

Collaboration personas: A new approach to designing workplace collaboration tools

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ABSTRACT

The success of social computing has generated a host of workplace collaboration tools. However, adoption of these tools by entire groups is a major problem. One reason for the adoption problem is a lack of methods for considering collaborative groups in technology design. Even when designing *collaboration* tools, designers often employ methods that focus on *individuals*. This leads to tools that are not well targeted at the groups who will use them. To solve this problem, we propose the notion of *collaboration personas*, which are empirically derived descriptions of hypothetical groups, including details that inform the design of collaboration tools. Collaboration personas differ from individual personas in having (1) *multiple, inter-related individuals* playing specific roles; (2) a focus on *collective goals* and elaboration of individual goals that affect the collective goal; and (3) new attributes that characterize *collaborative aspects* of the group's work. We contrast collaboration personas with other design approaches and provide examples of how they can be used to design new collaborative tools that better meet the needs of typical groups.

Author Keywords

Office, workplace, collaboration, design tools, personas.

ACM Classification Keywords

H5.3. Group and Organization Interfaces.

INTRODUCTION

Recent years have seen the emergence of a multiplicity of workplace collaboration tools. Collaborative groups now face complex decisions about whether to use Facebook-style social networking tools; tools for sharing files, bookmarks, and tags; wikis; community tools; team-space tools; and so on. The complexity of these decisions often leads groups to adopt tools that are not optimized for their particular type of collaboration [13,17]. Furthermore, despite this proliferation of tools, one tool is often not enough to satisfy all the collaboration needs of a single group [1,17]. As a result, groups often cobble together multiple tools to serve their collaboration needs. Using multiple tools for

collaboration adds complexity to members' lives, when they already have limited time to learn about and access these tools. These factors lead to an *adoption* problem, which is demonstrated by the continued use of email to share files, discuss projects, and coordinate tasks, instead of dedicated collaboration tools [23].

A possible reason for the adoption problem is the typical technology design processes used to create these tools. Even when designing *collaboration* tools, designers often employ methods that focus on *individuals*, leading to tools that are not well-targeted at the groups who will use them. For example, personas are a commonly used design tool [6,21], but they sketch the qualities and goals of an *individual* rather than a team. Though techniques exist for understanding collaboration, such as ethnography, these are time consuming and unlikely to be performed for every product development effort. Furthermore, we lack methods for translating the understanding gained through user studies into reusable design tools for collaboration.

To address this design problem, we propose the notion of *collaboration personas*. Collaboration personas are *empirically derived* descriptions of hypothetical groups of people with specific qualities, goals, and needs realized through collaborations with each other. They are derived from empirical studies and a typology and framework describing distinct types of collaborations [17]. By considering the specific *interactional* properties of different types of collaborations (roles, interdependence, etc.), collaboration personas can improve tool adoption by helping designers create better targeted collaboration tools.

Our contributions in this paper are (1) proposing the novel concept of a collaboration persona, which is significantly different from an individual persona, and (2) presenting and motivating a set of collaboration personas that represent collaboration needs in modern enterprises.

RELATED WORK

The concept of a *persona*, introduced by Cooper [6], is a hypothetical archetype of an actual user, describing that person's goals, aptitudes, and interests. Personas are intended to avoid the problem of designers, developers, or stakeholders invoking the "elastic user" who can be bent and stretched to suit the needs of the invoker. Cooper estimates that each design problem will require between 3 to 12 personas. Many practitioners and researchers have found

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personas to be useful in design, helping to better focus designs, allocate development resources, and contribute to product positioning and sales [6,7,11,21].

Given other design methods available, why personas? The closest alternative is participatory or cooperative design, which involves the design team interacting with future users throughout the design process [22]. Though they share many of the same goals, participatory design is primarily useful for small development teams designing for a specific or homogeneous group of users. Personas can be useful where participatory design is not effective, e.g., for large development teams and diverse user populations.

