Extending BPM(N) to Support Face-to-Virtual (F2V) Process Modeling

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Abstract: In this paper, we present research on CoPI4P (Community of Practice & Interest for Purpose) communities that consist of knowledge and creative workers in domains such as education, environmentalism, inter-disciplinary research, engaged art, and practice F2V (face-to-virtual) processes, i.e. processes that consist of both face-to-face and virtual (online) activities. Standards and methods for modeling business processes have successfully solved various crucial problems, such as providing boundary objects (or a common language) between business analysts, domain experts, process performers and business solutions developers. Performers can execute business processes with standards that support the execution of such processes. However, for CoPI4P communities, BPM standards 1) require additional domain specialization and 2) are either too imperative, or fail to provide enough guidance. This paper identifies these challenges and provides partial solutions applicable to modeling and supporting CoPI4P communities and the corresponding F2V business processes. In addition, results of focus groups interviews and surveys are provided that shed light, notably, on the way CoPI4P communities have been impacted by COVID-19 and how they have coped with digital disruptions to their working models. Our contribution to business processes management lies in researching and identifying the peculiarities of such communities and their workflows, followed by interventions in the BPM, and particularly the BPMN, domain. We then propose a toolset of BPMN extensions required to match the observed F2V workflows and thus to digitalize CoPI4P business models. In this context, we introduce the notion of sub-process palettes as a means to reduce the rigidity, and introduce personalization, of processes.

1 INTRODUCTION

With the rise of knowledge and creative workers and creative economy, we face new businesses and the challenges of modeling them (Loo, 2016). In contrast to conventional business models and the corresponding business processes, these new business models are difficult to model in a deterministic and prescriptive way (Swenson, 2010). For knowledge and creative workers, working procedures become increasingly blurry, business performers are no longer performers that merely *execute* (human) tasks; in such business scenarios, they expect freedom of choice regarding, notably, their decisions, methodologies and time handling, to name just some aspects of their work (Loo, 2016).

Our work focuses on the aforementioned business scenarios and systems that help communities geared to solve complex interdisciplinary problems in face-to-virtual (F2V) events. Such events take the form of rapidly changing activities happening in real-time with various frictions as each activity can involve different media (face, virtual, hybrid), methodologies, and/or participants. They involve participants who work in a non-coordinated manner and with full creative freedom. The participants often work offline with results eventually provided (digitized) online. This is why we use the term ***face-to-virtual*** **(F2V)** for such events and processes.

At the same time, the communities these participants belong to (i) design, (ii) evaluate, (iii) evolve, and (iv) practice various methodologies that are inherently well structured and imperative in their intention toward the participants and the communities. This *digitalization dissonance* between the non-imperative behavior of the performers and the imperative expectations of the community conducted processes provides a great challenge in terms of the digitization of

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* Face-to-Virtual is a Combination of Face-to-Face and Virtual (Online) Activities.

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such community workflows.

In this paper, we present our work on evaluating a visual workflow language (particularly BPMN) as a way of (BPM) modeling of the working practices of such communities, evaluating their benefits over non-formal and non-semantic encoding of their workflows. We research and explore community practices and challenges with non-digitalized workflow practices. Afterwards, we evaluate the attitudes of the communities stakeholders' toward the introduction of visual workflows and toward the extension of BPMN we proposed as a way to properly digitalize their business processes. We discuss both approaches for business digitalization; (i) *top-down*, conducted by business and domain experts, and (ii) *bottom-up*, conducted either by community members through participatory design, or through ecosystem augmentation (e.g. process-mining).

This paper is structured as follows. First, we introduce the necessary terminology (sec. 2) followed by presenting the research challenges involved (sec. 3). After that, we present our contribution with relevant research and findings on the types of communities and processes discussed in this study (sec. 5). We then present the proposed BPMN extensions (sec. 7) and introduce new BPM(N) mechanisms - subprocess palettes to reduce the rigidity, and introduce personalization, of processes (sec. 8) and conclude the paper (sec. 9).

2 RELEVANT TERMINOLOGY

Here we introduce the relevant terminology including standard BPM terms, terms from other relevant disciplines and new terms that we introduced to explain new concepts.

On using the "*business*" Denominator: Our research focuses on exploring and supporting workflows that prominently depend on participants' *creative and free forms* of work. However, the *business "tone"* does not fully suit either of these kinds of work, or the communities conducting it. Therefore, instead of contextualizing each aspect of such work and corresponding processes with the "*business*" denominator, we prefer to refer to them either without the *business* denominator or with a more specific denominator, e.g. *social*, *creative* or *innovative*.

Newly Introduced Terms:

Trans-domain Ecosystems: we refer to open *sociotechnical systems* partially encoded through the *digital world*, partially through the external *physical world*, and partially through the *social world* of the community members.

(Eco)system Values: ecosystem artifacts that ecosystem domain experts have recognized as important for the specific purpose of the ecosystem and the community or business it stands for.

