PLANNING FINANCIAL ABSORPTIONS ON INFRASTRUCTURE PROJECTS THROUGH ADJUSTED S-CURVES IN FIDIC CONTRACTS

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ABSTRACT
Today it is hard to imagine new things, inventions and any accomplishments without projects standing behind them. Projects of any kind are a crucial part of our world; they have become the way of thinking and inevitable foundation for successful businesses. In order to produce a desirable impact on the community, project goals must be achieved – in other words, projects must be successful. Nevertheless, it often seems that we live in a world of unsuccessful project endeavors. Many authors agree that problems occurring in implementation phase could have been foreseen in conceptualization and planning. Therefore, planning has been recognized as a critical phase for projects to succeed. High-quality plans enable easier procurement, contracting, monitoring and control – leading to a better project management and overall project success. One of the most popular project management tools for project planning, especially when it comes to budgets, is a well-known S-curve. S-curve is simple, clean, report and user-friendly. All the above is stressed on the special manner when it comes to the largest and most complex projects – infrastructure projects. In Croatia, as well as other EU members, infrastructure projects are mostly EU co-financed, and often contracted via FIDIC terms of contract, which makes planning phases even more important. This research was conducted in order to contribute to the improvement of baselines and projection of financial realization. Theoretical baseline and empirical S-curves on portfolio of FIDIC Red and Yellow Book contracted projects in water sector were analyzed and compared, with the aim of proposing adjusted prognostic S-curves of financial absorption and therefore contribute to more efficient planning and implementation of projects.

KEYWORDS
1. INTRODUCTION

We live in a project-oriented world in every aspect of our lives and business. Projectification as a trend in organizations has broaden the very term of “a project” (Maylor et al., 2006). Contextualization, social and political aspects, rethinking practice, complexity and uncertainty, actuality of projects and broader conceptualization, were key terms found by Svejvig and Andersen (2015) in their study of rethinking project management. In such environment, project success becomes more important than ever.

This has a significant impact in terms of infrastructure projects. Infrastructure projects are defined as a kind of public good in which government policy has an important role to influence the effects of the project on economic development and social needs (Shen et al., 2011). Investments in building of successful sustainable infrastructure has numerous advantages for society, from local, national, regional to wider global aspect, depending on the size of the project size, its type and complexity. Project success is therefore crucial in any project endeavor, but is stressed on a special manner in terms of infrastructure projects, due to the wide impacts they have on society, economy and politics.

There are two important reasons why projects don’t achieve the desirable impact – in some cases they are conceptualized or planned on inadequate manner, and in the others they are managed with insufficient quality and care. In this paper, authors will put an accent on the first reason, in order to contribute to better planning of infrastructure projects.

There are numerous tools, methods and techniques helping to plan and implement projects, but one of the most used, recognizable, and easily understood is the S-curve. Study undertaken by Radujkovic and Sjekavica Klepo (2021) showed that traditional project management tools such as Gantt charts and S-curves still remain popular. Their possibilities can be seen in the study of Hwang et al. (2018), who found out that the “S curve,” “forecasting techniques,” “cost control software products” and “WBS” are popular tools and techniques used for cost control in megaprojects.

In this study, authors aim to contribute to better project planning by the usage of S-curves in one type of infrastructure – water infrastructure which consists of water and sewage systems, wastewater treatment plants and drinking water treatment facilities. Those kinds of projects are mostly EU co-financed, and often contracted via FIDIC terms of contracts, both in Croatia, but also in other EU member states.

The Authors have conducted this research with a goal to improve baselines and projection of financial realization on different types of contracts.

A literature review on the topic of project planning and S-curves was made.

After that theoretical baseline and empirical S-curves on portfolio of FIDIC Red and Yellow Book contracted projects (in mature implementation phase) in water sector were analyzed and compared.
As a result of this comparison, adjusted prognostic S-curves of financial absorption were made for different types of contracts regarding:

- Type of FIDIC Book contract
- Advance payments
- Retention money
- Duration of Trial operation period for FIDIC Yellow Book

Finally, recommendation for future research and final conclusions were given.

2. LITERATURE REVIEW

2.1 Planning of construction projects

Planning is a group of measures set in advance, that predict realization of certain tasks and time within which they should be made (Simovic, 2002).

