Celonis Studio – A Low-Code Development Platform for Citizen Developers

Carolin Ullrich *1*, Teodora Lata*1* and Jerome Geyer-Klingeberg*1*

1 Celonis SE, Munich, Germany

Abstract

Low-code development platforms (LCDPs) are attracting considerable interest because they promise shorter development cycles, the inclusion of business knowledge in the development process, and closing of talent gap in software development by citizen developers. With an ever-growing pressure on companies to accelerate their digital transformation, the next decade is likely to witness a considerable rise in LCDPs for business applications. Especially in process mining, close alignment between development and domain expertise is critical for success. The aim of this demo paper is to introduce the Celonis Studio, a recently launched LCDP that enables citizen developers to build, deploy, and maintain analytical and operational process mining applications in one centralized space. In addition to the Studio, we also share best practices that have been identified through the launch of Celonis Studio for empowering citizen developers.

Keywords

Process Mining, Low-Code Development Platforms, Citizen Developer

1. Introduction

LCDPs enable the creation of applications with minimal code writing, while reducing the development time [1] and empowering users with non-technical backgrounds to be involved in the development process [2]. These users are referred to as citizen developers, as they have little or no experience with code [3]. The Celonis Studio is an LCDP that allows citizen developers to build, deploy, and maintain analytical and operational process mining applications in one centralized space.

Process mining makes use of event logs gathered from information systems to gain insights into business processes, their performance, and opportunities for improvement [4]. In recent years, machine learning-powered recommendations for operational users as well as task automations through various real-time source system integrations have been added to the scope of process mining solutions [5, 6]. With these advancements, the scope of process mining has expanded to include analytical and operational applications [7]. As complexity increases, a seamless and user-centered development experience for process mining applications becomes a crucial success factor.

The importance of an LCDP for process mining arises from its end-to-end involvement of business users and domain experts throughout the development of applications. The need for better alignment between IT and business in the area of Business Process Management can be addressed through low-code development, which leads to shortened development cycles and thus to a faster time-to-value while improving end-user experience [8].

A recent case study with IBM illustrates the need of business expert involvement when putting process mining in practice [9]. [10] report results for the compliance field, where a detachment between domain experts and technical implementers led to incorrect specifications. Empowering citizen developers to take ownership of process mining application development and customization not only

improves data accuracy, but also contributes to the development of 'responsible process mining' [11]. By opening the development of process mining applications to a broader range of people, a higher level of transparency and thus more trust in process mining results can be achieved. A more diverse creator pool could have a positive impact on the existing risk of drawing biased conclusions from process mining results [11]. In a similar vein, involving operational end users in the development process could also improve the usability and understandability of process mining applications, which were identified as two of eleven process mining challenges [4]. Thus, LCDPs for process mining applications represent an important step towards the goal of day-to-day utilization of process mining.

2. The Celonis Studio

The Celonis Studio is an LCDP for analytical and operational process mining applications.[2] Core features are interface templates, extension mechanism, and version control.[3] Applications are bundled in packages and can consist of a wide range of assets focusing on process discovery, simulation, actions, or process automation. Assets are Knowledge Models, Analyses, Views and Skills. The process mining applications created in Studio can be uploaded to the Celonis EMS Store and installed by end users, which are notified of any updates of their installed application.

The Celonis Studio provides the ability to create *Knowledge Models*. In a Knowledge Model, citizen developers can create reusable business knowledge using the human-readable data-serialization language YAML. It allows adding meaningful names and descriptions to business entities and acts as a bridge between the technical data model layer and the business logic of an application. Knowledge refers to KPIs, defined undesired activities and their impact on KPIs, filters, variables, or actions that should generally be taken when certain process activities occur, or undesired patterns are uncovered. This knowledge is captured once and can be reused inside the application or even across multiple shared applications.

Citizen developers who want to build an analytical application can use this knowledge inside *Analyses*. Analyses are used to visually reconstruct processes from data across a company's IT landscape to gain transparency and detect undesired activities and cases. In addition, citizen developers can also create role-based user interfaces, called *Views*. Views are a collection of components and tools to provide business users focused access to the business context and engines to consume data, create insights, and act on knowledge. Views can be configured using either YAML or visual editors. End users can interact with the various components of a View, such as triggering actions in underlying source systems, writing comments, exporting data, or sending emails with a selection of data points.

Within *Skills*, citizen developers can use sensors to identify undesired behavior in the process. They can then use a low-code interface to trigger actions using conditional logic and more than 100 pre-built automations.