CoPI4P (Community of Practice & Interest for Purpose) (pronounced as "*Copy for P*")**:** a complex and heterogeneous community of *practitioners* (hence CoP[2]) and participants *interested* (hence CoI[3]) in the topic of the community and its *purpose* (hence CoP[4]) ((Chatzinotas, 2017)).

Face-to-Virtual (F2V) Process: a process that combines face-to-face and virtual (online) activities. The events consisting of both kind of activities are also called *hybrid* (Bonakdarian et al., 2009), but the F2V stresses the interaction across different *"worlds"* and the fact that the F2V activities affect both virtual and physical worlds and artifacts in them. The **workshops** and **Participatory action research (PAR) sessions** conducted and presented in the course of this work consist of F2V events orchestrated with such face-to-virtual processes.

Sub-process Palette: a collection of subprocesses that are functionally semi-equivalent, but with different behavioral footprint and matching each of community persona. They are *functionally semi-equivalent* in the sense that the differences in their performance outcomes (mostly in the regard of the ecosystem values) are negligible from the perspective of domain-experts or the community performing them, and as such they are perceived as equivalent and used in an interchangeable manner.

3 CoPI4P CHALLENGES

Modeling business processes is an inherent part of any business analysis work. In the recent decades, tools supporting this work expanded (Indulska et al., 2009), with the possibility of digitization of business processes and describing business processes through digital business models. The robust and widely used business process modeling language is BPMN (Recker, 2008). BPMN has proven itself as a solid language for modeling business processes, describing

[2]For general info please check on the Community of Practice: https://en.wikipedia.org/wiki/Community_of_practice

[3]For general info please check on the Community of Interest: https://en.wikipedia.org/wiki/Community_of_interest

[4]For general info please check on the Community of Purpose: https://en.wikipedia.org/wiki/Community_of_purpose

each particular role in multi-actor business processes, activities and points of collaboration and messages exchange.

This precision in process description has helped business analysts to design accurate processes that business participants can follow so as to contribute their results and progress. The *inherent association and alignment* of the executed activities with the results of activities execution enables business analysts to *evaluate* the work being done, notice outstanding and problematic parts of work and *compare* it with the past work of the same or other relevant business actor. This, in short, explains the feedback loop in modern business models, and the benefits of using structured models like BPMN and argues the benefit for CoPI4P communities embracing BPM digitalization practices.

However, the strict (and generic) nature of the BPMN language is not adequate for domain-specific businesses; the language lacks the vocabulary to express specific domain needs. This is the reason for business communities of practice (CoPs) to extend the BPMN standard to better fit their specific domains (Bocciarelli and D'Ambrogio, 2011). In the same way as UML provides extension mechanisms through stereotypes, tags and constraints (Koch and Kraus, 2002), the BPMN 2.0 metamodel provides a set of *extension elements*, which allows to add new attributes to existing BPMN elements and new elements types to the standard. This allows BPMN adopters to expand the original BPMN metamodel with necessary extensions to fit a particular business model.

Such BPMN extensions allow for domain-specific constructs while still keeping the digitized domain-specific business processes BPMN-compliant. *Social BPM* (Social Business Process Management) (Kemsley, 2011) demonstrates another relevant example of a need for BPMN extensions: an approach to encapsulate important social aspects of business processes. The main focus of the Social BPM is on extending BPM to support social activities, actors, events (as specializations to the corresponding BPMN entities) and semantically integrate them into conventional business processes (Brambilla et al., 2011) (but also keeping them executable).

In a similar way, we need to describe and encode unique aspects of CoPI4P business workflows. We need to encode the dynamic nature of their work, and explicitly support their creative freedom (which we will address in the sec. 8) to *chose their optimal way* of performing *the expected work*.

We need to describe the "soft-aspects" of each business process activity (like motivation sources, space for creative freedom, frictions, etc) to increase efficacy of multiple stakeholders; *facilitators* need to understand the context of the performing activity, participants (performers) need to understand work, available freedom and social capacity of the activity, *ecosystem* has to be able to properly coordinate and visualize the performing activity.

4 RESEARCH METHODOLOGY

Our investigation of visual conceptual modeling language notations (Bork et al., 2018), (Proper et al., 2018), (Bork et al., 2020), (Pankowska, 2019) is beyond the scope of this study, so we will limit ourselves to the most important reasons for choosing BPMN over other standards. We compared BPMN, CMMN, ArchiMate, UML, and IFML. BPMN came as the winner as (i) it is aligned with other OMG standards (as CMMN, DMN, VDML), enabling support for declarative case business management, (ii) it seems to be more widely supported in frontend open space, (iii) it is executable.

In our work with CoPI4P (Community of Practice & Interest for Purpose) communities, we have focused on 3 types of ***stakeholders***: (i) *domain experts* (organizer, leaders, facilitators), (ii) regular *community members* (members, participants, followers), and (iii) *(eco)system architects* (designers, developers).

