Developing and Implementing a Process-Performance Management System: Experiences from S-Y Systems Technologies Europe GmbH—A Global Automotive Supplier

Josef Blasini, Susanne Leist, and Werner Merkl

Abstract

(a) **Situation faced**: S-Y Systems Technologies Europe GmbH develops, manufactures, and distributes worldwide wire harnesses and associated components for automotive electronic distribution systems. Problems occurred with some automotive manufacturers' ordering wire harnesses, who sent ordering files to the intermediate S-Y Systems to be converted, interpreted, enriched, and forwarded. Errors occurred even in the first steps of data processing errors (e.g., name, format, structure, content), but the exact allocation of errors in the process, the reasons for the errors, and their origin were not apparent. Therefore, S-Y Systems faced the challenge of investigating the processing errors, hoping to prove that the reason for most of these errors lay elsewhere.

(b) **Action taken**: S-Y Systems decided to monitor their operative IT processes and started a Process Performance Management (PPM) project. PPM uses performance measurements to improve the performance of processes. Performance planning, monitoring, and controlling actions in PPM are strongly supported by process-oriented key performance indicators (KPIs) and IT systems. Our case describes a PPM approach to developing and implementing PPM systems and the results of applying this approach at S-Y Systems.

(c) **Results achieved**: The findings from the case refer to the importance of a structured, top-down-oriented development procedure and provide concrete

J. Blasini • S. Leist (✉)
University of Regensburg, Regensburg, Germany
e-mail: email@josef-blasini.de; susanne.leist@ur.de

W. Merkl
it-motive BCS GmbH, Business and Consulting Services, Regensburg, Germany
e-mail: werner.merkl@it-motive-bcs.com

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indications about the appropriate, goal-oriented, and useful KPIs of the processes to be monitored.

(d) **Lessons learned**: The case reveals a clear risk of PPM projects' losing their focus on the intrinsically relevant processes, the tasks in the processes, and particularly the overall initial goal of the project. Losing focus explains why many projects generate too many or inappropriate KPIs. The PPM approach presented in this paper helps to keep the focus on the overall goal and enables companies to develop a PPM system, including the appropriate KPIs.

1 Introduction

Process performance management (PPM) helps to monitor and manage business processes using process-oriented key performance indicators (KPIs) (Heß 2004; Jeston and Nelis 2008; Heckl and Moormann 2010; Cleven et al. 2010). Even though PPM has long been applied in business practice, companies still struggle with its challenges. The search for process KPIs that are appropriate for their businesses and their underlying processes is particularly challenging. Although several PPM methods and concepts ask for a top-down procedure, most companies try to identify useful, process-oriented KPIs using an unstructured, bottom-up approach.

The challenge of PPM application arises from the fact that there is no one-fits-all PPM solution (Blasini et al. 2011). PPM has to be adapted to each company based on (1) the company's industry, (2) the company's role in its industry (e.g., service integrator, service provider, or intermediate), and particularly (3) the company's underlying processes and services. Moreover, process KPIs have to be implemented in keeping with the company's vision and strategy in order to enable it to monitor performance consistently, right down to the processes. Thus, the characteristics of the individual company strongly influence the application of PPM and the selection of appropriate process KPIs (Blasini and Leist 2013).

This case deals with the development and implementation of a PPM system at a German automotive supplier, S-Y Systems Technologies Europe GmbH (S-Y Systems). Founded in 2001, S-Y Systems was a joint venture between the two major, globally active companies Continental and Yazaki Europe Ltd. In 2013, Yazaki acquired all of S-Y Systems' shares.

At the time of our case study, S-Y Systems had about 280 employees, generated a turnover of 420 million euros, and operated in seven sales and development locations and six logistic centers. S-Y Systems offers integrated solutions to complex problems in the automotive industry's electrical and electronic distribution systems (EEDS) market (S-Y Systems Technologies Europe GmbH 2012). The company identifies and analyzes interdependencies between EEDS to optimize its customers' electric vehicle architecture and develops and produces wire harnesses and associated components for automotive electronic distribution systems. Its portfolio of services also includes marketing and distribution, logistics, production planning, and quality management, while Yazaki takes care of assembling the wire harnesses.

In 2012, S-Y Systems conducted a project in cooperation with the University of Regensburg that sought to control its operative IT processes; as a result, the company implemented the PPM system. The operative IT processes were comprised of IT service management processes such as help desk services according to the Information Technology Infrastructure Library (ITIL), and data transmission processes, especially electronic data interchange (EDI) processes. The development and implementation of a PPM system to monitor EDI processes constituted the project's first challenges.

This case describes the application and results of applying a PPM approach that had been developed and implemented at companies in the energy industry, the manufacturing sector, and the banking industry some years before the project at S-Y Systems began.

After a description of the automotive supplier in Sect. 2, Sect. 3 introduces the approach used to develop and implement PPM systems and describes its application at S-Y Systems. Section 4 provides a brief overview of the project's results, and Sect. 5 summarizes the lessons learned.

2 Situation Faced

Although S-Y Systems is the market leader in the field of EEDS optimization, the company has been strengthening its position in the system business by incorporating mechanical, electrical, and electronic solutions. Innovations in the areas of automotive information and energy management for EEDS systems highlight the company's role as a system integrator. S-Y Systems extended its presence with offices in Spain, France, the UK, Romania, and Turkey.

