

Seamless Integration of Order Processing in MS Outlook using SmartOffice: an Empirical Evaluation

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IESE-Report No. 087.12/E
Version 1.0
October 2012

A publication by Fraunhofer IESE

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Abstract

MS Outlook is currently the most widespread e-mail client in corporate environments. However, e-mail management with MS Outlook is usually decoupled from enterprise processes, making it difficult to synchronize e-mails and attachments with currently running processes. In this paper, we introduce SmartOffice – an extension for MS Outlook allowing the seamless integration of e-mail management with enterprise workflows, thus increasing the effectiveness of e-mail processing as well as coupling process-relevant e-mails and documents with the respective process instances. SmartOffice was integrated with a legacy system supporting the import management process of a large German retailer. We evaluated the SmartOffice integration in an empirical study in the context of the import process, using real data, and with the employees of the retailer's import office. We conducted a semi-structured interview, where one participant answered questions after solving three typical tasks and surveyed a group after a presentation and demonstration of SmartOffice's functionality. The results show that SmartOffice has high potential for being introduced in the process with high efficiency and high user acceptance. Although the number of participants was low, the results are considered very relevant from the perspective of the domain experts, since the study took place in an industrial setting.

Keywords: SmartOffice, e-mail management, import process, retail, knowledge base, usefulness.

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1 Introduction

According to the recently published studies of Pingdom [7], an average corporate user is sending or receiving 112 e-mails per day. BearingPoint states in [1] that e-mails increasingly contain business-critical information, e.g., orders, offers, inquiries, thus

making employees' mail boxes valuable information sources –critical not only for individual workers but also in the scope of the enterprise. The information contained in business e-mails is highly relevant to enterprise business processes and needs to be accessed timely from running workflows. And vice versa, to speed up e-mail processing, quick access to relevant workflow information is required. Documents and e-mails used during process enactment document a process implicitly. Such process documentation can be used for continuous process analysis and improvement. Although solutions for integrated collaboration and process management exist (e.g., Lotus from IBM), their popularity and market share are continuously decreasing. Currently, MS Outlook is maintaining its leading position as an e-mail client and is widely used in corporate environments [2].

We considered the problem of efficiently integrating e-mail management performed with MS Outlook with the process of importing promotion articles from the Far East by a large German retailer in order to contribute to process analysis and controlling. The process of article import is extremely agile and requires communication via e-mail in all of its steps. Orders were originally managed by generating MS Excel spreadsheets from a centralized order database and maintained with status updates by process participants. E-mails and attached documents, e.g., order confirmation and test reports, cannot be connected with the import order information using the current practice. Process information is distributed over the computers of all process participants so that collecting process information and analyzing it is extremely difficult. During the project, a web-based application named Import Status List was developed to allow central maintenance of information about current orders, e.g., order number, article name, quantity, price, quality tests, manufacturer, and relevant documents. To address the problems of integrating e-mail communication with the Status List application, we developed the SmartOffice plugin for MS Outlook. It helps to easily map e-mails to running import processes and to quickly access the process information required for e-mail processing. It is important to note, that the maintenance of the status data is an obligation of the employees and their current job. The Status List replaces the spreadsheets and adds more convenience in maintaining this data. SmartOffice in turn uses this data and does not require

maintaining additional data. This paper gives the necessary background information on SmartOffice and describes its evaluation.

2 Related Work

Drezde et al. [4] introduce a plugin Activity Manager for Mozilla Thunderbird that allows semi-automatic classification of an e-mail as belonging to either a personal or a collaborative activity. Semi-automatic e-mail filing for personal information management (PIM) using a semantic desktop approach was considered in [8]. Scerri et al. developed an MS plugin, Semanta [9], which can assist users in extracting one or several *speech acts* from e-mail. Semanta helps to fill patterns for *speech acts*, e.g., action, object, and target, depending on the activity type. It builds upon the PIM ontology developed for the semantic desktop. All suggested systems are very generic, require considerable modeling effort for bootstrapping, are targeted at expert users, and do not consider processes. In contrast, SmartOffice aims at keeping modeling effort low, being integrated into the daily work environment, and being intuitive for non-experts.

