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Egon Lüftenegger, Selver Softic

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Crowdsourced Sentiment-driven Process Re-design with SentiProMoWeb: Towards Enterprise Social Information Systems

Egon Lüftenegger¹ [0000-0003-0998-58144] and Selver
Softic²[0000-0003-2949-8239]

¹ Salzburg University of Applied Sciences, Austria
egon.lueftenegger@fh-salzburg.ac.at

² CAMPUS 02 University of Applied Sciences, Austria
selver.softic@campus02.at

Abstract. Due to the new remote working conditions driven by the consequences of the Covid-19 pandemic, we extend our previous work on sentiment-enabled business process modeling by including crowdsourcing capabilities with a web interface: SentiProMoWeb. These capabilities enable us to perform sentiment-driven business process re-design method with remote stakeholders from different locations. SentiProMoWeb implements an enterprise social information system to capture the feedback from stakeholders in a crowdsourced manner. We demonstrate the crowdsourcing capabilities of our approach with an illustrative scenario by using our SentiProMoWeb software.

Keywords: Social Information Systems, Business Process Re-design, Crowdsourcing

1 Introduction

Social information systems (IS) are different from traditional business information systems. Social IS shifts the core system function from work support to online social interaction (e.g., the system allows commenting and similar feedback mechanisms) or open collaboration (i.e., the number of contributors or participants in the system is not predefined). Hence, we can reach a significant amount of feedback and comments from social interactions into a Social IS.

Firms increasingly use open and social processes for their value-creation activities and communication between users (consumers) and employees. One key area of social information systems research focuses on using Social IS within the firm. Industry often labels these supporting social technologies as social enterprise software or enterprise

2.0. Firms embracing social technologies for internal use are constantly increasing. Due to the social distancing measures triggered by the Covid-19 pandemic, social interaction through technology has become key in performing daily work within companies. Social software such as Slack and Microsoft teams are driving social interactions in companies. In today's working environment, driven by the increase of remote working at home, the adoption of such social applications is expanding from start-ups worldwide to traditional companies such as airlines [1].

One area that combines social IS with business process management is social BPM, which combines social IS concepts with BPM. Embracing and modifying business processes is crucial for companies to cope with growing competition and customer expectations in a digital-driven business landscape [2]. Many methods and techniques support the systematic redesign of processes defined as a logical sequence of steps [3]. However, it often happens in a black box because creating to-be process designs primarily results from a creative process [4]. In particular, the discussion on business process redesign has shifted from physical to remote work. Hence, we need methods and tools for performing business process redesign initiatives in the home office. This paper presents a software-supported method to assist business process analysts in performing business process redesign initiatives. In this research paper, we extend the current capabilities of our sentiment-enabled business process modeling (SentiProMo) software to capture the voice of users regarding a business process task following social information systems aspects: SentiProMoWeb.

The structure of this paper is as follows: First, in Section 2, we present the result of following the aspects of social information systems in our sentiment-driven business process modeling approach. Next, Section 3 presents our crowdsourced sentiment-driven business process re-redesign method with a running example within SentiProMoWeb. Finally, we end this paper with discussions and the next steps.

2 Social Information System and Crowdsourced Business Process Re-design

Due to social distancing, we encounter home-working issues during our preliminary tests with Senti-ProMo as a desktop software tool with an airline company. As a requirement, we need to obtain the crowdsourced customer feedback in a contactless manner for redesigning customer-focused airline processes. Furthermore, social BPM scholars identify the enhancement of business processes with annotations from different sources as a relevant problem to solve [5]. By following design science research [10], we formulate the following research question: How to conduct sentiment-driven business process redesign in home-office during the Covid-19 pandemic with social information systems? In our previous work, we presented SentiProMo as a tool for business process redesign to assist business process analysts. Senti-ProMo uses the stakeholders' comments on a business process task to guide the analyst in the business process redesign with positive and negative aspects. A business analyst can use the negative aspects to improve a business process. However, due to the limitations driven by working at home, we need to adopt the guidelines of a social information system for

capturing stakeholders' feedback through crowdsourcing [6]. In this work, we aim to solve our research question by adopting the unique features of social information systems such as sociality, openness, contributions, content, technology, and location [7]. We explain each term briefly and how we apply it to our approach as follows:

