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OBJECTIVES-BASED BUSINESS PROCESS REDESIGN IN
FINANCIAL PLANNING – A CASE STUDY

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Abstract

Semi-structured processes appear in many domains. Especially within multinational enterprises, it is often impossible to implement completely structured and standardized processes because of a rapidly changing environment. Nevertheless, semi-structured processes have a potential for improvement. In order to meet or even outreach compliance and governance requirements it is essential for an enterprise to exploit such a potential. Yet, existing approaches either focus on entirely unstructured or fully structured processes. The goal of this paper is to present a framework for innovative process redesign to improve a semi-structured process and to illustrate the potential of such a theoretical framework, taking Bayer AG as an example. We achieve this goal in three steps: (i) we present our Objective-Based Business Process Redesign Model, including a list of objectives for the improvement of semi-structured business processes; (ii) we conduct the case study by executing our Redesign Model; (iii) we present the practical process along with its implementation and evaluation. The evaluation of our case study shows the vast potential for improvement in semi-structured processes, implemented by a considerable reduction in time and complexity.

Keywords: Financial Planning, Business Process Redesign, Compliance, Governance, Semi-structured Processes
1 Introduction

Corporate financial planning within global companies is a very complex process of data gathering and validation. This is especially true if multi-nationality and heterogeneity come into play: Due to mergers and acquisitions along with internal growth, a company’s set of subsidiaries can easily grow very heterogeneous regarding the size, the position within the group and the cultural context. As shown by Martin and Blau (2010), the Bayer AG is such a heterogeneous, multinational company which regularly faces the challenge of creating a common corporate financial plan based on reports delivered by its heterogeneous set of subsidiaries. There are multiple possible gateways for the data transmission, spanning from a delivery via email to a company-wide reporting system. For this reason, the Bayer AG has implemented its own information system (IS) for corporate financial planning - the Corporate Financial Portal (CoFiPot) (Vo et al. 2005). This portal is a Web-based IS consisting of numerous Web services. These services are not limited to financial planning, but also offer, for instance treasury functionalities. The financial planning services are accessible for both the planners in the subsidiaries and the planners within the holding. Data transmission and a large number of validity checks are already integrated in CoFiPot. Nevertheless, the incorporated process holds potential for improvement, especially regarding governance and compliance aspects. Furthermore, each subsidiary follows its own local planning process and, due to the heterogeneity of the subsidiaries, these planning processes differ significantly. Therefore, validation checks are required to ensure compliance. As described in Martin and Blau (2010), the Bayer AG has already set up numerous checks to ensure the quality of the delivered data, thereby improving data quality and meeting a certain level of compliance. But from a governance perspective, the focus on data quality is not sufficient. It is also necessary to monitor the process itself to increase transparency and to identify further potential for improvement. In this paper, we present a case study that implements a redesign framework, the objective-based Redesign Model, to improve the semi-structured financial plan data delivery process of the Bayer AG.

The remainder of this paper is structured as follows: In Section 2 we discuss the state of the art in semi-structured business processes and the research field of compliance and governance, both being foundations and reasons for the underlying business process redesign. In Section 3, we present a brief description of our objective-based Redesign framework. Based thereupon, we enrich our theoretical model with a case study for a stepwise realization in Section 4. In Section 5 we present an evaluation of the Redesign Model application within the financial planning of our industry partner, the Bayer AG. This paper closes with a conclusion and an outlook of future research.

2 Foundations

2.1 Semi-Structured Business Processes

Business processes can be distinguished by their structure. We define a structured, semi-structured and unstructured business process based on Oberweis (1996) as follows: in a structured process the sequence of tasks and business rules is predetermined and prescribed, structured process are applied in standardized scenarios. In semi-structured ones, only parts of the tasks sequence and rules are determined. Some tasks are not ordered at all and some of the rules may be modified or added latter on the fly. Unstructured processes do not have any repeatable patterns, are executed spontaneously and are difficult to automate. As above-mentioned, the financial data integration process focused on in this paper is a semi-structured process. In recent work, the focus was laid on either structured or unstructured processes. Van der Aalst et al. (2000), for example, introduced a framework to verify workflows. But like all workflow management systems (WFMS), verification only operates in a standardized scenario (van der Aalst et al 2005). Moreover van der Aalst et al. (2005) presented process support strategies for unstructured processes. In this case, the unstructured processes parts are individually handled as cases. To fill this research gap, we apply an approach for semi-structured non standardized processes, which is a WFMS, as well as case handling in some parts. Thus, we integrate methods from business process management also including workflow redesign aspects into one
framework. Our framework is a stepwise approach to redesign an existing process according to a redesign model including the tailoring to a specific domain. It enables us to incorporate detected objectives, shortcomings and constraints. In order to evaluate our framework, we furthermore present a case study based on the financial data integration process of the Bayer AG. The implementation of the stepwise realization is strongly supported by the modular setup of the IS CoFiPot (Elsner and Vo 2007). This approach enables a dynamic improvement of the semi-structured processes and hence offers flexibility and non-standardized solutions.