The company's goal is to maximize customer satisfaction, so it must provide excellent customer service. Small, flexible teams work closely with the customers; analyze their needs, opportunities, and risks; and adapt their concepts to the customers' requirements. Quality is a key factor for the company, and its goal of "zero defects" can be achieved only through advanced planning and the consistent implementation of all necessary measures to be described later on in the paper. To achieve its goal of zero defects, the company continuously improves its products and processes in both R&D and production in order to offer the highest-quality products and services. Hence, measuring process performance by implementing a PPM system was necessary to identify potential areas for optimization.

Since the PPM system focuses on IT operative processes, S-Y Systems' IT department, called Central IT, was responsible for conducting the PPM project. Central IT not only provides IT support for other departments, such as help desk services, but also makes considerable contributions to the company's value chain. As the link between automobile manufacturers' ordering the wire harnesses and Yazaki's assembling them, the IT department is in charge of the order monitoring, that is, sending, converting, and receiving files like orders and invoices. Since these communication processes are highly automated, and only processing errors require manual intervention, the overall process performance depends heavily on the performance of the IT systems and their underlying processes.

The initial situation was that problems had occurred with the orders of some automotive manufacturers that had ordered wire harnesses from Yazaki, so ordering files were sent to the intermediate, S-Y Systems, to be converted, interpreted, enriched, and forwarded. Errors occurred even during the first steps of data processing (e.g., name, format, structure, content), but the exact location of the errors within the process and the reasons for the errors were not apparent. Most important, the errors' origins were not clear: The automotive manufacturer that had sent the files might have made a mistake when creating the files, or S-Y Systems could have been responsible for the mistake when receiving and editing the files. S-Y Systems needed to monitor their processes to demonstrate that the reason for most of the processing errors lay elsewhere.

Therefore, S-Y Systems decided to monitor its operative IT processes, particularly EDI processes, and started a process-oriented measurement project. Prior to the project, the company had not attempted to collect data on its IT processes, so it had gained no theoretical or practical experience in applying PPM. As a result, a structured procedure for implementing a PPM system for monitoring the EDI processes was needed.

PPM systems that support the operative tasks of PPM are computer-supported tools for the execution of the three phases in PPM: planning, monitoring, and controlling the performance of processes. The pivotal points are process KPIs that enable process managers to compare the actual and the target performances of business processes like S-Y Systems' EDI processes.

EDI is the electronic movement of business documents between or within firms (including their agents and intermediaries) in a structured, machine-retrievable data format that permits data to be transferred without rekeying from a business application in one location to a business application in another (Hansen and Hill 1989). Ritz (1995) and Choudhary et al. (2011) define EDI in terms of four elements: (1) the electronic transmission (2) of structured data (business documents) (3) in a standardized, machine-readable format (4) between trading partners' computer systems. Its benefits are reduced paperwork and inventories, reduction in transaction times, improvements in data-entry activity, and improved communications (Chen and Williams 1998; Choudhary et al. 2011; Hansen and Hill 1989). Therefore, companies almost always adopt EDI for the same reasons: to enable quick response and access to information, to gain cost efficiency, to respond to a customer's request, and/or to reduce paperwork and improve accuracy (Weber and Kantamneni 2002; Hansen and Hill 1989).

As the EDI processes are time-critical, and as business processes that exchange documents with other trading partners depend on them, the processes should be measured and monitored. Therefore, the implementation of a PPM system is the first step in analyzing and optimizing EDI processes.

3 Action Taken

Against this background, a PPM project was conducted as part of a student seminar over 4 months in 2012. Two groups of two students each were involved, guided by a Ph.D. student. The goal of the project was to develop a PPM system for the implemented ITIL and EDI processes for which the IT division of S-Y Systems was responsible. Although the project achieved this development and led to useful findings regarding the implementation of the PPM system for both process areas, the case reported in this paper focuses on the EDI processes. In what follows, we introduce the general approach to developing and implementing a PPM system and explain its application in the case.

3.1 The Approach to Developing and Implementing a PPM System

In order to implement a PPM system successfully, a structured top-down procedure must be applied to ensure that the system monitors all the necessary aspects of the processes that the user wants to monitor. A seven-step PPM approach was developed to ensure the design and implementation of a PPM system was done in a structured and methodically consistent way.

Step 1: Define the goal of the PPM project: Without a clearly stated goal, the original objective of the project may get lost and important KPIs may get less attention than necessary, while inappropriate KPIs accidentally become part of the PPM system. Therefore, the first step of developing a PPM system is to define the overall goal. Examples of such goals are to improve the performance of all customer-related processes within 18 months in order to increase customer satisfaction or to demonstrate within 6 months that the company complies with service-level agreements (SLAs) with another company.

Step 2: Ensure a solid basis of information: All important information—including the company's strategy and related success factors, its organizational structure (organizational charts), its IT architecture, its process map, and any relevant process models that exist—must be gathered to create a solid basis for further steps.

Step 3: Select and model the process: The output of this step is a complete and current model of the process selected for monitoring and performance improvement. For this purpose, all existing process models must be checked for timeliness and refined or enriched with missing information. If the selected process has not been modeled as a process model, the process flow must be identified by analyzing documents and interviewing the staff involved and then by modeling it.