Sociality. The sociality aspect of Social IS focuses on information exchange rather than solely on information processing. The system is open to a broad range of participants/contributors: The crowd. Usually, the decision to participate is voluntary. This aspect of traditional IS represents a shift from solely focusing on information processing to communication and information exchange. Hence, we embrace this aspect as an easy mechanism to capture stakeholders' opinions.

Openness. This aspect of Social IS focuses on including many users that can contribute voluntarily. Enterprise social information systems limit their access to the firm's stakeholders rather than publicly open to anyone. However, it should be open enough to let different stakeholders participate inclusively and voluntarily. Concerning traditional IS, this aspect represents a shift from limited and mandatory use toward an inclusive and voluntary contribution. In our approach, we implement this feature with a web commenting user interface that is available to all users related to the business processes. We enabled the access as a web link generated by the business analyst. The business analyst could share this link within social enterprise tools such as Slack and Microsoft Teams (See Fig.1).

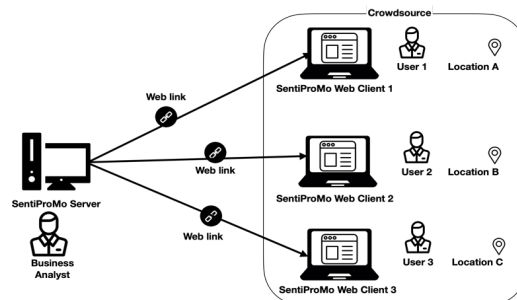


Fig. 1. In SeniProMo, the business analyst can reach users' opinions from different location with a web link that opens a web form for inserting comments regarding a business process.

Contributions. This aspect calls for various forms of user co-creation to emerge on the Internet, effectively constituting a new production method. In our approach, the users make comments as a Crowd-sourcing mechanism for gathering comments (See Fig. 2).

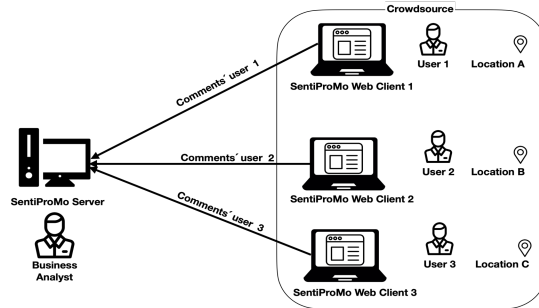


Fig. 2. In our approach, the users contribute with comments as content.

Content. The content aspect aims to facilitate user-created content as a co-production mechanism with the contributors. Concerning traditional IS, this aspect represents a shift from professionally created content to user-generated content. In our approach, we transform the user-generated opinions into a positive and negative sentiment that guides the business analyst into the business process re-design. The content as options is crowdsourced and then transformed into positive and negative feedback with our tool.

Technology. Social computing tools are the technology core of social information systems. The technology aspect aims to include social technologies such as wikis, social networking sites, collaboration platforms, blogs, and similar social (media) tools. Concerning traditional IS, this aspect represents a shift from complex software to lightweight tools [8]. Our focus relies on enabling crowdsourcing capabilities for conducting remote business process re-design sessions asynchronous rather than physical and synchronic. These capabilities enable the business analyst to perform process re-design initiatives in remote locations with different time zones. We extend our previous SentiProMo architecture [6] into a client-server architecture by adding a Web layer that consumes SentiProMo's modules, such as sentiment analysis as web services.