2.2 Compliance and governance

In this section we discuss the state of the art in the research field of compliance and governance relevant for our research and give a description of compliance and governance aspects in our scenario.

Compliance and governance are nowadays important subjects not only for IT managers in practice but also for researchers in many communities such as IS, business process management or legal studies. In the presented approach we focus on modeling compliance and governance requirements from a process-aware IS (PAIS) perspective, in particular on IS in financial planning. We define compliance in the context of PAIS as the execution of business processes consistent with standards and regulations relevant for a given area of responsibility (Sadiq et al. 2007). Two main compliance validation strategies are used: compliance by design and compliance by runtime (Liu et al. 2007, Governatori et al. 2009, Namiri and Stojanovic 2008). In our work, we achieve compliance, analogously to Küster et al. (2007), by process redesign (cp. Section 3). Governance can generally be defined as securing of a responsible business management. Teubner and Feller (2008) describe the roots of corporate governance in the value-orientation. Thus, as we are focusing in our work on financial planning, we define that the goal of governance is the maximization of shareholders’ equity (Rappaport 2000). In order to achieve maximization of shareholders’ equity the financial planning needs to be conducted with maximized efficiency and effectiveness (cp. Section 3).

The heterogeneous set of subsidiaries leads to many different plan data generation processes within the subsidiaries. From the holding point of view, integrating unchecked data into the holdings financial plan is not compliant if quality assurance based on process monitoring is not possible. In this case other ways have to be found. For this reason the Bayer AG has developed different validation steps to ensure plan data quality, like for example invoice-liquidity or consolidation checks (Martin and Blau 2010). Parts of the validation checks are already automated and others have to be carried out manually. Furthermore a first step of monitoring is implemented to enable the planners to give the subsidiaries specific feedback also including some kind of historical perspective. Although such a framework for validation and monitoring exists, the potential for improvement has still not been fully tapped. For instance, if we look at the Bayer AG with more than 100 subsidiaries delivering plan data and afterwards waiting for the communication of the results of the detailed validation, just the automation of the validation and result communication is likely to offer a huge time reduction potential.

Transferred to our use case at the Bayer AG, the general definitions of compliance and governance reads as follows:

- **Compliance** is to ensure correctness in data and procedure. Via a complete financial planning automation at the Bayer AG, the number of potential error sources is minimized; an extension of the existing checks further increases compliance.

- **Governance** is to guarantee the efficiency of the procedure. At the Bayer AG, we focus on the relation between carried out tasks and required time. Via an optimization of the process structure, a reduction of time indicators, both on the holding and on the subsidiary side, is intended.

The shortcomings in Table 1 illustrate that the original data delivery process (Figure 1) violates both, compliance and governance requirements. For instances, system brakes hold potential for data errors (compliance) and delay the data processing (governance).
3 Towards Objectives-Based Process Redesign

In this section we present our business process redesign framework, including our Redesign Model, as theoretical background for the case study presented in Section 4. The challenges arising from the characteristics of semi-structured processes (cp. Section 2.1) and the compliance and governance requirements (cp. Section 2.2) can be expressed in the following two research questions:

RQ 1 Does Objective-Based Process Redesign improve the correctness and hence the compliance of financial plan data delivery process?

RQ 2 Does Objective-Based Process Redesign increase the efficiency and hence confirm with governance requirements of financial plan data delivery process?