The fundamental research methodologies practiced across our work with CoPI4P communities are *Participatory action research (PAR)* ((Chevalier and Buckles, 2019)) and *Participatory Design* ((Bratteteig and Wagner, 2014), (Simonsen and Robertson, 2012)). Due to the nature of these communities and the fact that their work is concerned with group dynamics, our study of the majority of the communities involved started, in its *first phase*, with unobtrusive participation and observation. This gave us an *initial understanding* of their work, goals and eventually the challenges they faced.

In the *second phase*, we started with more engaged Participatory action research (PAR), whereby we practiced CoPI4P communities' methodologies and contributed to their ecosystem values. This developed mutual trust, familiarity with community members and their practice, and a chance to co-design.

In the *third phase*, we engaged with the first group of stakeholders - domain experts. We practiced *focus group interviews* with domain experts. This gave us an additional understanding of our research scope through both formative evaluation (before the research was conducted) and summative evaluation of our research contributions.

The participatory design work happened at two

levels. The first is the *community level*, where we co-designed community methodologies, practices and particular workshops and events with community members. The second one is the *augmentation level* where we were augmenting community practices through digitized business processes.

Finally, to gain more precise and unified data from the first group of stakeholders - facilitators - we conducted surveys evaluating their needs (e.g. what type of BPMN extensions they needed) and their satisfaction with our contributions (e.g. introducing BPM into their work practices).

5 RESEARCH AND FINDINGS

We base our work on our action research enrolment with CoPI4P (Community of Practice & Interest for Purpose) communities. These are communities that practice with new forms of research and education, engaged artists and poets, youth organizations, climate changes and ecology related organizations. To give a quick understanding of their scope we organized them in the following 5 categories:

i. **Eco & Sustain. Dev.:** sevaral intl. events, including **Climathon** hackathons for climate challenges, happening each year in 55 countries.

ii. **Engaged Art (Multiple):** communities that use various methodologies, media and transdisciplinary initiatives combining art, science and knowledge to achieve social change.

iii. **Digital Humanities (Multiple):** a field comprising communities of researchers that are inherently interdisciplinary, bridging two different disciplines. Authors design their tools and workflows.

iv. **Educational (Multiple):** communities that work on innovative models of education, such as model-based and paradox-based education, educational games and lifelong learning.

v. **Knowledge Federation (KF):** international community gathered around the challenges of knowledge federation across interdisciplinary communities.

Through PAR sessions and focus group interviews, we have captured the following challenges posed by non-digitalized workflow practices (expressed as ***"It is hard to ..."***): (i) communicate workflows with other stakeholders, (ii) monitor the evolutionary development of workflows, (iii) evaluate workflows, (iv) claim improvements of either community or ecosystem values achieved through conducted workshops (critical for commercial workshops), (v) ensure the coordination of other facilitators by top level facilitators, understand and communicate which group dynamic results have already been achieved with the help of the previous activities in the workflow (for example, to determine if participants already share a common vision).

There is no real application of BPM practice in these business scenarios and communities, and open source communities and industries do not seem to be interested in using the BPM standards and modeling to augment such communities and processes.

We identify the characteristics of CoPI4P communities that constitute a challenge in implementing their workflows, conceptualize them in terms of the associated process models and summarize them later in the section (table 1).

The challenges are largely due the fact that knowledge and creative workers are not performers that merely "execute" precisely prescribed (human) tasks designed for them and given to them to execute. Such workers want to organize and handle their own time as they usually work with no time limitation (in order to foster the process of creativity). They often practice open innovation, discover their own business peers (B2B), and find innovative ways to reach customers (B2C). Such workers rarely work in isolation. Rather, we can often model them as part of a ***CoPI4P (Community of Practice & Interest for Purpose)***, a *wise-crowd* actively interacting and continuously contributing to a shared corpus of knowledge, ideas, practices, or whatever the ecosystem-values of the community they belong to happen to be. Therefore, we need to enable business scenarios that provide such communities to contribute their work in F2V (face-to-virtual) events (either real-time or asynchronous), which additionally complicates business modeling in this context.

The above-mentioned business scenarios argue ***against*** *the rigid and imperative business process modeling*. However, such workflows are mostly governed with specific creative work methodologies (like Rapid Foresight methodology, model based education, paradox problem resolution, structured democratic dialog, among others) that rely on the group dynamic and coordinated work. Additionally, they consist of articulated work for each process activity with the outcome of particular activity (e.g. *"Write Needs"* and *"Write Offers"*) used for later activities (e.g. *"1. Match Offers ..."*) as presented on the example of such a workflow (fig. 1).