Step 4: Determine the goal of the process: Determining the process's goal helps to identify the process's relevant KPIs. Process goals are either generic and qualitative, such as "customer orientation and satisfaction," or specific and quantitative, such as "reaching the minimum threshold of concluded contracts."

Step 5: Identify the process's critical success factors (CSFs): Examples of success factors are time, quality, costs, and energy consumption. Depending on the process's goal, the process's success factors specify the dimensions in which the process KPIs are derived in the next step.

Step 6: Identify process KPIs: The central and perhaps most difficult aspect of developing a PPM system is identifying the necessary and appropriate process KPIs. Following steps 1–5 helps to ensure that only KPIs that are in accordance with the process's CSFs, the company's strategy, and the overall PPM goal are identified.

All relevant information about every KPI must be laid down in a KPI description, including:

- the point of measurement in the process model
- data sources, calculation algorithm, and graphic visualization
- thresholds and/or target values based on experience, previous data, SLAs, and/or legal regulations
- staff members who are responsible for the KPI and for monitoring it
- staff members who are to be informed about violations of thresholds

There is an obvious risk of choosing KPIs that not closely interrelated and, thus, do more to confuse than to support the monitoring and management of the process's performance. The process KPIs that are identified are be implemented in a PPM system that consists of an IT system and that supports the PPM by calculating and graphically representing the KPIs automatically. A PPM system provides a dashboard view for the system user and visualizes the past and/or present performance of the underlying processes by means of suitable diagrams, such as tachometers and RAG ratings. To ensure that the process KPIs are correctly calculated and that the PPM system works reliably, continuous quality assurance must be conducted on both KPIs and the PPM system. The effort required to develop, implement, and test even a single process KPI is often underestimated and may lead to project delays.

Step 7: Implement organizational integration: To ensure that the PPM system is regularly used and that the necessary information about past and current process performance reaches the staff members responsible for the process, the PPM system must be well integrated into the organization: it has to be documented who is responsible for the operationalization of the PPM and each single KPI (see KPI description in step 6), and for the development of the PPM system and its KPIs.

The PPM approach has a two-sided relationship with the six phases of the BPM Lifecycle. The most obvious relationship is that the approach specifies the "process monitoring and controlling" phase of the BPM Lifecycle and defines how to monitor and control a process systematically and in a goal-oriented manner. In addition, the BPM Lifecycle phases of "process identification" and "process discovery" provide concretion for step 3 of the PPM approach and help to support modeling the process that is to be monitored and controlled. Finally, as a result of the application of the PPM approach, a new process, "Monitor and control the EDI process," is designed and implemented. Therefore, the BPM Lifecycle describes the new process's lifecycle phases of design, analysis, implementation, and monitoring and controlling.

3.2 Application of the Approach at S-Y Systems

This section describes the application of all seven steps of the PPM approach in the IT division of S-Y Systems and presents the results of the project.

Step 1: Define the goal of the PPM project: The goal of the PPM project was to overcome the existing deficits in process monitoring to demonstrate that the fault for most of the EDI processing errors did not lie with S-Y Systems but that the performance of their processes was in keeping with agreements. The company also wanted to strengthen its relationship with its customers. The duration of the PPM project was planned to be 4–6 months.

Step 2: Ensure a solid basis of information: The basis for the next development steps consisted of information about the company's strategy, success factors, its organizational structure, its IT architecture, and its processes, preferably documented as models. This basis of information basis was necessary to limit the enormous number of possible KPIs to a small number of goal-related and case-specific KPIs.

Regarding the company's strategy, S-Y Systems' strategic orientation is based on customer satisfaction. To react quickly to arising problems, S-Y Systems sets great store by being as close to its customers as possible in terms of both time spent and geographic proximity. Quality is also a strategic top-goal, as S-Y Systems aims at zero defects for its products and processes. In short, S-Y Systems tries to offer the best possible quality at the lowest possible price and to satisfy its customers completely with regard to its services and products. The company's IT department provides the support required to reach these strategic goals.

A closer look at S-Y Systems' success factors underscores the company's focus on quality and customer satisfaction. The most important success factor is quality, manifesting as freedom from errors. As customer satisfaction decreases with every error, such as errors in products received or in EDI files, S-Y Systems cannot offer mediocre quality. Therefore, the company has to optimize its process and product quality by eliminating errors and by continuously monitoring the quality of its operative IT processes. Responsiveness is the second important success factor, as fast responses to customer problems helps to ensure customer satisfaction and adds to the company's positive image. For S-Y Systems, responsiveness also includes the more generic ability to react more quickly to changes in the business environment than other companies do, a goal that may not be measurable.

Finally the information basis for the project at S-Y Systems has to be complemented by its organizational structure, IT architecture, and processes:

- The organizational chart helped to clarify the company's organizational structures, but information about the external organizations that were involved had to be added for the subsequent steps of the PPM approach. After all, the company's role as an intermediary (a service provider between two companies) strongly influenced the selection of appropriate KPIs. Since the IT processes of S-Y Systems depended significantly on the quality of the incoming EDI files, a distinction had to be made between external errors caused by external (customer) companies that occur at the start of the EDI processes and subsequent internal processing errors for which S-Y Systems was responsible.
- A graphic representation of the IT architecture, particularly all relevant IT systems of the EDI section, for use in the subsequent process-modeling steps, could be modeled from interviews with the employees responsible for them. The IT architecture at S-Y Systems consists primarily of two IT systems (Fig. 3). The Seeburger Business Integration Server (BIS) is responsible for receiving and sending EDI files from and to customer companies. The BIS also prepares the EDI files for internal use, that is, for the second main IT system, SAP. In addition, there are three main connections: the Integrated Services Digital Network (ISDN) and the European Network Exchange (ENX) network for partner companies and an intranet (TCP/IP) connection to the company's corporate parent, Yazaki.
- Since neither a process map of the EDI processes nor detailed process models existed, they were modeled in the next step.