Citizen developers can create a wide range of assets and package them in a point-and-click interface. Once a packaged version is published, it can be used by the operational end users. The clear distinction between development and consumption of applications gives flexibility to the citizen developer who can develop the next iteration without disrupting existing users in their daily work.

The Celonis Studio is available since late 2020.[4] It has been used by more than 6,700 citizen developers so far to build process mining applications for various business areas such as Accounts Payable, Accounts Receivable, Procurement, Order Management or Opportunity Management. Celonis customers can not only consume pre-built applications, but also use the Studio to build and maintain their own analytical and operational applications. In addition, ecosystem partners use the Studio to build process mining applications that they distribute via the Celonis EMS Store to a wide range of departments and industries. Celonis' Studio software development kit (SDK) enables customers and partners to expand the Studio with additional assets to complement their process mining application. To further evolve the Celonis Studio, we start to move from low-code to no-code through providing visual editor interfaces for all Studio assets.

---

[2] Auraquantic offers a related LCDP in the process mining field (https://bit.ly/3hUajVt)

[3] A video demonstration of the Celonis Studio can be found at https://bit.ly/3rsJye9 and a tutorial document at https://bit.ly/3Bsjp3H

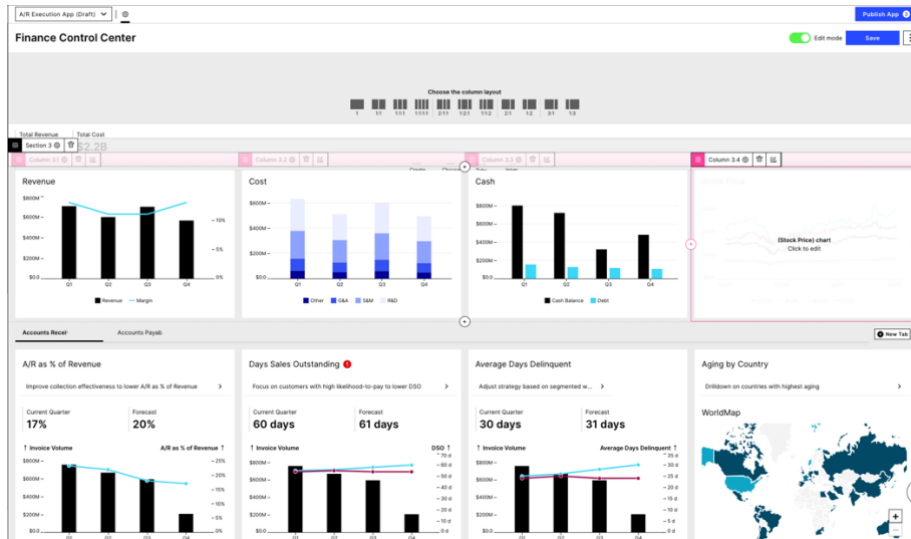[4] A free demo license including Studio features can be obtained via https://www.celonis.com/academic-signup

Figure 1: Screenshot of the Celonis Studio with elements such as version control, click-to-edit operations, layout builder, and in-product help

3. Best Practices for Empowering the Citizen Developer

In the following, we present three best practices that aim to empower citizen developers. We hope that the present strategies support other practitioners and academics while contributing to a dialogue around citizen development in the process mining field.

Guiding the citizen developer. To train the citizen developer on how to create analytical and operational apps, an interactive online training[5] was created that focuses on the core features of the Studio. Next to the training, the product itself contains prompts that guide the citizen developer and presents 'next best action' to reduce ambiguity and guide the citizen developer. An example is 'empty screens' that appears when a citizen developer has just created an asset and highlights next steps to take. Moreover, powerful validation of the View and Knowledge Model definitions navigates the citizen developer to the specific issue in case of errors and how to solve them.

Simplifying proven IT concepts. With LCDPs, a trade-off arises between hiding technological complexity from the citizen developer and using - complex but proven - software development-specific processes and tools. The Studio attempts to solve this trade-off by providing simplified versions of proven IT best practices such as version control, code editor command palettes, and in-editor documentation. The Studio offers a no-code version control which combines the upsides of fast development cycles with graphical, click-and-select user interfaces using visual cues, such as color-coding the published version in green. YAML editing of Knowledge Models allows the use of powerful features such as 'replace all' or 'auto complete' that speed up the development process. At the same time, the in-editor documentation provides ready-to-use snippets for View components or Knowledge Model objects, lowering the entry barrier of using the low-code editor.[6]

Building for scale and reuse. The Studio offers various mechanisms for the citizen developer to re-use their own or publicly available content. To help the citizen developer get started, the Studio already includes a set of View *Templates* that only need to be linked to the desired data points. Another concept of the Studio are *Extensions*. An extension inherits the configuration of a Studio asset which can be modified, subtracted, or added on while never losing the connection to the parent asset. Extensions allow applications to scale, such as deploying the same process mining application to all country divisions of a company and allowing for local customization while using a company-wide standard. Using templates and extensions, citizen developers can use their valuable time on customizing process

---

[5] The training is publicly available after sign-up at https://www.celonis.com/lms/signup

mining applications to their specific needs and adding their domain expertise rather than building from scratch.