Most of them use specially designed tools and artifacts for facilitating and capturing information, knowledge, and to foster various aspects of their

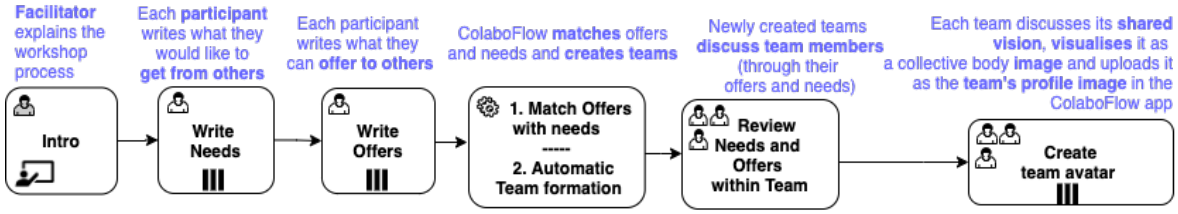

Figure 1: Workflow process describing CoPI4P's demo F2V workshop.

work, such as ideation, innovation and creativity. We have also found that they very often find digital technologies *disruptive* for the group dynamic and are potentially reluctant to use them, mostly due to previous negative experience or conservative policies or habits which, based on our survey findings, significantly changed during the COVID-19 period (Tesar, 2020), (Khalili, 2020). Providing declarative experience instead of more solid imperative IT solution would increase the discomfort (the feeling of being lost) of both facilitators and participants.

They use non-digital memoization artifacts whose contents then becomes necessary for the further digital phases of the community's business workflow. Therefore, we have to capture and respond promptly and bridge and transfer ecosystem values across the real-world and virtual-world in face-to-virtual processes in order to preserve the group dynamic, and provide rapid feedback, satisfaction and "*ROI*"[5] for both participants and facilitators.

Apart from deeper discussions through individual interviews, co-design and focus groups interviews with high-level facilitators, we have conducted a survey (provided in both English and Russian) interviewing international facilitator and educators (over 30 of them, the countries represented include Serbia, Russia, Italy, India, Norway, USA, Germany, UK, Malta, Portugal, Latvia, Croatia, Canada, and Belgium). The survey included questions on the impact of COVID-19 on their work and its relationship with IT technology, workflow and BPM augmentation, as well as demographic and professional data.

The figure 2 presents the first set of our findings that demonstrates, notably, that (a) facilitators' work overall did suffer due to lockdowns and isolation related to COVID-19. Some of them (b) successfully transformed their working practices into the digital realm and benefited from IT tools. However, focus groups interviews have shown that facilitators sacrificed their pre-COVID working practices and key values for the sake of digitizing their work and communities, and lost control over and understanding of their community dynamic. This probably explains why the majority among them would (c) benefit from visual workflows and a BPM approach, (d) find benefit in the proposed BPMN extensions (decorations), and (e) are interested in using ColaboFlow framework for augmenting their working practices with IT. The last two diagrams of the figure 3 show that (b) the majority of facilitators acknowledge IT technology as augmentative, and (c) the over 45

In the following table 1, we present CoPI4P communities and the correlated F2V processes more systematically through the features recognized and analyzed here. We will especially focus on the features that have impact on the business modeling of their workflows.

6 NEW DESIGN PARADIGM

In this section, we argue for a new design and development paradigm tailored for trans-domain ecosystems. We approach it by considering the problem of extending an IT system with intangible, "soft"-parameters of business processes (such as performers' motivation, developmental transformations, social and psychological aspects and satisfaction, among others) into already designed and developed IT system. We argue that with the proposed paradigm shift such an extension

We will focus our argumentation for the proposed paradigm shift on introducing the notion of *motivation* in systems implementation and standards. When it comes to work motivation, existing studies address motivation in an organizational context (Gebauer and Fleisch, 2007), (Lepper and Greene, 2015), (Ilgen and Pulakos, 1999), as well as the "psychology of" motivation within strictly business organisms - the *how* and the *why* of business motivation mechanics, notably the *WHY* in Zachman Framework, Business Motivation Model (BMM) (an OMG's standard) and ArchiMate motivation extension (Berkem, 2008), (Quartel et al., 2010), (Bhattacharya, 2017).

However, there is no clear work on (and motivation, no matter how word-pun that sounds) understanding and encoding motivational aspects in either BPM tools or standards. This is true on any as-

[5]Return on investment.

Table 1: The list of the features of CoPI4P communities and F2V (face-to-virtual) workshops relevant to the process modeling and execution.

CoPI4P features	
term	description
ad-hoc	consist of well-established core members and ad-hoc ever-changing participants that contribute to the community core eventually
experimentation	the modus-operandi is evolution through continuous experimentation and incremental improvement practices
group-dynamic	their values strongly rely on the inner community dynamics, motivation, and energy
tech-concerned	due to the *group-dynamic* they are very careful with introducing IT tech tools in their workshops and events