3.1 The Business Process Redesign

The implementation of the redesign presented in the Case Study Section 4 is a design science artifact and is part of an overall redesign framework followed in this article. The framework is developed according to the seven guidelines to be followed when pursuing a design science approach as introduced by Hevner et al. (2004). Hevner et al. (2004) denote design science as a problem solving process in which knowledge and understanding of a problem "and its solution are acquired in the building and application of an [IT] artifact" (Hevner et al. 2004). According to Walls et al. (1992) the definition of an IT artifact not only includes instantiations of the IT artifact but also the constructs, models, and methods applied in the development and use of IS. This caused us to structure our framework into the Redesign Model (method) and its implementation in a case study (instantiation). The case study thus is an essential part of the framework and allows for the evaluation of our redesign science problem. The development of the Redesign Model is motivated by a gap in existing literature discussing the management of IS and the integration of new processes. The authors focus either on completely structured processes to apply WMFS (van der Aalst et al. 2000) or unstructured processes (van der Aalst et al. 2005), or they miss to provide a concrete process redesign model (cp. Section 2.1). This incompleteness results in the necessity for a model with a higher flexibility regarding the structure degree of the affected processes and the model presentation. Nevertheless, the literature presents criteria for an efficient process, like redesign goals, which we utilize in our work. Reijers and Mansar (2005) try to get rid of unnecessary tasks, reduce contact and reduce waiting times. Moreover, like Redman (1995), they work on task automation. In addition, Redman (1995) explicitly includes the focus on data quality. Davenport et al. (2004) enrich this data perspective by the need for data completeness. Data quality and completeness often depend on the process integration level and therefore van der Aalst and Weske (2001) and Davenport et al. (2004) claim an increase of integration. The reduction of the research to such objectives is close to the definition of structural metrics. This allows us in the following section to integrate the metrics “communication automation factor” and “activity automation factor” presented by Balasubramanian and Gupta (2005) into our structured notation, too.

In the following we present a set of objectives \( O = \{O_i | i = 1, ..., n\} \) as a structured representation of these general optimization measures. Integrating all general ideas mentioned leads to \( m = 7 \) objectives for business process redesign:

O1 Contact reduction: Reduce the number of contacts with customers and third parties. (Reijers and Mansar 2005, Balasubramanian and Gupta 2005)

O2 Task elimination: Clean up the process regarding all unnecessary tasks. (Reijers and Mansar 2005)

O3 Task automation: Eliminate all manual tasks where automation is possible and promising improvement. (Redman 1995, Reijers and Mansar 2005, Balasubramanian and Gupta 2005)

O4 Process integration: Reduce system and workflow breaks through data integration. (Davenport et al. 2004, Van der Aalst and Weske 2001)

O5 Waiting time reduction: Process optimization by reducing both the waiting time and the setup time. (Reijers and Mansar 2005)
O6 Data quality: Assure and, if possible, increase data quality. (Redman 1995)
O7 Data completeness: Ensure completeness of the data base in order to enable funded decision making. (Davenport et al. 2004)

All objectives presented here are driven by governance and compliance aspects. While R_1, R_6 and R_7 are based on compliance needs, R_2 and R_5 correspond to governance aspects. Furthermore R_3 and R_4 are driven by governance and compliance aspects. We present detailed derivation of our Redesign Model in the working paper "Towards Objectives-Based Process Redesign" (Martin et al.).

3.2 The Redesign Model

The Redesign Model inherits from the stage-activity framework for business process reengineering introduced by (Kettinger et al. 1997). This stage-activity framework is composed of six stages that we present in this section.

Stage 1 – Envision: Each redesign project begins with the commitment and decision of the management. Redesign opportunities are discovered, suitable IT related levers are identified and the targeted process is selected. The Redesign Model is designed for semi-structured processes.

Stage 2 – Initiate: Having identified and selected the field of application and the process to be changed, it is necessary to plan the redesign in detail and to define performance goals by analyzing and determining the redesign requirements. In case of the Redesign Model, the functional goal is assumed to be fixed as a sine qua non. Thus, our model is focused on the non-functional goals, or objectives, as they are denominated above.

Stage 3 – Diagnose: The initial state of the process including its subprocesses has to be documented prior to the redesign (at time t = 0). We index the sequential redesign steps by t ∈ N. Let D denote the domain of the process containing all process related information such as process attributes, resources, communication, roles, and IT. D is the only static documentation element since the domain cannot be changed by redesign steps (i.e. the domain sets the overall scope of the process). Based on D, our redesign model identifies two basic concepts to document the process state at each time t: The constraints C_t of the domain D and the shortcomings S_t of the process. An example for a constraint is a limited automation degree that allows only for a few automated tasks during process runtime. With C_0 denoting the set of limiting characteristics of the domain D. All sets of constraints C_t with t > 0 are subsets of C_0. C_t impacts the process P_t at step t. These dependencies can be represented as mappings:

\[ C : D \rightarrow C_0. \]  (1)
\[ P : C_t \rightarrow P_t, t \geq 0 \]  (2)