Similarly, a part of project management is project planning, which is linked to the usage of time plans – e.g. Gantt charts, which are used both for planning and reporting within project environment later on (Kerzner, 2003).

Chronologically, planning is a second phase of a project lifecycle, coming up after conception, and followed by execution, maintenance, and project closure at the end. As such, it is of fundamental importance in management of construction projects. Namely, development of construction plan and schedule is a critical task in construction management, even in the case when plans are not written or formally recorded on some other way (Hendrickson, 2008).

From the above, it is possible to conclude that even in informal project environment, plans have significant value and complexity. They gain even more on those elements, if there are certain special requirements put onto projects, originating from their special funding (such as EU) or contract models (such as FIDIC).

Both of those inputs have certain requirements in a sense of project planning, which go beyond the basic ones.

Furthermore, planning can be defined as a process in which events and activities of future endeavors are predicted, and then, on the base of the known information and inputs and optimized technology and organization of work, their linking, dimensioning, scheduling and control of execution is made. The aim of planning is to manage costs, time, risks and resources on a project, with an aim of their minimization, while obtaining the set quality of product (Radujkovic et al., 2012). Planning has a task to manage project variables optimally, monitor and control project execution, ensure decision making while undertaking corrective measures and create an information base on planned and executed values of projects.
Planning within project management is an item so important that, from the earliest phases of project management development, is recognized as one of critical project success factors. The importance of usage of project plans (Clarke, 1999; Pinto and Mantel, 1990; Pinto and Slevin, 1988), moreover, the necessity of their usage as critical success factor (Morris and Hough, 1987), is recognized widely in project management literature. Planning of high quality is a project success factor (Heising, 2012; Ika et al., 2012), and pre-project planning and clarity of project scope has been shown as a crucial success factor on a large scale of researched public construction projects – e.g. in India (Doloi et al., 2012; Tabish and Jha, 2011), Jordan (Sweis et al., 2013), Lithuania (Gudienë et al., 2013), or on megaprojects (Misic and Radujkovic, 2015). While researching construction projects, project time and resource plan is defined as one of 21 factors critical for contribution to project success (Gunathilaka et al., 2013), and similar has been agreed within other studies also (Fortune and White, 2006; Ramayah and Lo, 2007). The main reason behind this lies in the fact that, in the most cases, construction projects address success factors defined in conceptualization of a project, which then lead to quality of plan being made (Thomson, 2011).

Even when perception on planning is not accompanied by its importance as a factor influencing an increase of possibility for project success, plans are still used as a project success measure. Namely, entire changes, execution, progress, quality, budget and time management, i.e. processes of monitoring and control, reporting and change management, are being made in regards to plans made on the project start. The traditional measure of project success has indeed been consistency in following plans regarding costs, time and quality/scope – so called “adherence to planning” principle (Atkinson, 1999; Cooke-Davies, 2002; De Wit, 1988; Ika, 2009; Jugdev and Müller, 2005).

When it comes to classifying project plans, there are different ways to it. We can discuss quality plans, stakeholder management plans, communication plans, procurement plans, deliverables plans, project management plans, risk management plans, etc. (IPMA, 2018). The Project Management Institute (PMI, 2020) indicates that the project plan is a formal, approved document, used to document planning assumptions and as a tool to communicate approved project management elements such as scope, cost and schedule, etc.

To distinguish those terms, project schedules reflect how the work will get done and when it will get done. Putting project activities (that define scope) in time span, linking them logically, assigning resources to them (both financial and material), and optimizing the process would be planning in narrow sense – i.e. scheduling.

Dvir et al. (2003) discuss that planning can be seen through three different levels: end beneficiary level (focuses on functional characteristics of the final deliverable), technical level (focuses on technical specifications of project deliverables), and project management level (focuses on activities and processes that must be executed so the technical work could be effectively finished).

Planning in general is done in different project phases, involving different stakeholders. At the same time as the project idea is concretized, first plans are being made. The investor
plans all project activities that precede designing process – project goals and scope definition, investigative works, defining sources of financing, feasibility studies, decision on the project, master plan of key milestones, etc. Then, designer should plan all activities related to technical documentation. Note here that this is applicable to do at this moment if project execution and design are provided through different contracts – e.g., Red FIDIC Book. If provided through one contact (Yellow FIDIC Book), contractor should plan design activities within the implementation plan also.

