Towards an AI-Agent-based Framework for Agile Business Process Management

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Abstract. The traditional approaches in dynamic and collaborative environments that use Business Process Management (BPM) methodologies usually lack the ability to adapt to real-time changes in case of heavy human involvement in repetitive processes. The agility of social BPM is, however, still limited because of a lack of context-sensitive tool support. This paper proposes a mapping framework that leverages conversational AI agents on a social media platform to enhance BPM agility. AI-driven conversational agents are mapped to the respective phases of the BPM lifecycle to provide real-time guidance, recommendations, and context-sensitive feedback. The agents' collaborative features enable inclusive co-construction, interactive task execution, and continuous monitoring of the processes. That allows dynamic adaptation of the processes in case of changes so that tasks remain aligned with the users' needs and contextual demands. This framework is developed through an exploratory approach that integrates literature review, deductive design, and use case-based evaluation. This framework could bridge gaps in the current BPM practices by integrating BPM, AI, and social media, thereby offering a new model for agile and collaborative business process management.

Keywords: Business Process Management · Agility · Conversational Agents · LLM · Social media.

1 Introduction

Before the formalization of Business Process Management (BPM), organizations operated without proper processes or structured workflows. As businesses became increasingly complex, leaders saw the need to review former organizations

in order to gain better control over different operations. This led to the introduction of pre-established processes: business processes (BPs). They designate a series of interdependent actions or procedures carried out coherently to achieve a specific objective [12].

However, traditional BPM is often notorious for its inability to handle changing environments requiring flexible, evolving real-time processes [4]. In a Volatile, Uncertain, Complex, and Ambiguous (VUCA) world, businesses are all too prone to rapid, unpredictable change, requiring flexibility and context awareness. Our research addresses this issue by proposing a framework that relies on generative AI, here, conversational agents (CAs), that will evolve in a social media environment to enable genuine agile BPM. The latter can provide real-time support for the process and feedback to adapt the process to real-time constraints.

The aim of this research is to support process agility, where processes can adapt in real-time to real-world situations, with a convergence of design-time and run-time of BPs. From the perspective of this paper, our research question is: **How can BPM be more flexible and context-aware to bring the required adaptation and real-time support to an organization's BPs?** Based on this, the present paper develops a theory underpinning BPM from social media platforms. The work will be presented as follows: we will start with a background check on BPM, agility, and CAs in Section 2. Next, we will present the framework in Section 3 and show its feasibility in an illustrative use case in Section 4. Finally, we will conclude (Section 5) by highlighting the different challenges and benefits presented by BPM combined with CAs.

2   Background and related work

BPM initially focused on the detailed design of processes, which were then executed in a linear, predefined way with standardized tasks. The BPM lifecycle can generally be broken down into two main phases. First, we have the "**design time**," which is the phase when the process is identified, defined, and ratified. Then there's the "**run time**" when the process is actually executed.

2.1   Agile and social BPM

Agile BPM has emerged as a response to the limitations of traditional BPM, emphasizing iterative, user-centric approaches that allow processes to evolve in line with changing needs. Agility, in the context of BPM, is about observing the need for change, choosing an effective response, and implementing that response efficiently [11]. To this end, a framework for integrating and improving agility in BPM has been defined [8]. Using this framework could bring greater responsiveness to change, making processes more responsive, adaptable, and efficient, while supporting better decision-making. However, although agile BPM offers greater adaptability, it often lacks real-time assistance tools that help users react proactively during the process.

Our framework envisages Social BPM as a means of overcoming the shortcomings identified above. Social BPM is an approach that integrates social media technologies into BPM practices to improve communication, transparency, and stakeholder involvement [10]. Unlike traditional BPM, which focuses on automation and technical efficiency, Social BPM integrates users' ideas, feedback, and contributions in real-time. It avoids response delays and back-and-forth exchanges when several parties are involved. Stakeholders become active players in the design, execution, and improvement of processes.

2.2   LLMs and Conversational Agents

Today, one of the most significant technological advances in AI is the introduction of Large Language Models (LLMs): "These transformative models, using statistical methods like n-gram models, can predict the likelihood of word sequences and create novel text based on given prompts." [1, p. 5050]. Furthermore, an innovative approach is Retrieval-Augmented Generation (RAG), which is a combination of information retrieval from a database or external system, and text generation. RAGs improve the accuracy of LLMs by using only concrete retrieved information, reducing hallucinations. They are useful for question-answer systems, document retrieval, and chatbots [7].

CAs or chatbots are the interfaces through which these LLMs are presented to interact with users. They can act as collaborators, support decision-making, and automate routine tasks [2]. One of the main assets of CAs is their ability to adapt to user needs. Being highly context-aware and able to learn from previous interactions, these agents can understand users' preferences, adapt their responses accordingly, and provide relevant information at the right time.