F2V features	
term	description
group-dynamic	the group-dynamic, number and structure of teams often change across the event span
frictions	frictions along face vs. virtual dimensions, single vs, group, among others
evaluation	real time evaluation of individual, teams and community's contributions
facilitators	multiple facilitators are responsible for each event, moderating both external outputs as well as internal user transformations, groups development and changes in its dynamics
continuity	facilitators and methodologies can switch with no breaks between them
process-engagement	engagement with the event process might be at multiple levels: (i) descriptive and collaborative model used at the workflow design phase, (ii) a blueprint for conducting the workflow, (iii) run the process evaluation, (iv) participants perform (some of) the process activities through, among others
f2v-bridging	the non-digital output of one activity is the input of a later activity. We need to ensure rapid, crowd-sourced digitization, digitalization or interpretation of non-digital outputs

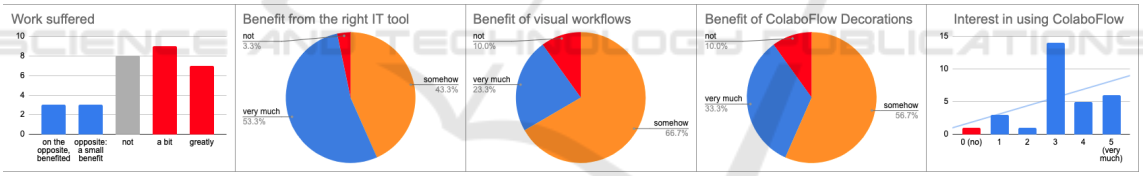

Figure 2: Facilitator survey findings; (a) work suffered (due to COVID-19), (b) benefit of using IT tools, (c) benefits of presenting workshops through workflows, (d) benefits of ColaboFlow Decorations, and (e) interest in using ColaboFlow.

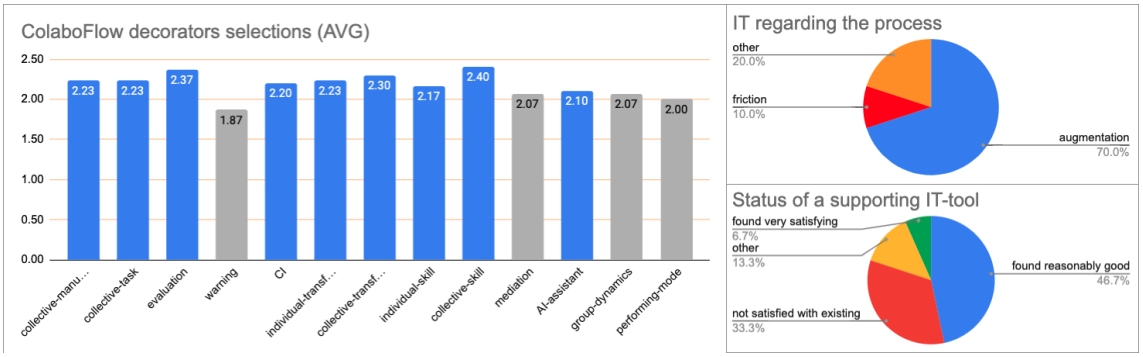

Figure 3: Facilitator survey findings; (a) ColaboFlow decorators selections (AVG), (b) I see IT tech (regarding my processes) as, (c) Status of a supporting IT-tool.

pect of business model; for business performers, activities or BPM process context. Clearly, such information, whether machine readable or not, would bring business benefits, especially when CoPI4P business scenarios are considered. It is similar to other "soft-"parameters of business processes, like performers' social and psychological aspects or satisfaction, among others.

The approach of *business modeling of a whole ecosystem* as an open sociotechnical system rather than just a digital system brings additional challenges. The whole ecosystem is partially encoded through (i) the *digital world* (online platforms, visual representations of workflows, mobile apps), partially through (ii) the external *physical world* (books, notebooks, methodological cards and tools), and partially through the (iii) *social world* of community members (facilitators, moderators, observers, participants) and tacit knowledge (methodologies, experience, emotions, individual and collective intelligence). On the one hand, the boundaries between the parts of the ecosystem introduce sociotechnical gaps (Ackerman, 2000), while the non-digital parts of the ecosystem make it hard to capture and digitalize the ecosystem's values. On the other hand, this (holistic) approach and problems of digitalization makes it even harder to use pre-designed business processes as a prescriptive guide for community behavior outside of the digital borders.

Additionally, the *ecosystem values* in such CoPI4P communities can be hard to digitalize. Apart from pure information and knowledge, they can comprise social content and social connections (social capital) in a social network, as well as tacit (inter/intra human) knowledge (Duguid, 2012), skills, collective intelligence (Woolley et al., 2015), and human emotions.

To support CoPI4P communities and the business modeling that is emerging from their distinctive practice, we need a shift in the system design itself. The motivation comes from the core difference in what we are designing, as instead of designing systems, we design ecosystems. Ecosystems stress the importance of the holistic and non-technical aspect of the solution. We build on top of the sociotechnical systems (Whitworth et al., 2006) (Trist, 1981) and theory that understands the importance of the *duality* in the design of such ecosystems. Apart from the already mentioned ***ecosystem worlds*** - digital, physical, and social - that constitute such ecosystems, these ecosystems encompass multiple ***ecosystem domains*** as well. There are social, technical, democratic, geographical, psychological, artistic, racial, religious, scientific, and many other domains or fields of inquiry. We are not proposing to integrate (support for) the entire variety of these domains as that strategy would be both unrealistic and counter-effective. The aim is rather to avoid *"excluding"* certain kinds of ecosystems from potential study merely due to the limitations of the current design and development principles and paradigms.