3 SmartOffice

SmartOffice is an extension of MS Outlook aimed at supporting office workers to cope with the large number of business process-related e-mails they receive every day. Its main features are: 1) proactive delivery of process-relevant information related to the current e-mail fully integrated into MS Outlook; 2) semi-automatic classification of e-mails and attachments via tagging, using concepts from the process-related knowledge base; 3) proactive delivery of desktop documents related to current e-mails; 4) evolutionary extension of the process-related knowledge base and implicit process documentation by automatic uploading of e-mails and attachments into the central knowledge base. Figure 1 shows a screenshot of the SmartOffice plugin. The panel on the right side integrated into the MS Outlook e-mail inspector consists of 3 parts: 1) *Tag cloud* – shows e-mail classification using tags – references to concepts from the process-related knowledge base; in the domain of import we consider orders, manufacturers, and quality test types as concepts, for example; using the tag cloud, the user can easily open the corresponding order in the *Status List* application; 2) *Categories* – proactive suggestions of concepts from the knowledge base the system considered as being relevant to the current e-mail, e.g., the order mentioned in the e-mail; the user can accept suggestions via drag&drop of the concept to the *tag cloud* or by attaching the concept using a context menu; if a suggestion is accepted, the concept appears on the e-mail's *tag cloud* and the e-mail is uploaded into the knowledge base together with its attachments. Concept suggestions can be expanded in SmartOffice, e.g., the user can see order details directly in MS Outlook. 3) *Document search* – the system proactively searches desktop documents and e-mails related to the current e-mail that could be helpful for processing that specific e-mail. SmartOffice is aimed to ease the problems of information overload when working with business relevant e-mail as well as the integration of e-mail communication into enterprise processes.

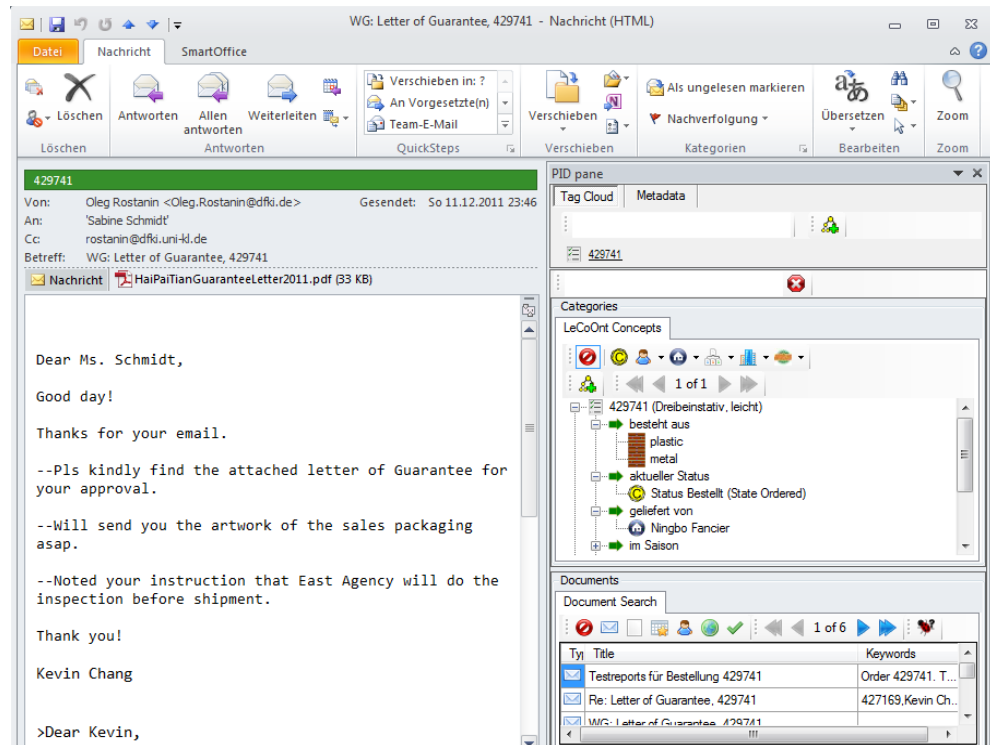


Figure 1. SmartOffice plugin for MS Outlook

4 Empirical Study

4.1 Context and Research Goals

The study took place in cooperation with a large retailer. We evaluated how SmartOffice supports the import process at the retailer from the users' perspective.

We investigated whether SmartOffice has the potential to be used to support the import process of a retailer and to identify aspects that can be improved. Specifically, we had the following goals:

Characterize the usefulness (RG1), efficiency (RG2), quality of the provided information (RG3), usability (RG4), and intention to use (RG5) and evaluate the perceived usefulness (RG6) and ease of use (RG7) of SmartOffice within the import process at a retailer from the user perspective.