For further deepening of the plan, the investor should also be in charge, and it should take place while preparing tender documentation. This basic plan should reflect investors views and expectations related to execution phase, and it consists of main execution phases, key milestones and expected dynamic of payments.

When competition is opened, bidders should enclose a plan as a part of their bid. This plan is a potential contractor’s answer to investor’s expectations and reflects the competency of one’s bid. This plan should have a detailed schedule of project activities, resource allocation and defined deliverables, main decision points, documentation and procurements.

Finally, once hired, contractor is obligated to make an implementation plan before the contract’s execution. This should be a detailed elaboration of a bidding plan; it is an operative plan with accurate resource allocation, roles and responsibilities of subcontractors and suppliers, and important events (handovers, approvals, controls).

2.2 Planning within FIDIC contract models

Everything said above regarding the plans in project’s implementation, is defined in detail by the well-known FIDIC contract models.

FIDIC (International Federation of Consulting Engineers) is a global representative body for national associations of consulting engineers (over 1 million engineering professionals and 40000 firms in more than 100 countries worldwide). FIDIC publishes international standard forms of contracts for works and for clients, consultants, sub-consultants, joint ventures and representatives, together with related materials such as standard pre-qualification forms (FIDIC, 2018). FIDIC General Conditions are currently the most often international standard of contracting for construction and engineering works in Croatia. Over the last 15 years, they have been largely used in projects funded by international financial organizations (development banks) and EU funds. FIDIC 1999 Suite of Contracts consists of four models intended for different purposes, some of which widely used, and some less used. In this study, authors concentrate on two most popular FIDIC books, by which projects in researched sample are contracted: The Red Book and The Yellow Book. The Red Book is being used for construction and/or reconstruction of sewage and/or water networks, where contractor is in charged only for execution. The Yellow Book is being used for construction or reconstruction of wastewater treatment plants and plants for water conditioning, with contractor being responsible for design, execution of works and trial operation period.
Due to General Conditions of The Red Book (FIDIC, 1999a) and The Yellow Book (FIDIC, 1999b), clause 8.3. “Time plan”, the Contractor shall submit a detailed programme to the Engineer within 28 days after receiving the notice under Sub-Clause 8.1 (Commencement of Works).

This plan should be revised by the contractor anytime it does not match the real progress or contractor’s responsibilities. This plan is so called initial, baseline plan, based on which activities of execution management, monitoring, control, change management, reporting, etc. are being made.

2.3 Planning within EU co-financed projects

EU co-financed projects have special set of rules regarding planning, emerging from legislative brought through Common National Rules (Ministry of Regional Development and EU Funds, 2022) and Manuals of Procedures (Croatian Waters, 2022). Also, multiannual seven years financial periods upon which EU budget is being spent on operations in accordance with EU policies, require comprehensive top-to-bottom planning which has to aim at possibility of specifying project portfolio size and dynamics of financial absorption within it.

The absorption of EU funds is basically realization of financial plans, which lies on accuracy of assessments of financial consumption on the field. Beneficiaries of EU funded projects gain their funds through verified Applications for Reimbursements. One part of those Applications deals with assessment of future financial realization, based on expected physical work. Contractor, beneficiary/project manager and EU verificator should give their reasonable assessments. Based on those assessments, future annual and multiannual budgets are being made. However, in many cases, those assessments are not parts of a projects that are being managed with care. This leads to many practical problems, the main one concerning the dynamics of funds’ absorption and inability to fulfil defined goals - on project, program, portfolio, institutional or state level.

These problems are also followed with problems immanent to any construction project regarding the plan, regardless the financing source. Planning approach of low-quality causes appearance of many factors of project failure, such as delays, exceeding of the budget, shortage of budget, expiry of eligibility period for allocated funds, communication problems, problems with scope and quality of project deliverables, inadequate stakeholders’ management, conflicts, claims, etc. (Alinaitwe et al., 2013; Anbhule and Kumthekar, 2012; Doloi et al., 2012; Hwang et al., 2013; Kikwasi, 2012; Marzouk and El-Rasas, 2014).