The problem is much larger than implementing particular sets of standards or polices by the system designer and developers. Rather, it concerns the challenge of the inherent incompetence of system designers and domain experts to design a whole ecosystem. It is valid for both the initial period of engagement with the designed ecosystem, and even more when it comes to an unpredictable future. If we take an example of the *democratic* domain, we can see that current social-media platforms lack mechanisms that would monitor and protect platforms' democratic values and principles (Rudan and Rudan, 2014). Additionally, it is hard to imagine today's social media platforms embracing such mechanisms, especially ones originating from a 3rd party independent institution such as are usually the most competent for particular domains. Therefore, we need to redesign the very way we design and develop ecosystems.

We thus propose to expand ecosystem design based on the sociotechnical and socio-material theories that inherently recognize the limited set of ecosystem aspects (i.e. *sociotechnical* or *socio-material* ecosystems (enlisting) =¿ socio, technical, material, ...) to apply a term that can potentially encompass an unlimited number of domains; therefore we introduce a new term: ***trans-domain ecosystems***. This term recognizes ecosystems as liberal and agnostic in their nature, but at the same time it calls for a paradigm shift in ecosystem design and development. Such a paradigm shift requires a design that would embrace an open world rather than a closed world, and provide mechanisms for introducing new ecosystem domains. It calls for declarative description, evaluation, and evolution of an ecosystem, done by all the key stakeholders of the ecosystem rather than solely by developers; including the community and experts in the given domain. It calls for a common language and a continuous ever-evolving bridge between ecosystem designers, developers and CoPI4P communities.

Without going into details, as it is out of the scope of this paper, the candidate for such a language is clearly *BPMN*, a language that can potentially be spoken by all the key stakeholders of an ecosystem. The additional, but often overseen [6], values of ecosystem

[6]This understanding comes from our preliminary exploration of the state-of-the-art research, focus-group discussions with system architects of CoPI4P communities sys-

design through BPM languages are ***ecosystem transparency*** to its stakeholders and ***ecosystem externalization*** of its business logic that makes it possible to *extend* and support ***ecosystem co-evolution*** through its practice with the help of all its stakeholders.

The proposed paradigm shift and trans-domain ecosystems to be implemented require (i) an extension of BPM(N) to support the additional needs of the CoPI4P communities as presented in the section 7 and (ii) support for (among others) functionally-equivalent sub-processes that we present in the section 8.

Our R&D implementation and support for trans-domain ecosystems is called ***Colabo.Space***[7]. It is an Open Source solution with a modular architecture. It provides a knowledge repository for practicing knowledge federation, and an extendable toolset of collaborative methodologies for various aspects of community collaboration such as knowledge federation, structured dialogue facilitation, creativity and innovation, and mechanisms for bridging the barrier between virtual and physical worlds. The mentioned components of the Colabo.Space ecosystem are orchestrated through the ColaboFlow component, a BPM component responsible for business processes execution and BPMN visualization (integrating the open source and modular Camunda solution for BPMN: https://bpmn.io/ and proprietary solutions for performing BPMN processes by human participants on the one side, and micro-services, on the other).

7 EXTENDING BPMN

We propose a set of extensions of the BPMN standard, based on the BPMN 2.0 native extension mechanism , in order to support the discussed paradigm shift, implementation of trans-domain ecosystems, and to include intangible, "soft"-parameters of business processes (sect. 6=. The notion of *motivation* is addressed by *CI genome* extension.

Based on the research explained in the section 4, and aligned with the CoPI4P and F2V features identified and listed in the table 1, the original set of extensions was provided: 1) through focus group interviews with the top level facilitators (from various types of CoPI4Ps), we have identified potentially necessary extensions, 2) through surveys with a larger group of facilitators, we have evaluated the importance of each of the extensions (figure 3 (a)) and 3) through open questions in the survey, we have confirmed their universal applicability. The list of extensions is presented in the table 2.

An excerpt from a demo process, covering representative aspects of the studied processes and practices, as well as scenarios of the interviewed practitioners/facilitators, is illustrated at the figure 4.

Several workshops conducted by authors and described in the section 5 demonstrates *digital disruption* in the context of the communities that don't practice digital augmentation of their face-to-face events. As such, authors had the very sensitive task of "*digitizing*" their practice from face-to-face to face-to-virtual, and "*patching*" it at particular spots with digital augmentation. Having business modeling notation such as BPMN, we could digitize the workflow. .

The digitizing procedure consists of (i) *identifying* (together with domain and community experts) known activities the given process should consist of and *describing* them as best as we can, followed by (ii) *proposing* necessary extensions for the process we want to contribute to it, (iii) *understanding* what the potential frictions may be, and (iv) evaluating digital disruptions in the proposed workflow.

