

# Collaborative Process Assistant – Towards a Context-sensitive Business Process Support Based on Emails

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**Abstract.** In many companies, a majority of business processes take place via email communication. Large enterprises have the possibility to operate enterprise systems for a successful business process management. However, these systems are not appropriate for small and medium-sized enterprises (SMEs), which are the most common enterprise type in Europe. Thus, the European research project Commius addresses the special needs of SMEs and the characteristics of email communication, namely high flexibility and unstructuredness. Additionally, it copes with the trade-off between process guidance and flexibility. In this paper, COPA which is a prototypical implementation of the Commius concept will be presented.

**Keywords:** Email, Workflow, Business Process, Flexibility

## 1 Introduction

Emails as a means for communication has become an integral part of our daily business activities, without which modern business would be unthinkable. On average, employees spend 2.6 hours a day with sending and receiving 33 respectively 72 emails [1]. However, not only the time spent with emails as a means of communication, but also the knowledge that is bundled in an unstructured way within companies' email repositories is quite difficult to manage. This becomes clear, if the number of 75 % is taken into mind representing the percentage of a company's knowledge saved in emails [2].

Large companies have the possibility to operate sophisticated enterprise systems, for instance ERP systems, which contain features for a successful business process management. Nevertheless, these solutions are not appropriate for all types of companies. Small and medium-sized enterprises (SMEs) do not have the ability to spend money for purchasing, operating and maintaining such expensive systems [3].

Currently, none of the existing software systems address the special needs for SMEs. Furthermore, email-based business process solutions would have to address special characteristics of email communication, namely highly flexibility and unstruc-

turedness. Traditional workflow engines lack the required flexibility for reacting to ad-hoc changes [4]. Their rigid underlying process model would need to foresee all possible variation, which becomes unfeasible even for simple processes. On the other hand, flexible workflow engines expect user knowledge about the procedural structures of an enterprise and do not provide enough guidance. However, introducing more procedural structures would result in a decrease of a system's flexibility [5]. Due to these problems, none of the proposed solutions could be established on the market.

The EU-FP7 research project Commius (COMMunity-based Interoperability Utility for Small and medium enterprises), in which 9 European participants were involved until the end of 2011, and its prototypical realization COPA (Collaborative Process Assistant) address these problems (cf. <http://www.commius.eu>). The proposed concept is tailored to the special needs of SMEs, manages email-based business processes and copes with the personal and company individual requirements of email communication. COPA has the overall target to make email workflows easier, faster and more structured. The achievement of these targets could be empirically validated [6].

## 2 The Collaborative Process Assistant

The usage of the system is divided into two phases, build-time and run-time. During build-time, the basic system configuration is accomplished in a first step. Afterwards, the process types to be supported are defined in a configuration tool. COPA will contain several standard process templates that can be customized or new processes can be defined. Therefore, parser elements to be identified in future emails are specified. A set of certain parser elements constitutes a certain process step. After defining such process steps, they can be combined to process types. Desired annotation and processing treatment can be determined individually for each process step.

Having defined customized process settings, the COPA system can be employed. During this run-time phase, all email movements of the given email accounts are observed with respect to potential emails. In case of an identification of such an email, it runs through the COPA enhancing treatment. From a more technical perspective, COPA is divided into three main layers:

- On the level of the *system layer* each received email will be intercepted by the system and subsequently be analyzed, archived, decoded and decomposed. Each part of an email will be transformed into plain text and merged into a single XML document to allow other COPA components to directly access the information for further processing. In addition, the system layer will provide system connectors usable to interface external as well as legacy systems.
- The *semantic layer* signifies meaningful communication of an enterprise. As such, it underpins the interoperability between collaborating enterprises. Outgoing from pattern-based information extraction, notifications, orders and other communication, can be identified and relevant information in this regard will be extracted.
- The *process layer* concerns process interoperability. User interactions take place mainly within this layer. The layer is subdivided into four run-time components that are described in the following subsections in more detail.

## 2.1 Detection Component

The first step along the email processing is the Detection Component. Here, the COPA system determines, whether the incoming E-mail concerns an already running process or if a new process instance has to be initiated. Based on the prior performed semantic analysis, the email can either be assigned to an existing process where it constitutes the next step or the email is considered as a starting event and triggers a new process. In this case a new process instance with its specific Process ID will be created outgoing from the corresponding reference model template from the Enterprise Process Repository. Further, the information, whether the incoming email is part of an already known process or a completely new one, is being displayed to the user. Future incoming emails concerning this particular process will be assigned to this initial process instance henceforth.

## 2.2 Tracking Component

The process tracking functionality is responsible for monitoring all incidents occurring within a running process as well as storing every performed process step and additionally relevant information, e.g. customer IDs or order quantities, in the respective context. Following this approach, every performed step and conjoined information within a process instance is documented and comprehensible for further disposal thus forming the precondition for further beneficial functionalities of COPA. As soon as the processing is completed the displayed email contains two sets of data consisting of information about the present state of the actual process and the visualization of the preceding modules including the corresponding emails.

## 2.3 Assisting Component

As the correct business module has already been identified, the *Assisting Component* exploits the Enterprise process repository gathering relevant process data in order to supply the user with beneficial information related to the particular process step. This data may either consist of internal information like for example customer history or article information or it can be presented in form of a gateway to external links. To achieve the best response to specific requirements the nature and the level of detail of the information to be displayed can be adjusted using the customization tool. The personnel of a shipping department for example would require item IDs and ordered quantity as well as the customer's address for example, while account details would not be expedient in this context.

## 2.4 Advising Component

Due to the knowledge gathered in prior phases, the *Advising Component* provides suggestions and recommendations for further proceedings in a particular process. If the incoming E-mail has, for example, been identified as a confirmation of payment of an order transaction, COPA would recommend triggering the shipment and procure

reasonable options like forwarding the confirmation to the shipping department. The gathered information is then being forwarded to the system interoperability layer, which incorporates the auxiliary information into the generated output email. This email provides the user with a set of descriptive hyperlinks representing the different possibilities to proceed within the process's workflow and allows accessing the ascertained information. Using the method of embedding the information directly into an email, allows COPA to be applicable as well in a collaboration scenario in which only one partner deploys the system, due to the wide spreading of the email standard. A second functionality of the Advising Component is to provide advice in actually executing the next process step once the user has chosen one of the provided actions. This more interactive part is not directly invoked while processing an incoming email, but later via the embedded hyperlinks which redirect the respective user to an integrated web-interface where he will be provided with more specific information on the further proceedings.

### 3 Conclusion

In this paper, we have presented Commius as a prototype to support enterprise interoperability based on email technologies which fits the special needs of SMEs. It enables SMEs to use and maintain the system without major financial efforts and changes in their technological landscape. The most innovative aspects of Commius include the extensive capabilities for flexible adaptation to changed environmental needs while still providing process guidance.

**Acknowledgments.** This work has been partially supported by the EU STREP project Commius (FP7-213876).

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