2.4 Planning of financial absorption via S-curves

In order to fulfil aims regarding maximization of planning quality, S-curves are often used in water infrastructure projects management, by contractor, as well as project management and strategic management side. S-curves are a representation of cumulative cash flow over a period of time (Ostojic-Skomrlj and Radujkovic, 2012), where the time is presented on the
x-axes, and cumulative costs on the y-axes. Therefore, it is an effective tool for measuring the utilization of the financial outlays of a construction project (Konior and Szostak, 2020). S-curve is therefore quite easily understood, user friendly and widely used planning, monitoring, and prognostic method.

Also, not only single S-curve but S-curve envelope can be used in planning and monitoring of the projects, where upper curve corresponds to the earliest times and the lower curve corresponds to the curve of the latest times (San Cristobal, 2017).

Nevertheless, traditional schedule-based method for estimating S-curves is not always as accurate (Chao and Chien, 2010). To improve accuracy of S-curves used in management of water infrastructure projects, existing expert, theoretical baseline S-curves are compared versus empirical S-curves on portfolio of finished FIDIC Red and Yellow Book contracted projects, which is a research method similar to those used in Ostojic-Skomrlj and Radujkovic (2012).

Results of this part of the research are given below.

3. RESEARCH METHODOLOGY

As mentioned in the literature review, FIDIC contracts are generally accepted contract models that are primarily used in Croatia for projects co-financed by EU, including the water utility sector for contracting projects under the Operational Program Environmental Protection (2007-2013) and the Operational Program Competitiveness and Cohesion (2014-2020). Of the pre-accession funds (IPA) used before the accession of the Republic of Croatia to the European Union, and after the accession to the EU when arrived the possibility of financing projects from Operational Programs, in the water utility sector projects were contracted according to FIDIC contract models either the Red Book or the Yellow Book. From the beginning of contracting until today, according to FIDIC contract models, over a hundred contracts / projects have been contracted (over 120 in water sector).

However, among all these contracts, only a small part has been fully completed, i.e., about twenty contracts where Final Payment Certificate was issued. There are several other contracts that are in a very high degree of execution (> 98%), so such contracts were also considered as relevant in the research sample. Therefore, for the purposes of this paper, the sample was prepared and selected as mentioned above, i.e., fully completed contracts and those that are in a high degree of execution were taken into the sample. The final sample consisted of 7 projects contracted through the Yellow FIDIC Book and 27 projects contracted through the Red FIDIC Book.

In addition to the basic division according to the FIDIC Red or Yellow Book, there was an additional division of projects according to the scenarios that will be described below. The scenarios were developed after considering the contract provisions that affect the appearance of the theoretical S-curve the most. For each book, 4 theoretical scenarios were developed.
depending on whether a right to take Advance Payment was consumed, or the contract prescribed a Retention Money and depending on the length of the Tests on Completion. Analyzed contracts have total advance payments of 10% of the Accepted Contract Amount and percentage of retention is 10% of the Interim Payment Certificates.

The scenarios for the Red Book are as follows:

A.1) The Contractor did not use the possibility of Advance Payment and the contract does not prescribe a deduction for Retention Money

A.2) The Contractor did not use the possibility of Advance Payment, but the contract stipulates a deduction for Retention Money of 10%

A.3) The Contractor used the Advance Payment, but the contract does not prescribe a deduction for Retention Money

A.4) The Contractor used the Advance Payment, and the contract stipulates a Retention Money of 10%

The scenarios for the Yellow Book are as follows:

B.1) The Contractor did not use the possibility of Advance Payment, and the Trial operation period lasts less than 30% of the total Time for completion (design, execution of works and trial period) of the contract

B.2) The Contractor did not use the possibility of Advance Payment, and the Trial operation period lasts more than 30% of the total Time for completion (design, execution of works and trial period) of the contract

B.3) The Contractor used the Advance Payment, and the Trial operation period lasts less than 30% of the total Time for completion (design, execution of works and trial period) of the contract

B.4) The Contractor used the Advance Payment, and the Trial operation period lasts more than 30% of the Time for completion (design, execution of works and trial period) of the contract

For each scenario, a theoretical S-curve was developed based on available data from professional papers and experience in the development of cash flows and planning the implementation of projects in the water utility sector (shown on Figures 1-8 as a blue S-curve).

This experience is based exclusively on water utility projects co-financed by EU funds, and the experience has been developed in the jobs of supervising engineer, project manager and staff of the Intermediary body that controls the implementation of projects. All these roles deal with forecasting of contract realization, cash flow and development of S-curves, therefore their experience we consider representative.