Step 3: Select and model the process: To model the process map, the project team interviewed staff members and analyzed existing documentation. The resulting process map (Fig. 1) is comprised of four EDI core processes extending over

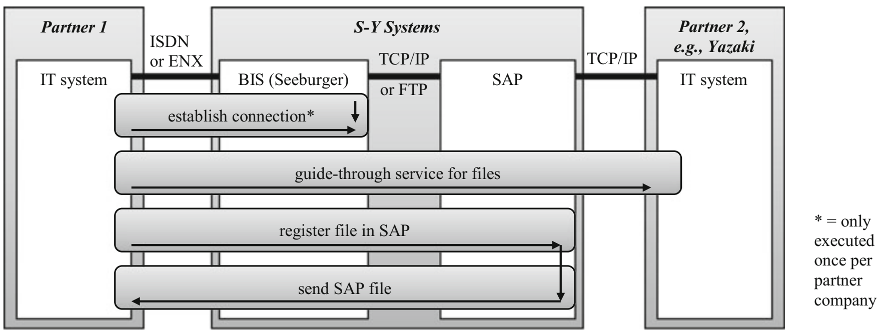

Fig. 1 Process map, including the IT architecture

three types of companies (the file-sending company, S-Y Systems, and the file-receiving company) and the two IT systems at S-Y Systems (BIS and SAP).

The EDI process "establish connection" (Fig. 1) is the only one of the four EDI processes that is executed only once for every partner. This process, which is the basis of the other three processes, establishes a reliable ISDN, ENX, or TCP/IP connection to the customer companies' IT systems. After the connection is tested, files can be exchanged between S-Y Systems and its customers. For certain processes, S-Y Systems acts as an intermediary service provider for Yazaki to process EDI files, receiving the files of one of Yazaki's partners and converting them so Yazaki's application systems can process them—and vice versa. This process is called "guide-through service for files." The last two main processes are "register file in SAP," which includes processing incoming EDI files, and "send SAP file," which includes preparing and sending an outgoing EDI file. Since S-Y Systems could provide process models for only a few parts of the four EDI processes, most of the processes that the company intended to monitor had to be modeled first. The project team used Business Process Model and Notation (BPMN) (Fig. 3), a standard for business process modeling, as the graphical process modeling language.

We focus on the third process, "register file in SAP," because it shows the difference between external and internal errors within the process. The "register file in SAP" process starts when a partner sends an EDI file to S-Y Systems. After receiving and archiving the EDI file, the BIS checks the name of the EDI file, and specific receiving rules are activated based on the partner. These rules determine which mapping is used to create proprietary SAP format files (IDocs) from the received file. Once the IDocs are created, they are sent to the SAP system either via the intranet or, if the file is too large, via an FTP server. Once the IDocs have been sent, the BIS archives them again, and the SAP system interprets and registers them for further use.

Step 4: Determine the goal of the process: Since every process can—and usually does—have its own goal, all processes must be analyzed individually. The generic, quantitative goal of "register file in SAP" is "fast processing without errors according to the customers' needs." The EDI process is automated, and manual interventions are necessary only if there are processing errors, but a fast and reliable run through this process must be ensured, as the customers expect it.

Step 5: Identify the process's critical success factors: Based on the process's goal of "fast processing without errors according to the customers' needs," quality and time were identified as the process's CSFs. To improve quality and to be in accordance with the strategic goal of zero defects, S-Y Systems focused on eliminating errors. Interruptions in the process flow and failures in processing activities that were causing delays in the process had to be eliminated. Errors that were not caused by S-Y Systems but by their business partners had to be identified and reported to the partner company to improve process quality in the long term. Time-related aspects of the process also had to be included in the measurement of the business processes to meet the customers' expectations and ensure compliance with agreements, so it was necessary to examine the processes' internal performance by means of time-related process KPIs. The focus of measurement lay particularly on manual interventions in the process.

Step 6: Identify process KPIs: After steps 1–5 were completed, detailed process KPIs that related to the CSFs of quality and time had to be identified. For the "register file in SAP" process, it was not the successful processing of the tasks but the appearance of processing errors that had to be measured. Since most of the process tasks were executed automatically, their monitoring had to focus on the parts of the process where the errors actually occurred and on actions to resolve these errors.

Thus, KPIs concerning five dimensions of time and quality were identified. The first three dimensions support the CFS of quality, while the last two dimensions focus on time.