8 SUB-PROCESS PALETTES

In the BPMN standard, processes are presented on one (conceptual) "*plane*", which is usually realized with a *pool* of business *roles* (realized as set of *lanes*) and the *interaction* between them. BPMN does support the encapsulation of process activities through ***sub-processes***, which enable the isolation of a set of activities into a separate (conceptual) plane and the possibility of reusing the part of business logic as a *sub-process*. *Modularity*, *reuse*, and *readability* are the main incentives for decomposing processes into sub-processes.

The most critical issue with using regular BPMN standard is the lack of flexibility to choose, adjust and personalize business processes from the perspective of performers. Very often rational is to go with declarative (case based) BPM (Goedertier et al., 2015) like OMG's CMMN standard instead. Unfortunately, CoPI4P communities find it too confusing and without capacity of quick (necessary at the real-time events) capturing the "flow" of the F2V process with declarative BPM approach. Instead the preferable scenario, that we experienced (participatory design and participatory action research approach) practicing with CoPI4P, is to provide the process confidence with imperative structure that BPMN provides but additionally loosened to give freedom and fle-

tems, and evaluating open source Github projects.

[7]Please check the official website of the system: https://colabo.space

xibility to describe behavioral and personal varieties.

This is our motivation to propose ***sub-process palettes***, or meaningful chunks of BPMN processes. A sub-process palette is a collection of similar, functionally semi-equivalent, sub-processes. The sub-processes in a sub-process palette are *functionally semi-equivalent* in the sense that the differences in their performance outcomes are negligible from the perspective of domain experts or the community performing them, and as such they are perceived as equivalent and used in an interchangeable manner.

The benefits coming with the proposed notion of the sub-process palette are: (i) non-rigid (reduced) imperativeness, (ii) personalization (iii) evolving sub-process palettes into design patterns recognized as best practices in process design, (iv) visually communicating top-level functional representation of the whole sub-process palette, (v) providing a container (mostly for the sake of human comprehension) for the community participants' activities as they are process-mined into functionally semi-equivalent sub-processes, a process that is crucial for capturing tacit knowledge (HOW) and not just the result of an activity (WHAT), (vi) the ability to interact with and configure, in an aggregated (clustered) manner, the exposed top-level aspects of the underlying sub-processes.

The figure 5 presents an example of the sub-process palette *Proposing a CONTEST* consisting of 3 sub-processes. It is an example of knowledge dissemination processes in the ISSS community ((Rudan et al., 2015)).

All three diagrams in the figure are functionally semi-equivalent from the perspective of performing the activity of proposing a contest. The diagram 5 (a) is an initial diagram, which assumes that the contest appears healthily now and then, whenever it makes sense to oppose an inappropriate INSIGHT.

9 CONCLUSION AND FUTURE WORK

In this paper, we have presented a paradigm shift in system design toward trans-domain ecosystems that better match CoPI4P (Community of Practice & Interest for Purpose) communities and F2V (face-to-virtual) processes. We have, further, proposed to extend BPMN with a new concept, sub-process palettes, and domain-specific support for F2V processes. Working closely with a variety of COPI4P communities, we have gained confidence in the conceptual and practical benefit of the proposed solution. With exemplar F2V processes, the wider group of facilitators showed no identifiable cognitive overload. However, the effect on more complex workflows communicated across various stakeholders of a community (namely, regular participants) remains to be understood. Given ColaboFlow's support for different views (perspectives) on visual workflows, we expect to address any of the potential problems. There are still open questions, with a positive note, when it comes to the framework as a whole and its capability to share common community practices, attract community members and engage them with the core community practices.

With the support of sub-process palettes, we are capable of ecosystem augmentation through a *process-mining* approach. It opens various possibilities, like detecting a community's best practices and behavioral patterns, as well as helps with monitoring and recognizing anti-patterns in regard of a community's social health or ecosystem values production. Apart from doing initial ABM (Agent Based Modeling) and evaluating the ratio between the community or ecosystems gains vs. the level of loss of user freedom (through following system suggestions for activities), this is still an open space for future research. Another key question and potentially challenge concerns fusing community crafted processes with the potentially vast number of sub-processes mined by the system.

We are also interested in the aspects of community engagement with visual workflows and process-driven IT technology overall. We have conducted an initial survey on that topic and recorded considerable interest in the whole spectrum of possible aspects, but as space is limited, this must be left for future research and reports.

Finally, we want to further understand the long-term impact of COVID-19 on the transformation of the CoPI4P practices and their toolsets. We are very interested in the potential friction in the technical integration of the proposed design paradigm by (eco)system architects, although the initial interviews with this focus group indicated a positive interest, mainly due to the possibility of semi-transparent system integration and expected overall benefits of such a paradigm shift.