In BPM, generative AI is already being explored for its ability to help with specific tasks, such as data mining for process models from text [3]. Also, a proposal of "Large Process Models" has been made recently by Kampik et al. [5], which would be a system integrating BPM knowledge to generate recommendations for the execution of a BP.

3   Framework concept

Social media are now part of our professional lives with Teams, Slack, or Discord. Its features, such as comments, group discussions, or notifications, encourage engagement. Social media could offer those involved in a BP (distinguished by its significant repeatability and human involvement) the possibility of communicating via this platform to co-construct the process from A to Z but also to put it into execution at the same time.

What if CAs were integrated into a BPM-style social media platform with co-constructed processes, acting as participants? It would enhance the agility of BPM by automating repetitive tasks. What's more, unlike static BPM systems, CAs could leverage NLP capabilities to interact with users in a natural,
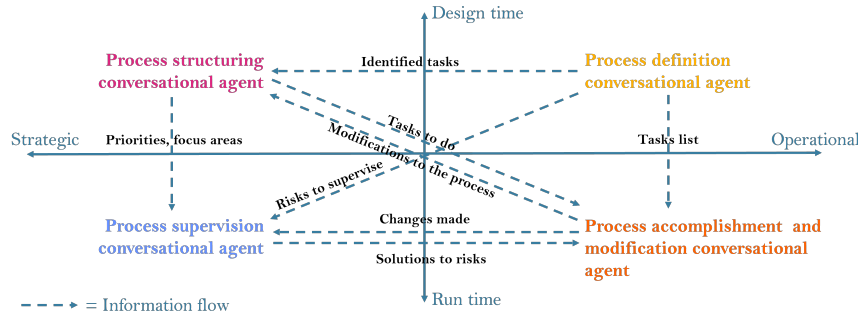
Different types of conversational agents characterization

Fig. 1. Characterization of the different CAs planned for the BPM platform [9].

conversational way, thereby improving communication and understanding between stakeholders, and encouraging greater stakeholder participation. In addition, these agents, which can analyze process data and user interactions, would be able to make informed recommendations, automate routine tasks, and anticipate potential risks, thereby improving efficiency. In the context of BPM, this could be extremely valuable not only to help teams stay agile but also to enable data-driven decision-making. Instead of relying on assumptions, teams could base their adjustments on clear information, improving effectiveness and efficiency throughout the entire BPM lifecycle.

To accomplish this best suited to the concrete needs of stakeholders, it is necessary to define CAs that would be responsible for overseeing the design and execution of the BP, assessing its goals and expectations, and offering suggestions in the form of feedback and suggestions for tasks.

3.1   Framework design and key components

We define our framework aimed to enable these features along two dimensions, as shown in Fig. 1. The first dimension is the phase of the BPM lifecycle. The second dimension is the strategic BPM / operational BPM. Strategic BPM concerns contextual elements such as strategic alignment and governance, without a technical foundation. Operational BPM, on the other hand, involves activities related to specific processes, with business knowledge of the process, and often with a view to their continuous improvement [6]. To achieve agility, it is important to combine these two complementary levels: strategic BPM lays the foundations and defines orientations, while operational BPM executes and improves processes. The proposed framework involves four main types of CAs (summarized in Table 1), each playing a specific role across different BPM stages and introduced in the following.

The Fig. 1, resumed in Table 1, is intended to be explanatory, but does not show a notion of temporality. Indeed, these CAs will not evolve sequentially but will communicate with each other at the same time according to a choreography.

The result is an AI ecosystem supported by social media, where users and CAs interact with a whole chain of interventions.

Design time During the BP design phase, the first CA to intervene is a **process definition agent** (yellow in Fig. 1). It all starts when a user posts an activity that corresponds to a BP. In this post, they give a very precise description of their objective and identify the first users concerned. Our process definition CA will intervene at this point in the first instance, to identify and present the tasks required to execute the process. With subsequent comments from others involved, it continues its role of listing tasks until the users have a clear and detailed list of tasks with the users who are to carry them out. This implies a certain familiarity with the domain side of the BP. On the other hand, this agent plays a crucial role in risk prevention and management. It provides a combination of responses like "if this happens, then do that" scenarios. These combinations are known in advance, on the basis of tasks carried out in previous related processes, or on the basis of the CA knowledge.

As soon as the latter provides the to-do list of identified tasks, another CA comes into play during project planning. This is a **process structuring agent** (pink in Fig. 1), whose main task is to help define sub-tasks, set priorities, and manage dependencies between tasks. As some process tasks are wide-ranging, they need to be segmented to make them easier to understand. The agent also rearranges tasks to maximize efficiency and workflow. It achieves this with knowledge of BPs, risk management, and planning skills, but no business knowledge of the process.