To obtain data, i.e., S-curves that can be compared regardless of the duration and amount of the contract, the values on the x and y axes of the S-curve are presented in percentages. The values on the y axis are the percentages of cumulative realization in relation to the value of the contract, and the values on the x axis are the percentages of the duration of the contract in relation to the contract term. After creating the theoretical S-curves, the distribution of projects in each scenario was approached. In scenario A.1) there are three contracts, in
scenario A.2) five contracts, in scenario A.3) eleven contracts, and in scenario A.4) eight contracts. While in the scenarios for the Yellow Book the situation is as follows: in scenario B.1) there is only one contract, in scenario B.2) also one contract, in scenario B.3) there are four contracts and in scenario B.4) one contract.

According to the above, each contract was joined by a theoretical S-curve, with which the actual S-curve would then be compared. The actual S-curve was formed based on the date of Commencement of Works, the value of the Interim Payment Certificate, the date of completion of works (Taking-Over Certificate) and the value of the Final Payment Certificate. During the development of actual S-curves, it was noticed for a very large number of projects that the Contract Price increased during the duration, but a much more unfavorable situation was noticed, and that is that the Time for Completion was extended. The initial period of pre-accession funds and the Operational Program “Environmental Protection” 2007-2013 was accompanied by the crisis in the construction sector in Croatia, the consequences of which are the extended deadlines for the construction of water utility infrastructure. It is obvious that the newer projects are either completed within the Time for Completion or have much smaller extensions of Time for Completion than the first ones in the EU water utility projects.

After creating the actual S-curve, in order to compare it with the theoretical S-curve of the corresponding scenario, the duration of the contract is divided into 21-time intervals, from 0 to 100% of time, with an interval of 5% of time. However, the biggest task was to "accommodate" amounts from Interim Payment Certificate to defined time intervals.

For example, the 5% time interval is the duration of the project of 1.5 months, so the value of realization in the 5% time interval is equal to the sum of the amount of the Interim Payment Certificate for the first month and half the value of the Interim Payment Certificate for the second month of the project. Note that for the actual S-curve, the duration was defined according to the duration of construction (until issue of Taking Over Certificate) for Red Book or completion of the Trial operation period and issue of Taking Over Certificate, while the Defect Notification Period, is not included in Time for completion of the contract. Percentages of realization for the actual S-curve were calculated in relation to the total amount of Final Payment Certificate.

After calculating the realization for each time interval, S-curve is obtained based on the actual realization, which was now comparable to the theoretical one. The comparison of theoretical and empirical S-curves was made for each project from the sample, i.e., from these 34 S-curves we drew conclusions for cash flow forecasting and development of S-curves for water utilities projects contracted under the FIDIC Red or Yellow Book. The results of this comparison are shown on Figures 1-8, marked with orange color.
Figure 1. Theoretical and empirical S-curve: comparison for A.1) Scenario

Figure 2. Theoretical and empirical S-curve: comparison for A.2) Scenario
Figure 3. Theoretical and empirical S-curve: comparison for A.3) Scenario

Figure 4. Theoretical and empirical S-curve: comparison for A.4) Scenario
Figure 5. Theoretical and empirical S-curve: comparison for B.1) Scenario

Figure 6. Theoretical and empirical S-curve: comparison for B.2) Scenario
Deviations between actual and planned S-curves in different time intervals can be seen in Table 1 in accordance with different scenarios.
Table 1. Deviations between actual and planned financial realization and descriptive statistics of S-curves deviations in different scenar

<table>
<thead>
<tr>
<th>TYPE OF CONTRACT CURVE SCENARI O</th>
<th>N SAMPLE</th>
<th>CONTRACT DURATION</th>
<th>Mean</th>
<th>Standard Error</th>
<th>Median</th>
<th>Standard Deviation</th>
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<td>5%</td>
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<td>3</td>
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<td>A.2)</td>
<td>5</td>
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<td>2.84</td>
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<td>0.85</td>
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<td>1.42</td>
<td>2.76</td>
<td>3.39</td>
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<td>B.1)</td>
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<td>1.00</td>
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<td>4.00</td>
<td>5.32</td>
<td>2.52</td>
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<td>4.00</td>
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https://doi.org/10.5592/CO/SENSET.2022.19

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Also, correction coefficients of planned S-curves were calculated based on Equation 1, and shown in Table 2.