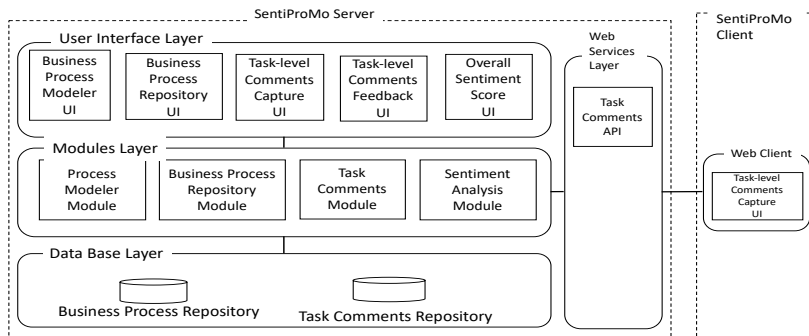


Fig. 3. SentiProMo server-client architecture for crowdsourced sentiment-analysis driven process redesign.

In Figure 3, we present the architecture of SentiPromo as an enterprise social IS. As the first step, we modified SentiProMo's architecture into a client and server by adding a Web services layer that acts as a bridge between the modules and software clients.

This software extends our previous work by bringing a service interface for connecting to remote applications such as web applications. In this way, we are extending sentiment-analysis-driven process redesign from an isolated software tool and a method to a crowdsourcing tool that enables to co-creation of process improvement among different stakeholders.

Location. Usually, social information systems are online Web-based systems hosted as a server with Web browser access. Concerning traditional IS, this aspect represents a shift from offline and local IS towards online and networked IS [8]. In our approach, we reach stakeholders not present in a single physical space by using a server with Web browser access to crowdsourcing users to capture their feedback on the business process.

3 Using Crowdsourced Business Process Re-design with SentiProMo: Use Case and Method

An airline company wanted to test its check-in process's workflow, as presented in Figure 4. Due to the home-office constraints, the company shifted its workforce from the physical workplace to the home office. Moreover, getting feedback face-to-face from customers during the Covid-19 pandemic presents a risk. Resulting in a change to test remote crowdsourced feedback with our sentiment-driven business process re-design approach. We present the steps of the crowdsourced sentiment-driven process re-design method with our web-enabled SentiProMo software by using the check-in process running example as follows:

1. First, the business analyst designs the as-is process within SentiProMoWeb to be re-designed. For instance, in Figure 5, we present the check-in process from our case study.

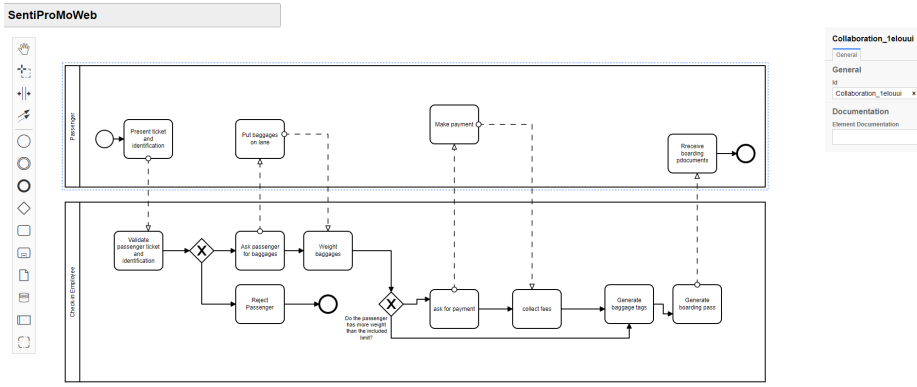


Fig. 4. Check-in process at the airport with the airline employee

2. The business analyst selects the process to be redesigned and submits web links to the involved stakeholders for crowdsourcing of comments.
3. The stakeholders comment on the business process tasks within the business process with SentiPromoWeb. In this way, we can share the link with many customers to capture feedback for business process re-design. The resulting web interface captures comments at the task level for a defined swim lane (See Fig. 2.)