- Type of error: Errors can be classified into "decider errors," "mapping errors," and "stop errors. (These errors are described in Table 1 and located within the process in Fig. 3.)
- Reason: The reason for an error refers to whether it is an internal failure or caused by an external partner (Table 1). "Stop errors" are always internal errors because they indicate a problem with the in-house connection between the IT systems BIS and SAP.
- Partner company: To react quickly when one a partner company sends many incorrect files within a short time, the number or frequency of errors per partner must be tracked in order to focus on this partner company and analyze the reason for the errors. In any case, when an error occurs, it must be resolved quickly. Bound by contract, S-Y Systems pays a penalty if the process delay exceeds a certain time because of an error. Therefore, monitoring the time-related aspects of the resolution to an error helps to improve the overall process performance and to avoid the need to pay contractual penalties.

Table 1 Overview of possible errors

Error type	Description	Reason
Decider error	No receiving rule can be found for the incoming file, or the receiving rule found does not match the incoming file. The process stops	External: New file sent without having a receiving rule, or the name of a file has been changed Internal: Misspelling within a receiving rule; receiving rule is inactive
Mapping error	The receiving rule is active, but the mapping of the data causes an error	External: Wrong data type for an area; no value for an area; changes in the logical structure of the file Internal: Incomplete mapping document
Stop error	The file cannot be sent or is not accepted by the following system	Only internal: Wrong file name or structure; errors within the connection; interface used by other files

- Time: The weekly average time for a particular error is compared with the weekly average time for similar errors, and the error is examined in more detail if the time taken deviates from the average of similar errors. The time per error can be split into two other KPIs: reaction time (the time between the occurrence of the error and the start of the resolving actions) and the time needed to resolve the error.
- Priority according to file content: The errors can be classified into four categories of priority according to the criticality of the EDI file's content: low, medium, high, and critical. According to this priority rule, the staff has to react within a specified period of time from a day to within 30 min, depending on the priority level. If this period of time is exceeded, the IT management is informed so it can react quickly.

For each KPI, a KPI description is made. These descriptions inform the PPM system users about what each KPI means, what it measures, where the measuring points are located, what problems and interrelationships exist, and so forth.

After the process KPIs were identified, a visual prototype of the PPM system was implemented. The prototype consisted of a PPM dashboard showing the process KPIs along the process models and used dummy data to calculate dummy values for them.

Step 7: Implement organizational integration: Since this step requires detailed organizational information and the power to enforce organizational changes in the company, S-Y Systems itself ensured the organizational integration of the developed and implemented PPM system and the assignment of responsibilities.

4 Results Achieved

To summarize the results of the PPM project, Fig. 2 shows an overview of the findings of each step of the proposed PPM procedure, which led to appropriate KPIs that fully support the company's vision and goals.

As Fig. 2 shows, each step of the approach uses the information collected in the previous steps, making this top-down procedure structured, consistent, and firmly interconnected.

Since the main result of the project was the PPM system prototype, more explanations are provided in the following paragraphs. The PPM consisted of two levels of aggregation.

On the initial level, a process map showed the four processes of the IT department. Traffic lights were allocated to each of the processes, indicating the overall status of each process, including all of its underlying KPIs. System users could choose one of the four processes and the system led them to the second level, where the selected process was graphically represented as a process model (modeled with BPMN).

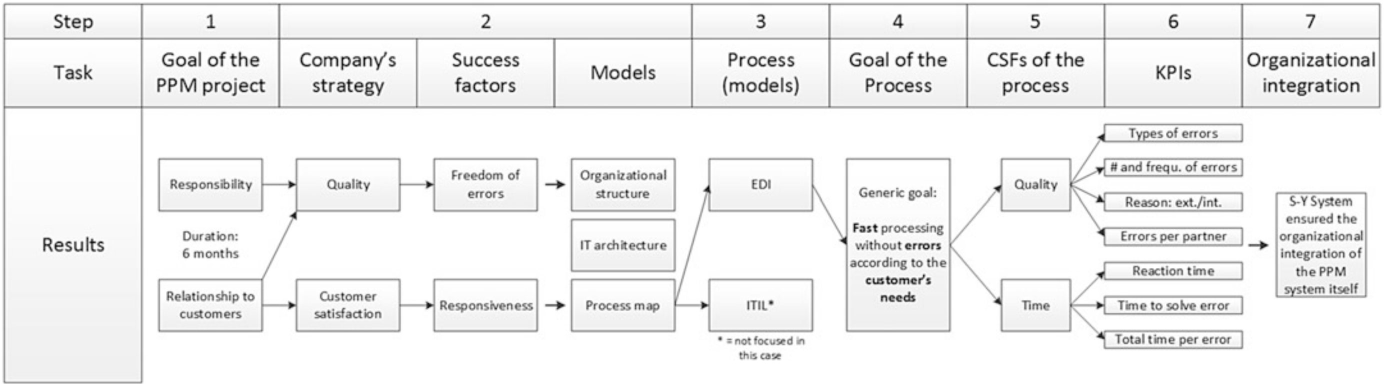

Fig. 2 Summary of the PPM project results

Figure 3 shows the second-level view of the process “register file in SAP.” The status of the KPIs at S-Y Systems regarding the three types of errors were allocated to the related task in the process model using traffic lights according to the identified thresholds in the KPI descriptions. In contrast to other dashboards, the process and its related process model was the focus of the PPM dashboard. The KPIs were allocated to the corresponding task within the process model, which emphasized the importance of the graphic visualization connected to the process flow. This process-oriented representation of KPIs differed fundamentally from other dashboards, which usually present KPIs only as tables or independent charts, losing any link to the underlying process.