\[
C_{\text{corr}}(i) = \frac{\text{Act}_{\text{FRi}}(\%)}{\text{Plan}_{\text{FRi}}(\%)} \quad ; \quad i = 0.5, 10, \ldots 100
\]

where:
- \( C_{\text{corr}} \) – correction coefficient of planned S-curve in time point “i”
- \( \text{Act}_{\text{FRi}}(\%) \) = actual financial realization in time point “i” (%)
- \( \text{Plan}_{\text{FRi}}(\%) \) = planned financial realization in time point “i” (%)

Table 2. Correction coefficients of planned S-curves \( C_{\text{corr}} \)

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<td>B.3</td>
<td>0.46</td>
<td>0.39</td>
<td>0.33</td>
<td>0.29</td>
<td>0.26</td>
<td>0.24</td>
<td>0.22</td>
<td>0.21</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
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<td>0.20</td>
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</tr>
<tr>
<td>B.4</td>
<td>1.00</td>
<td>0.95</td>
<td>0.81</td>
<td>0.70</td>
<td>0.61</td>
<td>0.54</td>
<td>0.49</td>
<td>0.45</td>
<td>0.41</td>
<td>0.39</td>
<td>0.39</td>
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</tbody>
</table>

Those correction coefficients marked in orange or red should be carefully considered in adherence to future planning via S-curves.

From table no. 2 it can be seen that most of the empirical S-curves are within acceptable limits of deviation from the corresponding theoretical S-curves. The empirical S-curves for scenarios A.2), A.4), B.2) and B.4) are almost identical to the theoretical S-curves, i.e. with minimal deviations. For scenarios A.3) and B.3) the empirical S-curve shows slightly larger deviations, but we believe that they are within acceptable limits, while certain time intervals for scenarios A.1) and B.1) are marked in red, which means that the deviations are too big.

Scenarios A.1) and B.1) have the biggest standard deviations, but there are objective reasons for this. Namely, in scenario A.1) there are three contracts contracted within the same project, and one common project deficiency resulted in the extension of the Time for Completion for all three contracts, although almost all physical work has already been finished in the initial Time for Completion. During the extended Time for Completion, a small amount of work was performed with very little financial impact, which significantly affects the S-curve. With the extension of the Time for Completion, on the empirical S-curve, Interim Payment Certificate with financially big amount moved to the "left", i.e. on the x-axis towards the interval 0, which is not followed by the theoretical S-curve. Therefore, the empirical S-curve in the initial period had a much higher rise compared to the theoretical S-curve, i.e. a large rise to a time interval of 35%, followed by a continuous decline. Given that the scenario A.1) consists only of contracts that are from the same project, we can agree that it is not representative and that deviations will be reduced with the execution of new contracts belonging to scenario A.1).
Regarding scenario B.1) we can see that it is a specific example, as well as scenario A.1), considering that so far we have finished only 1 contract and there is an objective reason for big deviations. Particularly, this contract has a very short duration (10 months of construction and 4 months of trial work) and a financially small amount (<HRK 5 million) compared to all other contracts taken in the sample. Since this is the Yellow Book, the contract contains a large share of equipment in addition to construction, and it was this equipment that formed this look of the empirical S-curve. Most of the equipment was delivered and confirmed in Interim Payment Certificate in one month period which sampled a large jump in the S-curve in one time interval. Also, with the emergence of more executed contracts that would join scenario B.1), and with longer duration and higher contract prices, deviations will certainly be reduced, especially deviations related to the time interval between periods 35-50%.

4. CONCLUSION

This research represents contribution to the improvement of baselines and projection of financial realization. Theoretical baseline and empirical S-curves on portfolio of FIDIC Red and Yellow Book contracted projects in water sector were analyzed and compared, in order to propose adjusted prognostic S-curves of financial absorption and therefore contribute to more efficient planning and implementation of projects.

Over time, more and more projects will be completed, for which a comparison of actual S-curves should be made. In a few years, when most of the currently started projects will be completed, we could get an empirical S-curve (based on those hundreds of completed projects) that would serve all of us for a better forecasting and allocation of funds for project financing.

Future research can be focused on finding accurate S-curves on other types of infrastructure and other construction projects, in order to contribute to creation of comprehensive platform for obtaining prognostic planning tools and therefore more successful construction projects.

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