies that have been able to do this radical step. Both are Scandinavian companies that often try to be inventors



**Figure 4: Continuous Planning and Forecasting Framework (CPFF) for Agile Project Management**

and are open-minded for new approaches. Svenska Handelsbanken eliminated budgets already in 1970. For consecutive 29 years, this bank was able to outperform others in terms of, e.g., cost-efficiency and expenses as a percentage of total assets—the bank focus on competition and benchmark against external sources. Broealis A/S (Denmark) is according to [20], the most excellent example which has established beyond budgeting. It uses no budgeting approach traditionally; however, Borealis uses rolling forecasts included in several balanced scorecards (BSC). The scorecards include an all-encompassing quarterly target setting for a total of five quarters (rolling). They try to use minimal overheads (10 days in total). Through cascading the corporate BSC down, all business units and departments have their strategic dashboards linked with several external sources, including several non-financial indicators, to get rid of internal bargaining and negotiations.

[18] surveyed mid- to large-sized North-American organizations questioning their budget practices. The result was that most firms use budgets for control purposes and perceive them as adding value. They prefer adopting the budgeting process rather than abandoning budgets altogether. This could indicate that the right framework is still missing to be used in "agilefall" environments. In situations where non-budgeting is strictly forbidden by policymakers, including contract bids that require budget estimates (e.g. government contracts) beyond budgeting is not applicable.

## 4 CONTINUOUS PLANNING AND FORECASTING FRAMEWORK FOR AGILE PROJECTS

This section outlines the CPFF and illustrates its application.

## 4.1 Description

Initiating the description of the model, it is vital to reassess the problem: In general, "agilefall" environments are more common than "real" agile enterprises. Within the boundaries of "agilefall," budgeting teams work with the yearly budget as if it would be a pure cost allowance. This has to be reflected critically as it certainly opens room for inefficacy and hinders out of the box thinking. While many companies can cover up for certain inefficacy during good times, a crisis like the COVID-19 pandemic shows that these limitations circumvent management decisions and reactions. In addition the increased existence of virtual settings (work from home, WFH) [14] increases the danger of technical debt [25] or social debt [28] mentioned in [15]. During times of uncertainty, agile teams require a more flexible approach that supports trust instead of hampering decision making. Thus, we propose the CPFF (see Figure 4) as an agile framework where each iteration reduces uncertainty by re-evaluation based on the beyond budgeting principles. Figure 4 depicts the three vital dimensions for agile software projects:

- *Number of open requirements*  
Additional requirements of the minimal viable product (MVP) unveil over time based on user and stakeholder input. Thus, the x-axis represents the number of open requirements, i.e., the # of items in the project's backlog.
- *Time*  
The y-axis displays the time units for the whole project phases.
- *Uncertainty about budget*  
Beginning with the project Kick-Off, where the project team starts to translate customer needs into actual software requirements, the z-axis displays total uncertainty about the budget. Uncertainty in our case contrasting the "agilefall"-duality of project budget approval, is presumably lower. The "agilefall"-duality is caused by the problem that a company typically has an approved budget - for the MVP, however, subsequent budgets are granted for a time-frame (e.g., one year) rather than necessarily feature-based on-time.

## 4.2 Application

Managers need room for maneuvers. In "agilefall" environments, they are always bound to constraints and fixed monetary targets. As a result, managers, for example, try to save costs to have a safety cushion at the end of the period, which consequently leads to the "December fever" / *budget wasting* [7]. By stating this exemplary management dysfunctional misbehavior, we like to start with the CPFF application:

Figure 4 displays a 3D funnel which explains the relationship of the aforementioned dimensions. Point 1: The graph starts at Time 0 (Kick-Off), Number of open requirements 0 (as the customer needs to get them translated into actual requirements first) and with an initial uncertainty strictly greater than 0 (due to the fundamental uncertainty which is inherited in every project start). Point 2: After the MVP is fully defined, the implementation phase starts. The initial implemented requirements (e.g. first [1-n] Scrum sprints) reduce the uncertainty because those are often the known ones (low hanging fruits). Point 3: During implementation, problems and unknown functions (e.g. subsequent [n-o] Scrum sprints) are to be

implemented. This is represented in the figure through the turning point, where uncertainty rises again. Point 4: The uncertainty reaches a level where management becomes unsure about the value and purpose of the project. This is not necessarily happening at each Scrum review meeting but should happen within this frame if uncertainty reaches the threshold. Therefore, the re-evaluation phase, including requirements analysis and specification, hooks in. Throughout this phase, uncertainty is rising because additional problems become visible, and communication flaws uncover. During this phase, customer feedback on the MVP is collected and translated into new software requirements. Point 5: Again, like in the first iteration (Point 2), the implementation phase starts with a reduction in uncertainty. In general, the MVP has collected the low hanging fruits within iteration 1, thus complexity increases while the #number of open requirements decreases. Represented in the same period from iteration 1 to iteration 2, fewer open requirements have to be covered. Point 6: This exemplary point shows that the iterations shall continue in recurring loops until reaching Point 7 (goal state): The graph ends at Time n (project completion), Number of open requirements 0 (as all open requirements are implemented) and Uncertainty about budget 0. The beyond budgeting principles are applied in every iteration, e.g., first iteration (Points 1-4). Point 1 marks when the team is briefed and aligned according to the leadership principles as purpose, values, transparency, organization, and autonomy. The last principle is most important regarding customer feedback (including the customer consistently in Points 1-2). Points 2-4: Targets are set relatively, plans are considered as drafts rather than as rigid exercises, resources are always available and feature-driven, management interviews evaluate performance, and shared success against the competition is rewarded *as long as uncertainty remains tolerable*, and therefore, confidence in the team lead remains stable.

## 5 CONCLUSION AND LIMITATIONS

The CPFF builds on the first draft presented within the AESP'20 at the Software Engineering conference 2020 [23]. Implementing the feedback and inputs from colleagues and practitioners, now the beyond budgeting approach is used to support "agilefall"-project management teams. Lowering the ambivalence of management by eliminating dysfunctional behavior, the CPFF provides room for maneuvers and is overcoming boundaries and constraints of mixed "agilefall"-environments. SIGITE'20 is the next step for the authors to receive feedback from the American academic community to further mature the framework before empirical validation and actual implementation in agile project management. Limitations are currently visible due to the non-validated stage of this framework, only logical deduction and feedback from academia and practitioners were used to model the CPFF. No significant quantifiable primary data from stakeholders was collected yet.

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