

Towards Social Robotic Process Automation

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Abstract. *Robotic process automation* (RPA) is an industry trend that describes the automation of business processes (or parts thereof) with the help of intelligent or pseudo-intelligent agents. In contrast to traditional business process automation, which aims for a seamless integration of traditional enterprise resource planning (ERP) systems, RPA agents interact with these systems in a somewhat human-like manner through graphical user interfaces (GUIs) and hence work around potentially lacking data interoperability support. In this paper, we highlight the challenges this data entry-oriented approach to agents for process automation brings. To solve these challenges, we propose that *social* RPA agents should be developed that emulate humans not only in their data entry capabilities, but also in their social proficiency.

Keywords: Business Process Management · Agents · Automation.

1 The State of RPA

Robotic process automation (RPA) is a recent industry trend that describes the automatic execution of business process tasks by somewhat “intelligent” agents. An overview of RPA research challenges by van der Aalst *et al.* [1] describes RPA as “an umbrella term for tools that operate on the user interface of other computer systems in the way a human would do”. Moreover, van der Aalst *et al.* highlight that current state RPA typically focuses on solving simple data entry/interoperability tasks and introduce the open research challenge of enabling “RPA agents and people [to] seamlessly work together” [1]. Indeed, a case study on RPA presented by Lacity *et al.* [7] shows that—at least in some high-profile scenarios—RPA is little more than traditional systems integration with a slightly different type of middleware. The pseudo-architecture diagram in Figure 2 depicts the currently prevalent RPA approach. As can be seen, RPA agents serve as isolated interfaces between the GUIs of enterprise systems and merely handle simple data extraction and data input tasks. The primitive nature of the current state of RPA is reflected by the fact that in practice, RPA is associated with “duct tape”³ and “pot hole fixing”⁴ metaphors; industry experts question the

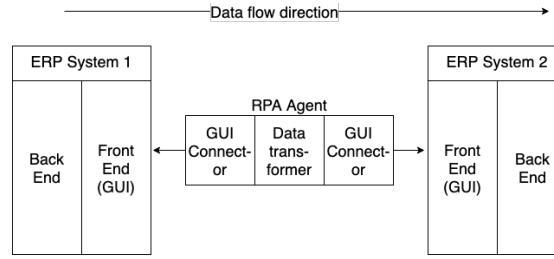


Fig. 1. Schematic architecture of standard RPA application scenario.

sustainability of RPA as a strategic approach. From the description of the state of the art of RPA, it is clear that currently, RPA comes short of its promise to effectively and efficiently induce artificial intelligence into enterprise software:

1. The *web scraping* approach of RPA facilitates computational inefficiency and creates instability and technical debt because software vendors typically do not provide stability guarantees in regards to the machine readability of their GUIs.
2. RPA agents are tied to a selected few, specific (GUI) interfaces, have a low level of autonomy, and do not interact with humans or other artificial agents. In particular, RPA agents are merely automating single *tasks*, typically lack the context of the whole process, and do not have an understanding of the *process goal*.
3. RPA lacks social capabilities that are typically associated with human-level (artificial) intelligence.

2 Social RPA: High-level Architecture and Use Cases

To address the limitations of current solutions (let us refer to them as *traditional RPA*), we propose a novel *social RPA* architecture, which distinguishes itself from the traditional approach in that its RPA agents have a greater degree of autonomy and social capability, in particular through the following features:

- The RPA agents interact with a multitude of enterprise systems, directly on API level, by automatically reverse-engineering the corresponding communication protocols.
- The RPA agents have read/write access to a database that contains social knowledge about organizational stakeholders (like customers and employees), which helps inform socially intelligent decision-making.
- The RPA agents are connected to a central hub that allows for human-agent interaction. In the long run, this hub could be replaced by a decentralized human-agent interaction approach; *e.g.*, each human employee could have their own virtual *liaison officer* and organizational hierarchies could be a seamlessly integrated mix of humans and agents.

³ <https://www.linkedin.com/pulse/rpa-software-really-just-duct-tape-henrik-nyberg/>

⁴ <https://www.signavio.com/post/robotic-process-automation-potholes/>

Figure 2 depicts a possible future *social* RPA architecture. The architecture

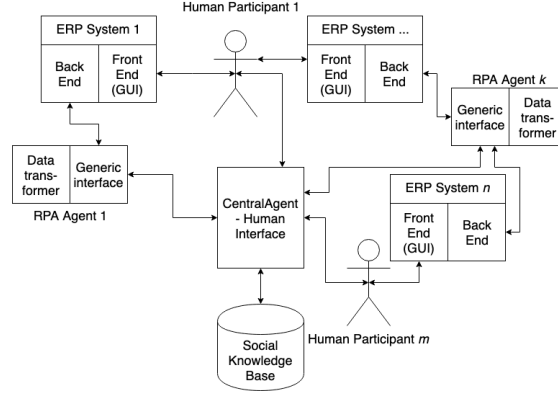


Fig. 2. Schematic architecture of potential future RPA application scenario (many-to-many relationships between (agent, humans), (agents, ERP systems), and (ERP systems, humans)).

integrates RPA with concepts from well-established socio-technical research contributions within socially intelligent agents [2] and social business process simulation [4] and can apply algorithms and low-level architectures from both *good old fashioned AI* (knowledge representation, reasoning) and (deep) machine learning. The proposed social RPA architecture could be employed in the following business scenario types, for example:

1. **Social RPA agents to protect the productivity of high-impact humans.**

While traditional RPA agents can automate low-skilled jobs at scale, they typically do little to increase the productivity of an organization's most valuable human workers: managers and highly specialized individual contributors. Socially intelligent RPA agents could change this by shielding such people from unnecessary socio-organizational work, for example by auto-replying to messages and auto-scheduling appointments (rejecting requests and forwarding messages to the correct individual is a significant, yet much-despised part of the work of most high-impact individuals)⁵.

2. **Social RPA agents as *maverick buyers*.**

Humans frequently work around business processes, for example to allow for faster or subjectively more favorable purchases—so-called *maverick buying*. While maverick buying is considered a business anti-pattern [6], it can be assumed that in some cases, the ability to work around a statically defined process flow to avoid socio-organizational gridlock can be useful, as

⁵ In a similar role as personal assistants, but at large scale (every employee would get one, not just privileged senior managers), with greater effect (lower management overhead), and at lower costs.

also discussed in [5]. We argue that the willingness of artificial agents to be occasionally non-conformist is a crucial ingredient for future business innovation.

3. Social RPA agents as hyper-performant sales lead generation agents.

Many organizations rely on humans as a first stage for generating sales *leads* (potential buyers). While parts of the sales pipeline of many organizations are already now executed by machines, more sophisticated tasks could be automated if the corresponding automation tools would—instead of only using simple automation scripts—rely on hybrid rule-based/learning agents to autonomously adjust and evolve their social interaction behavior (*i.e.*, their messages).

3 Research Challenges

While the design and development of socially intelligent agents is a well-established research domain (see, *e.g.*, Dautenhan *et al.* [3]), such research is typically not aimed at automating business processes on an industrial scale. In particular, the following challenges need to be addressed to progress towards social RPA:

1. Provide a structured representation of social knowledge for RPA agents to consume.
2. Endow RPA agents with social decision-making abilities.
3. Enable RPA agents to interact with a multitude of IT systems, as well as with human actors.

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