Scenario-based design creates a story with a setting, actors who have goals or objectives, and a sequence of actions and events [4]. Similarly, task analysis aims to formally represent user tasks [12]. The critical difference between personas and scenarios or task analysis is that the latter methods are not *generative*. Scenarios and tasks tend to capture key properties of specific situations. However, they do not enable designers to think about new situations.

CSCW patterns describe regularities in the organization of collaborative work practices, often focusing the role of specific artifacts [16]. They are useful complement to collaboration personas, since they can be included in the personas to describe how members of the group interact around their artifacts. Collaboration personas can provide context for CSCW patterns, by describing which roles are involved with a pattern and what part it plays in their larger project or ongoing collaboration. The key differences are that collaboration personas focus on the interactions of specific roles in a group, and describe the group in a way that it is easier for designers to relate to than an abstract model [11].

Methods for gathering data about users are an excellent complement to personas. Contextual design focuses on understanding users through field research, and communicating that data with flow, sequence, artifact, and cultural models [2]. Ethnographies also are a good (though expensive) source of data for personas. However both ethnography and contextual design have a critical limitation in capturing a concise but actionable representation of requirements data. In contrast, specific, concrete personas can address this challenge by bringing the data from contextual inquiry and ethnography to life for designers to use.

Personas have some drawbacks. It is difficult to verify that a persona accurately reflects user data [5] and challenging to pick the right personas [5,11]. It can also be difficult to initially convince a development team to use personas [21]. Despite these drawbacks, personas continue to be a popular method because of their power to engage designers and help them reason about user behavior.

DESIGNING FOR COLLABORATION: INDIVIDUAL PERSONAS ARE NOT ENOUGH

Our goal in this work was to design collaboration software for groups working in medium to large companies. Perso-

nas are the standard approach used to design software products within our company, in addition to providing the general benefits outlined above. We therefore started by following standard human-centered design processes involving personas, as outlined in [8,21]. Briefly, personas are created from data collected among user populations relevant to the design problem [7,8,21]. The data is analyzed to identify patterns of behavior which lead to categories of users. These categories are prioritized by the development team and product stakeholders. Finally, personas are fleshed out from the high-priority user categories with attributes from user data that are important to the design problem. Of particular importance in creating generative personas are the goals that underlie the behavioral patterns defining each user category [10].

Our first step was to study a sample of employees from a large company in a range of job types, to see how they collaborated. Our study is fully described in [17], but we briefly summarize here. The company was large, globally distributed and offered a complex array of technology products and services. We interviewed 21 employees drawn from hardware, software, sales, services, human resources, marketing, and communications. We used a semi-structured procedure to learn about participants' collaborations and their roles in the collaborations. We defined collaborations as activities in which people worked or interacted with others to achieve a work objective. Collaborations could also include activities that had more indirect effects on work, such as interactions in communities of practice.

We analyzed our interview data using open coding and thematic analysis. We then categorized interviewees into roles and their collaborations into types. This involved identifying behavioral and demographic variables that described each role and collaboration type.

The next step was to select our personas. Persona literature encourages designers to select one primary persona [6], perhaps a few [21]. But it also discourages putting personas in groups because it is a better use of scarce user experience team resources to create a broader set of personas representing variance in the user population [8]. At this point, we ran into our first problem when designing for collaboration:

- *Problem 1:* Which persona should we pick out of an entire group?

Not only did we discover that there were very different collaboration *types*, it was also obvious that people had different, but complementary *roles* within each collaboration type. In contrast to traditional personas where user types are independent, we discovered the importance of groups where the *interrelations* between people were critical. We therefore needed a cast of characters who comprised our collaborative group, each playing a different complementary role and providing specific expertise to the group. Characterizing each role and how they interrelated was critical to our understanding of how a collaboration tool would be used.