Deriving the initial set of shortcomings S_t includes, first, the domain-specific process P_t, and, second, the general set of objectives O (cf. Section 3). The set of shortcomings S_t can be formalized as a mapping:

\[ S : (P_t, O) \rightarrow S_t \]  (3)

In a nutshell, stage 3 is based on D and consists of the derivation of process specific shortcomings S_0 (the instantiations of the objectives O not fulfilled in the initial process P_0), and the constraints C_0. To exemplify the instantiation, assume that there are 3 system brakes in P_0. In this case, S_0 contains 3 different shortcomings of the class O_4 = Process integration. In the following steps of our redesign model we present an algorithm that deals with the documented shortcomings based on a stepwise constraint relaxation.

Stage 4 – Redesign: In stage 4 the actual redesign takes place. This stage of our redesign model is iterative and repeats along with the reconstruction stage. Each iteration is called a redesign step and the first step is indexed by t = 1 as t = 0 defines the status quo. Within each redesign step t we start by reducing and simplifying respectively the subset of constraints to C_t = C_0. We assume that some of the constraints C_0 can be deleted or at least formulated less restrictively (e.g. because of current
technical developments we can automate some process parts, which were not automated at \( t = 0 \). According to the Equations (2) and (3), the reduced/simplified constraint set \( C_t \) leads to a new process \( P_t \) and a new set of shortcomings \( S_t \). Each redesign step \( t \) is successful, if \( S_t \neq S_{t-1} \) holds. The redesign iteration will be stopped as soon as \( C_t = C_{t-1} \) at a certain time \( t \) (i.e. the set of constraints cannot be reduced or simplified any more) and/or if \( S_t = S_{t-1} \). We denote the number of the last executed redesign step by \( T \). The algorithm including the exit conditions is depicted in the following:

```
1:   bool terminated = false;
2:   int t = 0;
3:   List<ConstraintSet> C = new List();
4:   List<Process> P = new List();
5:   List<ShortcomingSet> S = new List();
6:   C.add(getC(D));
7:   while (!terminated)
8:       P.add(getP(C(t)));  
9:       S.add(getS(P(t), O));
10:      C.add(relaxC(C(t)));
11:      if (t > 0)
12:          then if (S(t) == S(t-1) and C(t) == C(t-1));
13:             then terminated = true;
14:      else t = t + 1;
15:      if (C(t) == C(t-1));
16:          then terminated = true;
17:   end while
```

Executing the algorithm, we get an optimal process \( P_t \) with respect to the constraints \( C_t \). The lists defined in rows (3) to (5) contain a documentation of the processed redesign steps. With \( k_t \) denoting the cardinality of \( C_t \) (constraints) and \( l_t \) the cardinality of \( S_t \) (shortcomings) it holds that \( C_t = \{c_t^i | i = (1, \ldots, k_t)\} \) and \( S_t = \{s_t^i | i = (1, \ldots, l_t)\} \).

**Stage 5 – Reconstruct:** The reconstruction consists of the realization of the new process and its implementation in supporting IT-systems. As mentioned above, stage 5 is part of each iterative redesign step, thus another iterative step. However, since the implementation of a redesign step in which one of the termination conditions is fulfilled generates no benefit, step \( T \) only contains stage 4.

**Stage 6 – Evaluation:** The evaluation can either be performed at the end of each redesign step or at the end of the complete Redesign Model. In this paper we present an evaluation of the first redesign step in Section 5.

### 4 Case Study

The case study is executed using the semi-structured financial data integration process of Bayer AG. In the following we execute stage one (Envision) to stage five (Reconstruct) of our model. Moreover, we present a first evaluation of our Redesign Model in the next section to prove the performance improvement of our redesigned process.