For example, to monitor decider errors, a set of KPIs (e.g., number of errors, number of errors per partner) are defined and represented with traffic lights next to the task “Check name of EDI file” in the process model. This task checks whether there is a receiving rule for the incoming file. If there is a receiving rule, the process continues; otherwise, the process stops and a decider error occurs. For instance, a red traffic light can indicate that the defined threshold for the number of internal decider errors has been exceeded, providing the analyst at first view of possible reasons for the decider error (e.g., the receiving rule contains spelling mistakes), which can be analyzed and corrected promptly.

The implemented PPM dashboard represents KPIs as separate bar charts when the traffic lights are clicked (Fig. 4). The bar charts in Fig. 4 represent different combinations of the dimensions of number and frequency of errors, reason for errors (internal and external), frequency of errors per partner company, average reaction time according to the level of priority, average time needed to solve errors, and average total time of errors.

Based on the defined KPIs, the allocation of errors within the process, the reasons for the errors, and their origin are traceable. The reports derived from this information serve as the basis for reviews with the partner companies to reduce the number and frequency of errors.

5 Lessons Learned

A review of the PPM project and its results reveals several lessons learned.

Top-Down Approach There is no one-size-fits-all solution when implementing a PPM system, so many companies face difficulties when trying to establish a monitoring system. As most companies follow an unstructured, bottom-up approach, they often monitor inappropriate KPIs and, consequently, define unnecessary measuring points. A structured, top-down approach builds a reliable basis for a PPM system, as the results of this case show.

Internal and External Errors Because of S-Y Systems’ intermediary role, appropriate process KPIs were related primarily to quality. Errors were of particular interest, especially in terms of whether they were externally or internally caused. In