Run time When entering the execution phase of the BP, a **process supervision CA** (blue in Fig. 1) is responsible for overseeing the process execution. This CA is designed to monitor task progress in real-time, enabling users to concentrate on their tasks without having to think about deadlines. It will track these deadlines and notify users of any delays. This CA is able to identify anomalies, such as delays, unexpected results, missed milestones, or priorities left behind, and propose solutions on a case-by-case basis for smooth, efficient resolutions. However, it does not carry out the deduced solutions.

The process supervision CA passes on these solutions to users and to the **process accomplishment and modification CA** (orange in Fig. 1) which will assist throughout the execution of the BP. It explains each step of an activity, answers questions, and proposes real-time modifications to tasks according to the user's needs. This requires in-depth knowledge of the tools and mechanisms needed to execute the task, and the ability to make the process adjustments that are necessary.

4   Illustrative scenario

To demonstrate feasibility, we use a fictional illustrative scenario. In other words, we don't carry out a real call for tenders, from start to finish, but we make a sto-

Table 1. Roles and Characteristics of Conversational Agents in Business Processes.

Conversational Agent	Role	Process Lifecycle step
Process definition CA	• Enumerates and presents the tasks required • Gathers inputs to create a structured tasks list • Identifies, assigns, and sequences tasks • Prevents risks & identifies corrective methods	Design time; During task identification
Process structuring CA	• Organizes and structures tasks • Assists in defining subtasks, setting priorities • Optimizes the arrangement of tasks	Design time; After task listing
Process supervision CA	• Monitors the progress of tasks and BPs • Identifies potential bottlenecks and solutions • Tracks deadlines and schedules	Run time; During task execution
Process accomplishment and modification CA	• Assists with the completion of specific tasks • Provides detailed instructions and answers • Facilitates real-time adjustments of tasks • Takes proactive action for risks and priorities	Run time; During modifications

ryboard of what we want from our agents. It relies on public documents such as public procurement regulations (available online to the public) and private documents issued by a public organization (RAG performance). What justifies the use of these agents is the complexity of public procedures, with strict regulatory requirements and a big need for efficient task execution.

There are three project participants (Employee1-3) who belong to the same public organization, and the CA named Virtual Assistant. It is a multi-faceted entity assuring both roles such as definition and structuring process.@Employee1 needs to buy a server to run some code. To do so, she has to issue a call for tender which leads to a BP.

She will start by logging into her account on the social media platform, and she will create a dedicated channel named after the objective (buying a server, here). She will then post, stating her needs as follows.

```
Employee1: Good morning. I hope you're all right. For our lab project, I have code to run.
I would like to buy a server to run it. I've looked at https://www.lci-albi.biz/,
and the server's budget is 20k€. @employee2 @employee3 @virtual_assistant Could
you advise us of the detailed procedure to follow and distribute the tasks among us?
```