#### 4.1 Envision

This section provides a detailed scenario description within the domain of financial planning in global companies. In Section 2.2 we already explained why compliance measures are necessary at all and we demonstrated how a company might get along with these complex requirements as exemplified by the Bayer AG. We now present a formal notation of the traditional plan data delivery process within the Bayer AG, as it looked like before we started the redesign. For the graphical illustration we use the Business Process Modeling Notation (BPMN), which has become the de facto standard in academic and practice communities for business process modeling (cf. Recker 2010, Wohed et al. 2006). The
“traditional” process depicted in Figure 1 is separated into three main layers, which represent the three participants of the plan data delivery. First, in the center, the corporate financial portal, second the holding (that again incorporates three participants represented by different layers) and third the subsidiaries which communicate through this portal. The process is initiated by the subsidiary with the upload of the financial planning data. This upload includes an automated validation regarding the structure of the delivered data. If successful, it initiates an upload notification in form of emails for both parties. This email initiates a detailed content validation. The financial planner at the top has to carry out the validation. First he imports the financial plan into the check-spreadsheet and second he extracts information from the portal and a monitoring-spreadsheet. Each of these data sources leads to an own validation step. The results of the validation are monitored in the corresponding spreadsheet and communicated to the subsidiary. In the following, the subsidiary has two opportunities: to correct mistakes that caused the results or to enter comments if there are special issues reasonable for the results. Comments can be transmitted in an email; corrections in the financial plan data lead to a new upload and validation. If the data causes no results within the validation on the holding side and/or the comments are valid the subsidiary gets informed by the holding and the process is finished.

**Figure 1.** Traditional corporate financial planning process in $t = 0$.

### 4.2 Initiate

In order to have chosen the above explained process we fulfilled stage one (envision). Additionally with having extracted the objectives in Section 3 we already executed the second stage. The objectives $O$ define the non-functional redesign goals that we follow in our case study.

### 4.3 Diagnose

The “Diagnose” stage starts the application of the algorithm noted in Section 3.2. To reduce the algorithm’s complexity for the reader’s convenience, we note the affected rows of the algorithm in our description.

**Redesign step $t = 0$:** The “Diagnose” documents the domain characteristics (represented by its constraints $C_0$ - cp. Equation (1)) and the characteristics of the original process (represented by its shortcomings $S_0$ - cp. Equation (3)). This leads to $k_0 = 6$ constraint $c_{i}, i = 1, ..., 6$, listed in Table 1.
The constraint $c^3_0 - c^4_0$ reflect the low degree of IT support along with many manual tasks. $c^5_0 - c^6_0$ arise within an multinational company having autonomously working subsidiaries. In total all constraints result in a traditional process as it is described above. Applying the objectives $O$ to this process (row 9) results in $l_0 = 28$ shortcomings, again listed in Table 1. Each $s^j_i$ is driven by exactly one objective $o_i$ but each objective $o_i$ can cause multiple shortcomings $s^j_i$. For example, $o_2$ results in the shortcomings “manual result communication” ($s^3_0$), “manual data validation” ($s^4_0$), “manual comment validation” ($s^5_0$), “manual monitoring” ($s^6_0$), “manual send data” ($s^8_0$), and “manual plandata generation” ($s^{13}_0$). But with a decreasing number of constraints, the number of shortcomings caused by each objective decreases as well.