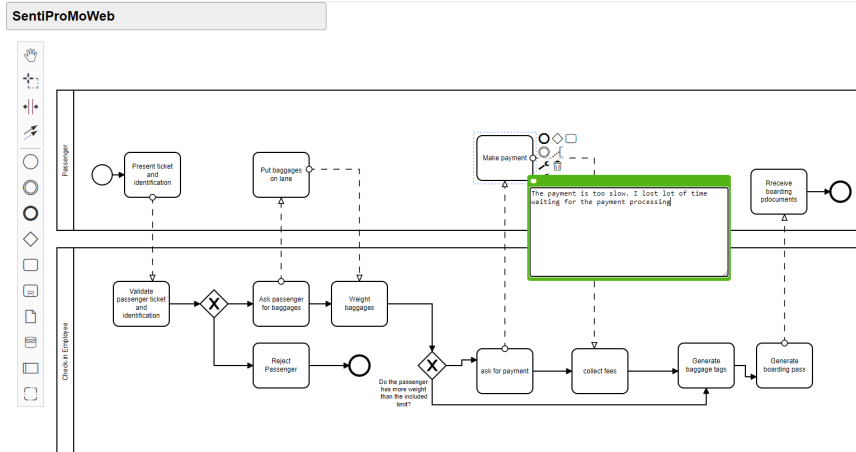


Fig. 5. SentiPromoWeb offers access to business process stakeholders to capture their comments on the business process tasks

4. SentiPromoWeb performs comment analysis to calculate the sentiment of each comment (For more profound information on how we implemented and applied the sentiment analysis module, please refer to our previous research work [9], [11], [12]). As shown in Fig. 2, a customer introduced the comment “the payment is too slow. I

lost lot of time waiting for the payment processing” into SentiProMoWeb. As shown in Fig.3, this comment on the is identified as a negative one by the server-side of SentiProMoWeb with a sentiment score of -5,439894.

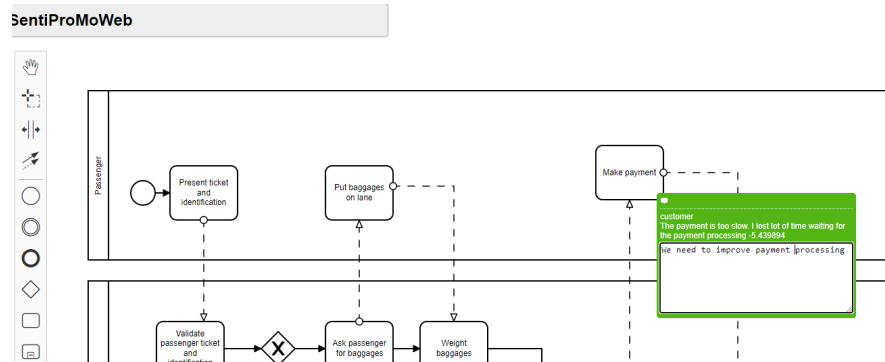


Fig. 6. SentiProMo sentiment-analysis feedback

5. The business analyst performs business process re-design with the crowd's voice as negative or positive aspects of each task. In our case study, reducing the time in payment processing is one aspect to improve.
6. If needed, repeat the process until the business analyst is satisfied with the level of acceptance of the business process with the stakeholders. In our case study, this business process is continuously improving until we reduce the negative sentiments from the business process. Hence, we can constantly improve the business process by monitoring the negative sentiments.

4 Discussion and Next Steps

Our research paper contributes to the advancement of social information systems by presenting a software-supported method for crowdsourced business process re-design with SentiProMoWeb. We developed this approach by following design science research for implementing critical aspects of social information systems regarding sociality, openness, contributions, content, and technology into SentiProMoWeb. The result is a server-client implementation that uses a lightweight Web user interface to reach the crowd's opinion. Our software tool processes the comments into negative and positive ones. In this way, we can assist the business analyst in re-designing the business process's negative aspects by reaching stakeholders in different places and time zones. This time difference is especially important in our case study with the airline company's customers in different countries and regions.

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