Virtual_assistant steps in rapidly to suggest the right way to achieve employee1's request by gathering Employee1's input and converting the needs into a task list. It makes sure that her needs align with local legal requirements and identifies key tasks such as defining specifications. We can see here that it acts as the process definition and structuring CA.

```
Hello !
From the sources provided, the process of call for tender for a server for public projects
would generally follow the following steps:
1. Defining the need : Define your server requirements (size, specifications, etc.)
and identify the resources needed for your project.
2. Search for tenders: Look for server tenders from various suppliers, especially those
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who have already worked on projects similar to yours.
3. Evaluate bids: Evaluate each option in terms of your needs and priorities.
4. Rendering of work: Rendering of work to validate the server specifications and
conditions of agreement.
As far as regulatory provisions are concerned, it's important to note that the process
of finding a server must comply with current rules and regulations. This may include
considerations such as confidentiality, security and ethics.
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To refine the list, we ask the *@virtual_assistant* to split the tasks between @employee1, who is a research engineer, @employee2, who is in charge of the finance department, and @employee3, who will be the main user of the server.

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Here is a proposed work plan to divide the tasks between the three employees:
- Task 1: Defining the need : @employee1 (research engineer)
- Task 2: Search for tenders : @employee1 (research engineer):
- Task 3 and task 4: Evaluate bids and render work, and validation of specifications :
@employee3 (main server user)
- Coordinate work between the three employees : @employee1 (research engineer)
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This agent would continue to work with the users and provide effective support by offering services to identify tasks, ensure compliance with public regulations regarding the budget, and align employee needs with legal and procedural requirements. In addition, for the process structuring service part, it could help organize the sequence of tasks at a basic level. Throughout the process, the process supervision CA would monitor deadlines, adherence to priorities, and performance. It would send alerts for upcoming milestones, such as the tender publication deadline and the proposal evaluation schedule. The process accomplishment and modification CA would provide real-time assistance, helping the employees adjust specifications if suppliers request clarification.

5 Conclusion

This paper proposes a conceptual framework for integrating CAs into a social media-based BPM platform, aiming to improve process agility, collaboration, and real-time adaptability. The framework leverages intuitive interactions to address long-standing BPM challenges. In our paper, we proposed a framework that shows the mapping of CAs to BPM steps that enables agility in the design time and run time of business processes. We have demonstrated the practical application of the framework in an illustrative scenario that shows the potential impact of CAs in real-world, agile BPM scenarios.

Integrating CAs into BPM has implications that go beyond improving individual processes. Indeed, the combination of generative AI, social media platforms, and agile methodologies would represent a paradigm shift towards more dynamic, user-centric BPM systems. Enhanced collaboration tools facilitated by CAs would help bridge the gaps between departments, fostering a more cohesive organizational culture. This research also paves the way for exploring other AI-based technologies, such as predictive analytics in BPM contexts.

The proposed framework lays the foundations for further research and development. Future work should implement the agents, either opting for one CA per role or a CA performing part of or all the identified roles. The framework should

also be tested in complex processes to validate its scalability and robustness. We would also like to assess the level of prior knowledge required from agents for qualitative responses by playing with different given prompts.

References

1. Bharathi Mohan, G., Prasanna Kumar, R., Vishal Krishh, P., Keerthinathan, A., Lavanya, G., Meghana, M.K.U., Sulthana, S., Doss, S.: An analysis of large language models: their impact and potential applications. Knowledge and Information Systems pp. 1–24 (2024)
2. Casheekar, A., Lahiri, A., Rath, K., Prabhakar, K.S., Srinivasan, K.: A contemporary review on chatbots, ai-powered virtual conversational agents, chatgpt: Applications, open challenges and future research directions. Computer Science Review **52**, 100632 (2024). https://doi.org/10.1016/j.cosrev.2024.100632
3. Grohs, M., Abb, L., Elsayed, N., Rehse, J.R.: Large language models can accomplish business process management tasks. In: De Weerdt, J., Pufahl, L. (eds.) Business Process Management Workshops. pp. 453–465. Springer (2024)
4. Imgrund, F., Janiesch, C.: Understanding the Need for New Perspectives on BPM in the Digital Age: An Empirical Analysis. In: Business Process Management Workshops. pp. 288–300. Springer International Publishing, Cham (2019). https://doi.org/10.1007/978-3-030-37453-2_24
5. Kampik, T., Warmuth, C., Rebmann, A., Agam, R., Egger, L.N., Gerber, A., Hoffart, J., Kolk, J., Herzig, P., Decker, G., et al.: Large process models: A vision for business process management in the age of generative ai. KI-Künstliche Intelligenz pp. 1–15 (2024)
6. Kourani, H., Berti, A., Schuster, D., Van der Aalst, W.M.: Evaluating large language models on business process modeling: Framework, benchmark, and self-improvement analysis (2024). https://doi.org/10.13140/RG.2.2.11821.70880
7. Liu, J., Lin, J., Liu, Y.: How much can rag help the reasoning of llm? (2024), https://arxiv.org/abs/2410.02338
8. Majidian-Eidgahi, M., Barthe-Delanoë, A.M., Bork, D., Namaki-Araghi, S., Macé-Ramète, G., Bénaben, F.: Integrating social media and business process management: Exploring the role of AI agents and the benefits for agility. In: Business Process Management Workshops - BPM 2023. pp. 205–216. Springer (2023). https://doi.org/10.1007/978-3-031-50974-2_16
9. Sarr, L.A., Ayite, P.K., Barthe-Delanoë, A.M., Bork, D., Macé-Ramète, G., Bénaben, F.: Towards the integration of conversational agents through a social media platform to enhance the agility of BPM. In: 25th IFIP WG 5.5 Working Conference on Virtual Enterprises, PRO-VE 2024. pp. 36–48. Springer (2024). https://doi.org/10.1007/978-3-031-71739-0_3
10. Schmidt, R., Zimmermann, A., Möhring, M., Jugel, D., Bär, F., Schweda, C.M.: Social-software-based support for enterprise architecture management processes. In: BPM 2014 International Workshops. pp. 452–462. Springer (2015)
11. Triaa, W., Gzara, L., Verjus, H.: Organizational agility key factors for dynamic business process management. In: 18th IEEE Conference on Business Informatics, CBI 2016,. pp. 64–73. IEEE (2016). https://doi.org/10.1109/CBI.2016.16
12. Zairi, M.: Business process management: a boundaryless approach to modern competitiveness. Business process management journal **3**(1), 64–80 (1997)