<table>
<thead>
<tr>
<th>Redesign step $(t)$</th>
<th>Characteristic $(C_t/S_t)$</th>
<th>Cardinality $(k_t/l_t)$</th>
<th>Components $(c^j_i \in C_t/s^j_i \in S_t)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t = 0$</td>
<td>$C_0$</td>
<td>$k_0 = 6$</td>
<td>$c^1_0$ manual comment validation, $c^2_0$ manual data validation, $c^3_0$ manual communication, $c^4_0$ manual monitoring, $c^5_0$ black box subsidiary, $c^6_0$ autonomous subsidiary process.</td>
</tr>
<tr>
<td></td>
<td>$S_0$</td>
<td>$l_0 = 28$</td>
<td>$s^3_0 - s^4_0$ manual result communication, $s^5_0 - s^6_0$ manual data validation, $s^7_0 - s^{12}_0$ manual comment validation, $s^{13}_0 - s^{15}_0$ manual monitoring, $s^{16}_0 - s^{20}_0$ manual send data, $s^{21}_0 - s^{24}_0$ system brake data validation, $s^{25}_0 - s^{27}_0$ system brake monitoring, $s^{28}_0 - s^{29}_0$ manual plandata generation, $s^{30}_0 - s^{33}_0$ system brake data upload.</td>
</tr>
<tr>
<td>$t = 1$</td>
<td>$C_1$</td>
<td>$k_1 = 4$</td>
<td>$c^1_1$ manual comment validation, $c^2_1$ manual monitoring, $c^3_1$ black box subsidiary, $c^4_1$ autonomous subsidiary process.</td>
</tr>
<tr>
<td></td>
<td>$S_1$</td>
<td>$l_1 = 18$</td>
<td>$s^1_1 - s^4_1$ manual comment validation, $s^5_1 - s^7_1$ manual monitoring, $s^{10}_1 - s^{11}_1$ manual send data, $s^{12}_1 - s^{13}_1$ system brake monitoring, $s^{14}_1 - s^{16}_1$ manual plandata generation, $s^{17}_1 - s^{18}_1$ system brake data upload.</td>
</tr>
<tr>
<td>$t = 2$</td>
<td>$C_2$</td>
<td>$k_2 = 3$</td>
<td>$c^1_2$ manual comment validation, $c^2_2$ black box subsidiary, $c^3_2$ autonomous subsidiary process.</td>
</tr>
<tr>
<td></td>
<td>$S_2$</td>
<td>$l_2 = 13$</td>
<td>$s^1_2 - s^2_2$ manual comment validation, $s^3_2 - s^4_2$ manual send data, $s^5_2 - s^6_2$ system brake data upload.</td>
</tr>
<tr>
<td>$t = T = 3$</td>
<td>$C_3$</td>
<td>$k_3 = 0$</td>
<td>$\emptyset$</td>
</tr>
<tr>
<td></td>
<td>$S_4$</td>
<td>$l_3 = 0$</td>
<td>$\emptyset$</td>
</tr>
</tbody>
</table>

Table 1. Development of process characteristics $C_t$ and $S_t$ during the algorithms completion time $T$.

Like the objectives, shortcomings are related to compliance and governance. According to this classification, $s^{19}_0 - s^{28}_0$ and $s^{23}_0 - s^{26}_0$ are shortcomings, which need to be overcome in order to increase process performance (governance - cp. Section 2.2). $s^{19}_0 - s^{28}_0$ are shortcomings that need to be overcome in order to increase data quality (compliance – cp. Section 2.2).

### 4.4 Redesign and Reconstruct

Each of the further redesign steps requires the relaxation of constraints. Of course, the application domain could cause constraints that cannot be relaxed. That implies that one central assumption of this Redesign Model is the reduction of constraints. The stepwise reduction of the constraints can be observed in Table 1.

**Redesign step $t = 1$:** This redesign step starts by checking the second termination conditions (row 15) - since the shortcomings could not have changed without any redesign done, the first termination condition (row 10) does not have to be checked. We assume that the data validation and the communication of the results are automated ($c^5_0$ and $c^6_0$). Thus, our relaxation is successful and the algorithm does not terminate. The remaining $k_1 = 4$ constraints result in process depicted in Figure 2. Therein, the set of shortcomings $S_0$ reduced (the components of $S_0$ are denoted in Table 1). The remaining shortcomings caused by objective $o_3$ are: “manual comment validation” ($s^1_1$), “manual monitoring” ($s^5_1$), “manual send data” ($s^8_1$), and “manual plandata generation” ($s^{13}_1$). This strong decrease of the shortcomings in the process is the reason why we choose to relaxing the constraints $c^2_0$ and $c^3_0$. Hence, for a successful application of our Redesign Model, it is inevitable to predict the
benefits that arise from the change of the constraints. In doing so, even a semi-optimal process as it is depicted in Figure 2 will result in a reduced effort. For instance, the automated validation in the holding process reduces costly knowledge worker resources. Moreover, manual data transfers between the enterprise portal and the spreadsheet application with a high potential error rate will be abolished. Altogether, the automation of the data validation promises to solve this shortcomings and therefore it is of high interest to automate such a task.

**Figure 2. Corporate financial planning after redesign step \( t = 1 \).**

**Redesign step \( t = 2 \):** Analogous to redesign step \( t = 1 \), neither the first (row 10) nor the second (row 15) termination condition is hit. The further reduction of the constraints (compare Table 1) allows for the automation of the monitoring. This increases the process integration and abolishes another system brake. Considering the shortcomings caused by objective \( o_3 \), only “manual comment validation” \( (s_2^1) \), “manual send data” \( (s_2^5) \), and “manual plan data generation” \( (s_2^{12}) \) are left. The resulting process is depicted in Figure 3. Therein, the data delivery process is completely automated including the data upload, the comment validation and the confirmations for both, the subsidiary and the holding. Furthermore the enterprise portal also includes a continuous, detailed monitoring that offers real-time information about each aspect of the corporate financial planning process.