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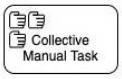
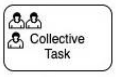
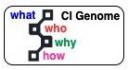
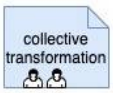
Table 2: Elements of the BPMN extension to support CoPI4P and face-to-virtual processes.

COPI4P and F2V (Face-to-virtual) BPMN Extension	
Representation	Description
	**collective manual task** - An activity with this decoration is performed **manually** (without IT support) and **collectively** (by the community/team/group). Supported features (table 1): *group-dynamic*.
	**collective task** - An activity with this decoration is **collectively** performed (by the community/team/group) in a **virtual** world (by digital tools). Supported features: *group-dynamic*.
	A value with this decoration is an **evaluation** of related activity by participants (about content, satisfaction) using different mechanisms (voting, comments, scales). It provides facilitators with *in-vivo* insights on the group dynamics and enables decision-making on which *compensation actions* to take. Supported features: *friction*, *process-engagement*, *group-dynamic*, and *evaluation*.
	**CI genome** - Decorates an activity with **CI** (**COLLECTIVE INTELLIGENCE**) aspects. This way, facilitators can design crowd-sourced processes (Malone et al., 2010), addressing participants' motivation for activity. Supported features: *facilitators*, *process-engagement*.
	**individual-transformation** - e.g. embodiments, attitudes changes, that are expected to happen as an activity outcome. Supported features: *group-dynamic*, *evaluation*, and *facilitators* features, and developmental and educational workshops, taking in mind internal, experiential, and intangible ones.
	**collective-transformation** - (e.g. community building, a team's shared vision) expected to happen as an activity outcome. It focuses on intangible outputs and supports group evolution and collective intelligence development. Supported features: *group-dynamic*, *evaluation*, and *facilitators*.
	**individual-skill** - skills (e.g. visualisation, negotiation) that a participant acquires by performing the activity. Supported features: *group-dynamic*, *evaluation*, and *facilitators*.
	**collective-skill** - (e.g brainstorming) that community/team/group acquire by performing the activity. Supported features: *group-dynamic*, *evaluation*, and *facilitators*.
	**AI-assistant** - the activity is augmented with **AI/IT-ASSISTANCE** provided by CoLaboFlow (e.g. team creation, ideas or interests matching). Supported features: *f2v-bridging*, *evaluation*, *facilitators*. It benefits to the most of other features.

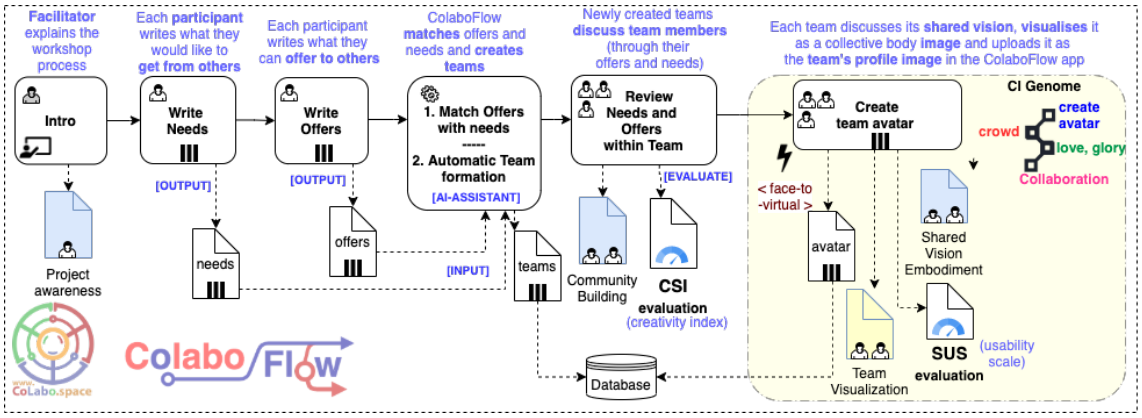


Figure 4: Business process behind a demo face-to-virtual workshop.

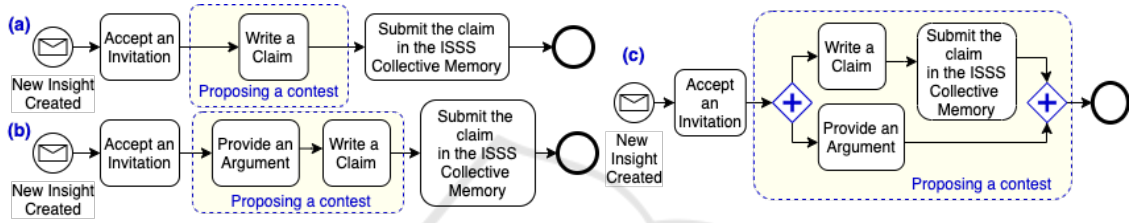


Figure 5: "*Proposing the CONTEST*" sub-process palette - (a) 0th approximation, (b) 1st approximation (alternative 0), (c) 2nd approximation (alternative 1).

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