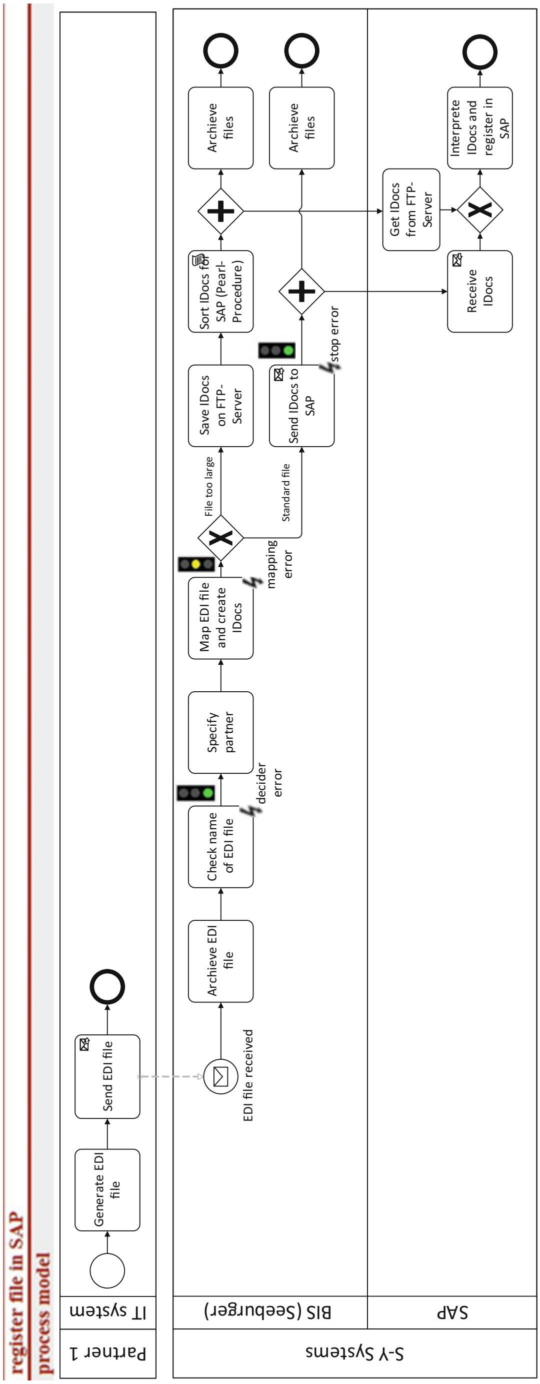

Fig. 3 Prototype of the PPM dashboard

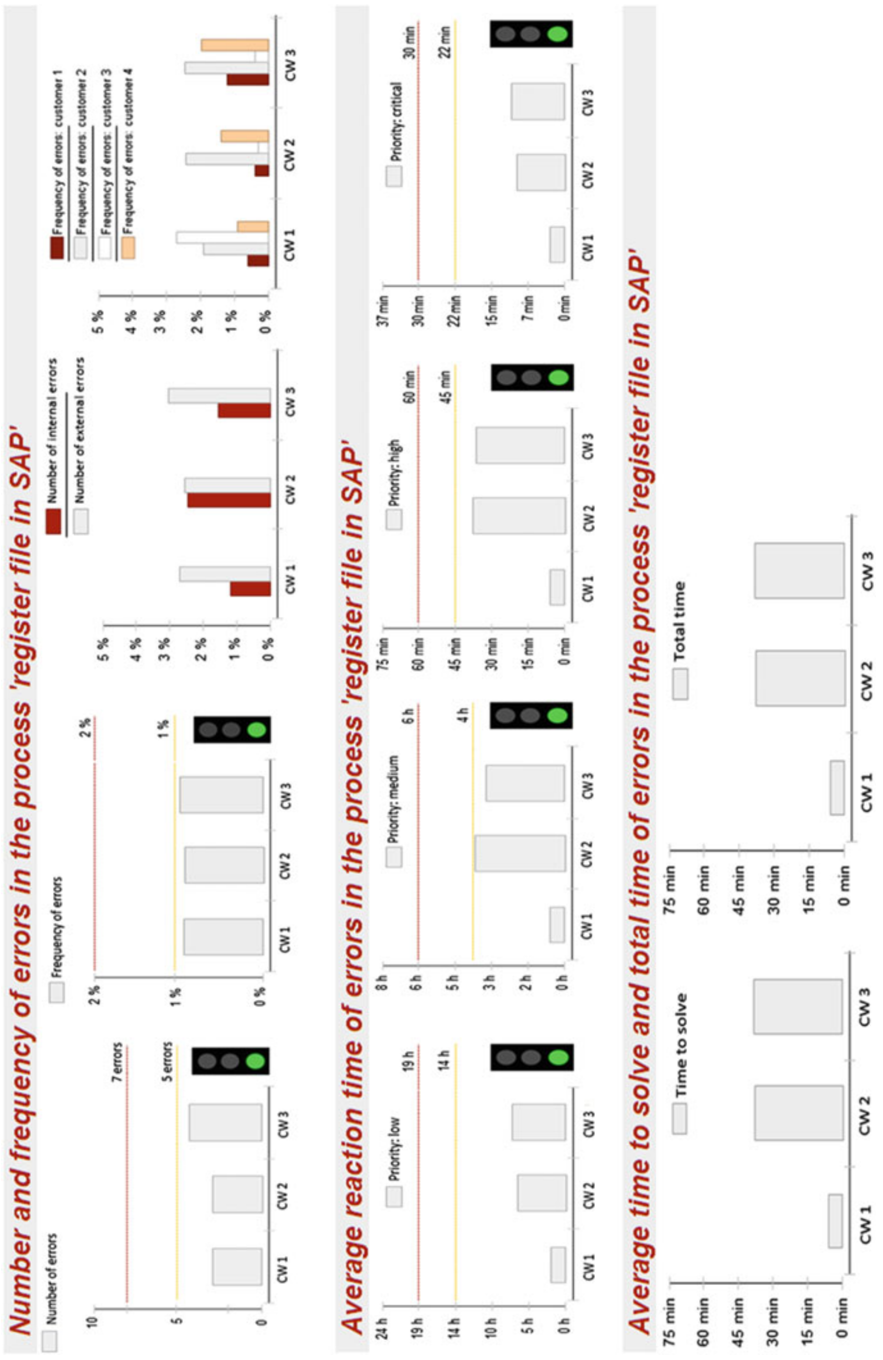

Fig. 4 Bar charts of the PPM cockpit (CW = Calendar Week)

general, whenever a process starts at an external process participant (company), the quality of the first process tasks depends on that participant, so errors in these tasks are mainly caused externally. In contrast, monitoring the performance of the following tasks deals primarily with the internal quality, for which the focal company is fully responsible. Therefore, KPIs that refer to quality are distinguished based on whether they are external or internal. This view affects improvement efforts because internal process performance improvement is much easier than improving the process performance of external partners.

Risk of Losing Focus on the Process While carrying out the PPM project, especially while developing the prototype of the PPM dashboard, the students occasionally strayed too far from the process. For example, they lost focus on the initial process by trying to advance the modeling and monitoring of subsequent processes, and they first presented KPIs in separate diagrams and tables with no visual relationship to the underlying processes.

Consideration of Time Restrictions when Measuring Time-Related KPIs In general, KPIs that relate to the operating time must take several assumptions into account because employees do not work 24×7. Calculations should relate only to the enterprise's contractual working hours, which was the case at S-Y Systems. Problems can also arise if the company has offices in multiple countries with differing holidays. For example, in Turkey (where one of S-Y Systems' affiliates is based), December 25 is not a public holiday as it is in Germany. A PPM system's skipping that day in the calculation would deliver process-performance values that were too positive and distort the KPIs when comparing performance across countries.

Problem of Variants The issue of too many KPIs is a problem caused by several dimensions:

- Process and task
- Type of error and reason for the error
- Partner company (customer)
- Priority of errors because of the priority of the EDI file
- Time interval
- Other possible dimensions, such as type of connection (ISDN vs. ENX vs. TCP/IP)

Since there are several possible values for each dimension, the combination of these dimensions results in a high number of possible KPIs. For example, the information about the number of "Internal high-priority mapping errors within 'register file in SAP' received from customer 1 in November" requires integrating five dimensions (process, type of error, customer, priority of error, time interval) into the calculation, and many KPIs can be defined just for the "time interval" dimension (e.g., processing time, waiting, time, response time, problem solving time, total time). Therefore, combinations of dimensions result in a large number of KPIs. To reduce the number of combinations and avoid losing focus, the PPM system at S-Y Systems specifies the "process" dimension by going from the process map on level 1 to the process model on level 2. The types of errors are located in the process model, and the other dimensions—"reason for error," "partner company," "priority," and "time" are handled by means of separate bar charts below the process model (Fig. 4). A detached button enables the user to select the time interval used for calculating the KPIs.