**Figure 3. Corporate financial planning after redesign step \( t = 2 \).**
Redesign step $t = T = 3$: The remaining constraints $c^1_x - c^3_x$ are very hard to reduce due to the heterogeneous structure of the subsidiaries within Bayer. Nevertheless, for the sake of effectiveness and to demonstrate the completeness of our Redesign Model, we assume that they could be relaxed. In this optimal scenario, the process would be entirely automated as it is depicted in Figure 4. Hence, the subsidiary would receive the result of the check immediately after sending the data. All time-consuming tasks would be carried out in the enterprise portal and it would not be necessary to export data to another software application. Comparing the process in Figure 1 with the optimized version in Figure 4 the system breaks have vanished. At the end of this redesign step, it holds $C_3 = \emptyset$ and $C_3 = \emptyset$, that implies both sets cannot be reduced any more. Thus, the algorithm terminates.

Altogether, the Redesign Model proposes at least 3 groups of tasks for automation and integration into the enterprise portal. As mentioned at the beginning of the paper, such enterprise portals usually are designed as IS. Hence, this separation into granular groups of tasks would strongly support their service-oriented implementation in an IS. Furthermore, the process in Figure 4 fulfills all objectives $O$ and thereby guarantees a maximum level of compliance and governance (cp. Section 2.2 and 3.1).

![Diagram of Corporate financial planning after redesign step $t = T = 3$.](image)

**Figure 4.** Corporate financial planning after redesign step $t = T = 3$.

5 Evaluation

In this section we present parts of the evaluation results that demonstrate the improvements induced by the first redesign step of the redesign model implementation within the financial planning of Bayer AG. These first changes in the data delivery process were implemented in June 2010 and according to Section 4.4 implement the automation of validation and result communication (cp. Figure 2). To illustrate the improvement, we compare the aggregated number of open instances $i_t$ during the data delivery periods June 2009, June 2010, September 2009 and September 2010. Figure 5 illustrates the results of 4 different scenarios. Therein, $t$ denotes the time difference to the delivery deadline in days. Moreover, $i_t$ states the quantity of legal entities that have started, but not yet successfully completed financial planning at any time $t$. In this scenario, two possible non-functional performance indicators are the completion time of the process along with the processing time of the open instances. The comparison shows a much faster decrease of $i_t$ for both 2010 deliveries. In June 2009 (September 2010), it took 24 (22) days to solve 80% of the open instances. In June 2010 (September 2010) the same percentage was solved in 17 (16) days. That is a time reduction of 29.2% (27.3%). Nonetheless, the total completion time for 100% of the tasks did not change due to a few complex and therefore time consuming entities. The difference between June and September is due to seasonal
effects as it appears 2009 as well as 2010.

In total, this part of the evaluation indicates significant improvement caused by our Redesign Model. The relevant changes done before the June delivery lead to a time reduction. Although the completion time was not reduced yet, the reduction regarding the first 80% of the open instances offered the respective staff member the opportunity to work on their other tasks.

![Comparison of the number of open issues between different data delivery periods](image)

**Figure 5.** Comparison of the number of open issues between different data delivery periods (differentiation by year and by month).

This time reduction is an increased efficiency of the corporate financial planning and as such Governance aspects are clearly improved. Additionally we achieved an increased correctness of data and procedure and as such Compliance aspects have improved.

## 6 Conclusion

In this paper we showed the enormous potential of process redesign in financial planning processes with respect to compliance and governance aspects. We presented a brief description of our Business Process Redesign Framework including the Redesign Model that provides the essential flexibility for redesign in this domain. Based on this theoretical background, we performed a detailed case study and documented the development of constraints and shortcomings for each single redesign step. The redesign started with the traditional financial planning process as within Bayer AG. In the following we proposed the stepwise automation of tasks along with their integration into an IS. This is a challenge that is faced in almost every IS application field. Our case study showed the applicability of our Redesign Model to financial planning processes, facilitating a flexible and stepwise integration of previously manual process elements into IS. Finally, we were able to indicate the success of our Redesign Model with an evaluation based on the implementation of the first redesign step $t = 1$ within an IS (the corporate financial portal of Bayer AG). Hence, the above raised research questions RQ 1 and RQ 2 (cp. Section 3) can be answered in the affirmative.
7 References