4.2 Participants

The participants were experienced retailer employees. Their tasks include planning the assortment of goods in the non-food sector, coordinating the import of planned products, organizing weekly promotions, and creating advertising flyers. Depending on their role, they are involved in various steps of the import process.

A key task in their daily duties is intensive communication with providers and colleagues via e-mail. E-mail is not only used to exchange documents, but important decisions are also made, communicated, and documented. Their e-mails are ordered in their personal inboxes and stored in folders (e.g., by provider or by season). The folder structure used depends on the employee's individual preferences. Each e-mail may contain one or more order numbers in the subject line or in the e-mail body, which is used to identify the reference to the corresponding orders.

Another important task for the import employees is keeping the status of the import process instances up to date. Currently, this is done by generating an Excel spreadsheet from a relevant excerpt of a centralized order database and communicating it to all process stakeholders via a network drive or e-mails. Thus, several Excel files need to be managed. To update an order status, the employee needs to search and access the corresponding file.

Vacation replacements use the substituted employee's computer. As a consequence, they have to deal with their e-mails following an unknown folder structure for e-mail organization.

4.3 Design

For this study, one person from the import office at the retailer was available for half a day, and another six people were available for one hour. In order to make the most of the opportunity of performing the evaluation with real users in their real work environment, our strategy was to conduct a semi-structured interview with the individual person and administer a questionnaire to the group.

4.4 Procedure

4.4.1 Semi-structured Interview

The procedure comprised three activities: 1) we provided training on how to use SmartOffice (20 minutes), 2) the participant conducted three different tasks and after each task answered questions about that specific task, and 3) afterwards we asked questions regarding SmartOffice in general and let the participant fill in the questionnaires. Each task was formulated in the text of the corresponding e-mail in MS Outlook:

T1: Find suppliers who delivered Buddha statues in the past.

T2: Assign the e-mail and its attachment to the corresponding import process instance in the status list.

T3: Reuse a test report from a past order for the current one.

4.4.2 Group Survey

During this part of the study, the group received a presentation and a demonstration of SmartOffice, where they were shown how to solve the same tasks as the ones that were solved during the semi-structured interview. The feedback was collected during a discussion and by answering a questionnaire.

4.5 Operationalization and Hypotheses

In a series of workshops, solution experts and an independent empirical expert derived items for measuring the evaluation goals. Four questionnaires were constructed: one for each of the three tasks (Q1, Q2, and Q3) and one for the

whole group, which includes standardized items (Q4). The group survey included eight standardized items (Q5). The standardized items were adapted from [3], [5], and [6]. We used 5-point Likert scales. For data analysis purposes, 1 was used for the lowest value for the concept and 5 for the best value for the respective concept. Table 1 shows the number of items used per concept and task. The questionnaires can be obtained from the authors.

Table 1. Items used per concept and task

	Task1 Q1	Task2 Q2	Task3 Q3	All tasks Q4	Presentation Q5
Usefulness	2	1	1	2	-
Efficiency	5	5	5	1	-
Quality of information	-	-	-	20	-
Usability	1	1	1	28	-
Intention of use	2	1	1	3	-
Perceived usefulness	-	-	-	4	4
Perceived ease of use	-	-	-	4	4
TOTAL	10	8	8	62	8

For the TAM items, we tested the following hypotheses:

H1: Median(Perceived usefulness) > 3

H0₁: Median(Perceived usefulness) ≤ 3

H2: Median(Perceived ease of use) > 3

H0₂: Median(Perceived ease of use) ≤ 3

4.6 Study Results

We tested the hypotheses using the one-sample Wilcoxon signed ranks test. Both H0₁ and H0₂ were rejected with a significance level of 0.01. Crombach's α was 0.24 for perceived usefulness and 0.70 for perceived ease of use. Table 2 summarizes the results from the closed questions.