As an example, D., a Cross-Brand IT Architect, describes the various roles on a particular dynamic project team:

On the client side, there's a project manager... [External Company] is the contractor that is doing the development, so they have a project manager and a development team... On the [customer] side, there's all the normal support people you'd have over there for infrastructure, hardware, software, networks, security, you know, the whole nine-yards... There is an overall project manager, from [our company], that keeps the task plan and leads the calls both internally and with the customer. There are sales and technical leaders for hardware and software, which I'm the software one. Then we have lots of technical specialties that we bring to bear here. Java, mainframe, Java on the mainframe. (Laughs.) Different [proprietary] technologies, database technologies. There are a lot of the technical specialties that we're employing. Then there's the whole sales team...

- **Lesson 1:** Design for collaboration requires (a) multiple inter-related people who participate in the same group, and (b) elaboration of multiple *roles* within a group with different people contributing complementary expertise.

The next step in traditional persona design is to flesh out attributes that are important to the design problem. One critical attribute is the persona's *goals*. The literature argues that persona goals should be stable over time so that they can generalize to different scenarios [6,8,21]. However, our interviews revealed that individuals have many goals, some of which are not relevant to the group's main goal.

- **Problem 2:** What persona goals are critical when designing for collaboration?

Our interviews revealed that participants had multiple, diverse goals. For collaboration, the important goals were those that contributed to the group, i.e., that overlapped across members. Focusing on individual goals only seemed to be relevant insofar as these related to group objectives.

In interviews, when asked what the group's goals were, participants would describe a goal that all members were working toward. For example, one team was put together to *win a customer sale*. Certain individual goals mattered in this case. In particular, subject-matter experts pulled into the team were motivated to lend their expertise so they could *claim the revenue brought in by the sale*. They were personally motivated to do a good job to *build their reputation and increase their access to future sales opportunities*.

- **Lesson 2:** Design for collaboration requires (a) focusing on the collective goals of individual contributors and (b) elaborating individual goals that affect the accomplishment of this collective goal. Elaborating representative tasks makes these goals more concrete.

Finally, we realized that our individual personas did not capture critical aspects of the collaboration. More specifically, purely individual personas omitted a group's *work style*, which comprises the interactive aspects of the group.

Individual personas usually include a variety of attributes that describe the individual, depending on the needs for a

particular product [21]. Some common ones are basic details (e.g., name, photo), personal information (e.g., age, fears, personal goals), job information (e.g., typical tasks, professional goals, title, responsibilities, working environment descriptions), technology usage (e.g., skill levels with relevant technologies, technology attitudes), and consumer information (e.g., relationship with your product, market size) [6,21]. These attributes are not enough to describe collaborating groups, which include dynamics that should be considered in design [9,18].

- **Problem 3:** Individual personas overlook critical aspects of collaboration. How can we characterize interaction processes that are critical to collaborations?

Critical to understanding collaboration is what we refer to as *group work style*, i.e., the ways in which group members interwork. We categorized work style into three categories based on prior literature [15]. The first two were based on a core work deliverable, the third on communication:

- **Deliverable pooling:** members work independently until it is time to combine their work toward the group goal.
- **Deliverable co-creating:** members work closely together to collectively create work deliverables.
- **Communication-focused:** the focus is on interaction; members work independently and do not rely on other members to complete their work deliverables. This interaction may be focused on maintaining a relationship or on sharing information.

D., a Software Services Director, describes how her dynamic project team collaborates by pooling work:

"There are people who create individual documents and tools and processes and those pieces and parts are pulled together to make an overall project."

G., a Software Development Lab Manager, describes how his stable project team co-creates deliverables:

We're working on a shared document, but the input to that has come from lots of individual elements that members of the working group have created and contributed. The work group leader, who is not me, has been the point of integration of the content... We've been using email as the primary mechanism to... comment on the documents and the content as it's being created... So people will send around a draft copy of the report and people will mark that up.