An outlook on further activities and research projects at S-Y Systems reveals two primary opportunities for future improvements in their PPM.

Performance Measurement across the Complete Process and across Companies To achieve transparency beyond company borders, the complete end-to-end process must be monitored. (See, e.g., the EDI process "guide-through service for files.") Such a cross-company PPM system requires synchronized data input from all participating companies in order to give them instant information about early or late parts of a process. In the case of S-Y Systems, its business partners that were sending EDI files could see how many files were running on failure at S-Y Systems because of their own bad process performance (e.g., sending S-Y Systems files with incomplete data values and causing mapping errors).

Subsequent Student PPM Projects Other student projects will intensify the monitoring within the BIS processes at S-Y Systems and use our university's computer center and the PPM approach to improve all customer-related IT processes, thereby improving customer satisfaction. For the latter purpose, a PPM system that focuses on time measurement will be developed and implemented. Another KPI focus of the project could relate to energy consumption in order to establish green processes.

References

Blasini, J., & Leist, S. (2013). Success factors in process performance management for services—Insights from a multiple-case study. In *HICSS*.

Blasini, J., Leist, S., & Ritter, C. (2011). Successful application of PPM—An analysis of the German-speaking banking industry. In *ECIS* 2011.

Chen, J.-C., & Williams, B. C. (1998). The impact of electronic data interchange (EDI) on SMEs: Summary of eight British case studies. *Journal of Small Business Management, 36*(4), 68–72.

Choudhary, K., Pandey, U., Nayak, M.K., & Mishra, D.K. (2011). Electronic data interchange: A review. In *Proceedings of the 2011 Third International Conference on Computational Intelligence, Communication Systems and Networks* (pp. 323–327).

Cleven, A., Wortmann, F., & Winter, R. (2010). *Process performance management—Identifying stereotype problem situations as a basis for effective and efficient design research* (pp. 302–316). St. Gallen: Desrist.

Hansen, J. V., & Hill, N. C. (1989). Control and audit of electronic data interchange. *MIS Quarterly, 13*(4), 403–413.

Heckl, D., & Moormann, J. (2010). Process performance management. In J. vom Brocke & M. Rosemann (Eds.), *Handbook on business process management* (Vol. 2, pp. 115–135). Berlin: Springer.

Heß, H. (2004). Marktführerschaft durch Process Performance Management: Konzepte, Trends und Anwendungsszenarien. In A.-W. Scheer, F. Abolhassan, H. Kruppke, & W. Jost (Eds.), *Innovation durch Geschäftsprozessmanagement—Jahrbuch Business Process Excellence 2004/2005* (pp. 119–136). Berlin: Springer.

Jeston, J., & Nelis, J. (2008). *Management by process: A roadmap to sustainable business process management*. Oxford: Elsevier Linacre House.

Ritz, D. (1995). *The start-up of an EDI network a comparative case study in the air cargo industry*. Dissertation, Hochschule St. Gallen.

S-Y Systems Technologies Europe GmbH. (2012). *Company brochure*. Retrieved October 05, 2012, from http://www.systech-eu.com/fileadmin/user_upload/downloads/SY-Image broschu__re_EN_Internet.pdf

Weber, M. M., & Kantamneni, S. P. (2002). POS and EDI in retailing: Underlying benefits and barriers. *Supply chain Management: An International Journal, 7*(5), 311–317.

Josef Blasini studied Management Information Systems at the University of Regensburg from October 2002 to March 2007. From April 2007 to December 2013, he worked as a research assistant at the chair of Management Information Systems III—Business Engineering—at the University of Regensburg, where he also received his doctoral degree (Dr. rer. Pol., title of his doctoral thesis: “Process Performance Management—an empirical investigation of critical success factors”) in November 2013.

Susanne Leist is Professor of Information Systems at the University of Regensburg, Germany. She is the author of numerous articles in scientific journals, for conferences and books (e.g., Business and Information Systems Engineering (BISE), Business Process Management Journal (BPMJ), Information Systems and e-Business Management (ISeB), Electronic Markets (EM), Managing Service Quality (MSQ), International Conference on Information Systems (ICIS), European Conference on Information Systems (ECIS)). She is a member of the Editorial Boards of the Enterprise Modeling and Enterprise IS department of the international journal BISE, the international journal EM, the quarterly magazine “BIT Banking and Information Technology”, and the Regensburg University research magazine “Blick in die Wissenschaft”. She has also been acting as an editor or reviewer in several international committees.

Werner Merkl, Director Central IT at S-Y Systems Technologies Europe GmbH until 2013, initiated the company's cooperation with the University of Regensburg and was the project leader on the part of S-Y Systems. Presently Werner Merkl is CEO of the it-motive BCS GmbH in Regensburg, which he founded together with the it-motive AG. He advises customers on Business Model Design, IT Strategy, Industry 4.0 topics and BPM. From 2013 till 2015 he was responsible for Quality, Environmental, Health and Safety and the internal Project Management System for Yazaki Limited Europe, which is the leading global wiring harness manufacturer in the automotive industry. From 2002 till 2013 he was responsible for IT in a Joint Venture of Yazaki and Continental. Prior to this he worked as Manager and Project Manager in the telecommunications and engineering sector. In 2012 he received the Handelsblatt IT Strategy Award.