Table 2. Results from closed questions

		Median	Mean	Min	Max	St. Dev.
Semi-structured interview (N=1)	Usefulness	4	4.29	3	5	0.76
	Efficiency	5	4.67	3	5	0.62
	Quality of information	4	4.11	4	5	0.32
	Usability	4	4	2	5	0.69
	Intention of use	4	4.2	4	5	0.48
	Perceived usefulness	4	4	4	4	0
	Perceived ease of use	4	4.5	4	5	0.58
Group (N=6)	Perceived usefulness	4	4.08	3	5	0.72
	Perceived ease of use	4	4.25	3	5	0.61

The efficiency of SmartOffice was rated as very good (mean=4.67). This can be explained by the fact that many tasks are automatically performed without disturbing the person at work. SmartOffice's knowledge-based support also allows performing quick searches because there is no need to know anything about the folder structure used to organize e-mails. This makes the use of SmartOffice good for beginners and vacation replacements.

Only the efficiency item for evaluating the tagging functionality was rated neutrally as (neither efficient not as inefficient). This is explained by the huge number of e-mails involved in the process. Manual tagging may be worthwhile only for specific e-mails, for example, e-mails which lead to a change in status or an agreement between the employee and the provider. This was confirmed during the group survey.

The other concepts were rated as good. Document reuse was difficult for the example in the evaluation scenario. However, in the discussion, the concept for reusing documents was described as useful. The chosen example was not really applicable in practice because the kind of document selected for the study first needs approval by quality assurance in order to be reused. As a consequence, the specific task in the example was evaluated as easier to solve without the support of SmartOffice.

The only concern regarding the intention of use was that the whole scenario with SmartOffice provides the best results if all stakeholders involved use it continuously, i.e., maintain the status on the Status List and tag e-mails with the relevant attachments. This is true. However, considering the current process at the retailer, the employees currently also depend on the continuous maintenance of the Excel files. The only thing new is simply that, with SmartOffice, relevant e-mails containing documents are additionally tagged with the respec-

tive order number. The evaluation shows that, in contrast to the current practice with Excel files, the use of the Status List is perceived as more efficient for accessing order status information. Moreover, the proactive retrieval of information automatically identifies the order, which reduces the effort for tagging only relevant e-mails. If any relevant e-mail is not tagged, a fallback to the current practice can be used to process the order, i.e., the employee in charge needs to respond to a request of a colleague by manually searching the database.

We also found that, if the system goes into operation, its usability should be improved. For this, special user profiles need to be considered. These include various concepts and focused vocabulary used by different participant roles during specific phases of the process. Because the evaluation was focused on the import sector, only an import-specific vocabulary was used. The technical implementation as a filter (e.g., *show only the relevant vocabulary for the import sector*) is already implemented in SmartOffice. It would be necessary to set the filter depending on the role of the employee. It was also mentioned that in an e-mail, over a hundred orders can be listed as an interval. This must be identified by SmartOffice and implemented accordingly as a dialog that takes over the automatic tagging of all corresponding orders.

4.7 Threats to Validity

Explication of constructs: Not all items used were standardized (29 out of 88). This may be a threat to validity because their meaning may be misunderstood. To mitigate this threat, domain experts reviewed the operationalization.

Contamination: The interview and the group survey were carried out independent of each other in terms of time and space. Nonetheless, we could not control interactions outside the study, i.e., the participants could have known about the contents beforehand.

Low statistical power: Because of the low number of participants, the results have low statistical power. Nevertheless, the results are considered very relevant by the domain experts.

5 Conclusions

Overall, this evaluation of the SmartOffice prototype has shown that it has the potential to be used in practice. In particular, the positive attitude of the employees towards the whole system and the problem solving functionality shows the potential of embedding process knowledge into daily work, of process orientation, and of assistance through proactive information delivery. Furthermore, the underlying semantic domain models allow transferring SmartOffice to other business processes.

The results also show that, by embedding process knowledge into daily tasks, it is possible to control, monitor, and analyze the process at no extra cost. The participants accept this solution and would use it in their daily work; they are convinced that they would get a gain in efficiency by using the solution for their daily work. Therefore, the data required for process analysis would be available without significant additional effort. With this solution, data for process controlling and monitoring could be accessible. With the current practice, such data is stored in multiple places and is not available in real time.

6 Acknowledgments

The work presented in this paper was funded by the German Federal Ministry of Education and Research (BMBF). It was performed in the context of the projects SWINNG, grant no. 01IC10S05, and ADiWa, grant no. 01IA08006. We acknowledge Liliana Guzmán for reviewing the questionnaires.

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Document Information

Title: Seamless Integration of
Order Processing in
MS Outlook using
SmartOffice: an Empirical
Evaluation

Date: October 2012
Report: IESE-087.12/E
Status: Final
Distribution: Public Unlimited

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