4. References

[1]   A. Sahay, A. Indamutsa, D. Di Ruscio, and A. Pierantonio, "Supporting the understanding and comparison of low-code development platforms," in *2020 46th Euromicro Conference on Software Engineering and Advanced Applications (SEAA)*, Portoroz, Slovenia, Aug. 2020, pp. 171–178. doi: 10.1109/SEAA51224.2020.00036.

[2]   C. Silva, J. Vieira, J. C. Campos, R. Couto, and A. N. Ribeiro, "Development and Validation of a Descriptive Cognitive Model for Predicting Usability Issues in a Low-Code Development Platform," *Hum. Factors J. Hum. Factors Ergon. Soc.*, May 2020, doi: 10.1177/0018720820920429.

[3]   C. Di Sipio, D. Di Ruscio, and P. T. Nguyen, "Democratizing the development of recommender systems by means of low-code platforms," in *Proceedings of the 23rd ACM/IEEE International Conference on Model Driven Engineering Languages and Systems: Companion Proceedings*, Virtual Event Canada, Oct. 2020, pp. 1–9. doi: 10.1145/3417990.3420202.

[4]   W. van der Aalst *et al.*, "Process Mining Manifesto," in *Business Process Management Workshops*, vol. 99, F. Daniel, K. Barkaoui, and S. Dustdar, Eds. Berlin, Heidelberg: Springer Berlin Heidelberg, 2012, pp. 169–194. doi: 10.1007/978-3-642-28108-2_19.

[5]   J. Geyer-Klingeberg, J. Nakladal, F. Baldauf, and F. Veit, "Process Mining and Robotic Process Automation: A Perfect Match.," in *BPM (Dissertation/Demos/Industry)*, Jul. 2018, pp. 124–131.

[6]   P. Badakhshan, G. Bernhart, J. Geyer-Klingeberg, J. Nakladal, S. Schenk, and T. Vogelsang, "The Action Engine - Turning Process Insights into Action," in *1st International Conference on Process Mining (ICPM)*, Aachen, 2019.

[7]   W. M. P. van der Aalst, M. Pesic, and M. Song, "Beyond Process Mining: From the Past to Present and Future," in *Active Flow and Combustion Control 2018*, vol. 141, R. King, Ed. Cham: Springer International Publishing, 2010, pp. 38–52. doi: 10.1007/978-3-642-13094-6_5.

[8]   A. Van Looy, "On the Synergies Between Business Process Management and Digital Innovation," in *Business Process Management*, vol. 11080, M. Weske, M. Montali, I. Weber, and J. vom Brocke, Eds. Cham: Springer International Publishing, 2018, pp. 359–375. doi: 10.1007/978-3-319-98648-7_21.

[9]   M. L. van Eck, X. Lu, S. J. J. Leemans, and W. M. P. van der Aalst, "PM2: A Process Mining Project Methodology," in *Advanced Information Systems Engineering*, vol. 9097, J. Zdravkovic, M. Kirikova, and P. Johannesson, Eds. Cham: Springer International Publishing, 2015, pp. 297–313. doi: 10.1007/978-3-319-19069-3_19.

[10]   E. Ramezani, D. Fahland, and W. M. P. van der Aalst, "Supporting Domain Experts to Select and Configure Precise Compliance Rules," in *Business Process Management Workshops*, vol. 171, N. Lohmann, M. Song, and P. Wohed, Eds. Cham: Springer International Publishing, 2014, pp. 498–512. doi: 10.1007/978-3-319-06257-0_39.

[11]   W. M. P. van der Aalst, "Responsible Data Science: Using Event Data in a 'People Friendly' Manner," in *Enterprise Information Systems*, vol. 291, S. Hammoudi, L. A. Maciaszek, M. M. Missikoff, O. Camp, and J. Cordeiro, Eds. Cham: Springer International Publishing, 2017, pp. 3–28. doi: 10.1007/978-3-319-62386-3_1.