For pooling and co-creating, many of our participants' activities involved coordinating with others to achieve collective goals. Coordination could involve recruiting people to staff a dynamic team, negotiations to ensure that group members were clear about collective objectives, status updates, awareness, discussing work dependencies and so on.

Also critical to collaboration is *management style*. This includes whether there is a leader and how decisions are made. For example, we found that certain collaborative groups had a democratic management style, where deci-

sions were made by consensus. This led to long discussions and inefficiencies, according to J., an Engineer:

...There are some things like a tactical roadmap that are too complex for democracy. Maybe this would have been better as a dictatorship. So a lot of different opinions, the compromise was satisfying everyone and the need to do something wasn't urgent. Not like the customer deals that I am working on now... No with the roadmap... we do not talk about the roadmap for next year... we talk about it for 3 years, and its too much discussion and not enough decisions. This was in addition to my main duties.

In addition to work style and management style, understanding collaboration requires information about organizational relationships among members, geographic distribution, and current tool usage. A persona must include these for it to be useful in collaboration tool design.

- *Lesson 3:* We need to add new attributes to personas that characterize *collaborative* aspects of a group's work.

What then can we conclude from applying existing persona approaches to collaborations? One repeated observation is that the *group* rather than the individual is the important organizational unit. Focusing on groups rather than individuals reveals the presence of different roles, how different roles interlock, how collective rather than individual goals are crucial, and how work style and management style facilitate effective group functioning. Groups rather than individuals are the critical unit of analysis, and our design approach needs to better reflect this.

We therefore propose a new design concept, *collaboration personas*, that is focused on *groups* as opposed to individuals. We illustrate this new approach with an example of a dynamic project team persona. In our interviews, dynamic project teams were the most common, mission-critical collaboration type relevant to the products we are designing.

COLLABORATION PERSONA EXAMPLE: A DYNAMIC PROJECT TEAM

Collaboration personas are precise descriptions of hypothetical groups with specific roles, goals, work style and management style. In this section, we use in-depth data on 13 real dynamic project teams from a study presented in [17] to develop an entire dynamic project team persona, explaining why content is included as we go.

The persona consists of several sub-sections, each detailing a specific attribute of the group. The *goals* help us understand *why* the group does what it does. *Members* tell us *who* share these collective goals. *Tasks* are one instantiation of the goals, helping us understand *what* the group does. *Work style* and *tools* show *how* they accomplish the goal, detailing specific ways that specific members interact, how they are managed, and what tools they currently use. Collectively, these sub-sections illustrate certain *collaboration needs*, and these are made explicit in their own sub-section. In the discussion, we explore how this content gives collaboration personas predictive power in the design process.

One key aspect of personas is that they should be *memorable*. Within most of the persona sub-sections, narrative details are provided to improve memorability and to help designers “get to know” the group. To help us craft these narratives, we borrowed particularly evocative descriptions of typical attributes of the group type from raw interview data (e.g., “lead cat herder” to describe a committee leader).

Goals

Both specificity and generality are important for personas. A defining characteristic of the personas approach is that individual personas include *very specific* information to avoid people invoking the “elastic user” who can be bent to suit edge cases or one's own beliefs [6]. Specific information also enables personas to be a powerful behavior predictor, since they facilitate the internalization of user models [10]. At the same time, personas need to include stable goals that can be generally applied in multiple scenarios.

This balance of specificity and generality is more challenging for collaboration personas. *Lesson 2* instructs us to focus on collective group goals. However, goals for groups formed to handle an objective are tied to a particular collaborative effort, introducing a problem of goal generality. For example, our dynamic project team persona is defined by the specific objective they are working on: winning a specific customer sale. The team was formed to accomplish that objective. This means that even the people and roles chosen to be on the team are defined by the specific objective. Thus, the objective is inherently tied to a particular context making it different from the types of goals included in individual personas. This blurs the line between personas and scenarios.

However, while the dynamic project team is an example of a group formed for a particular purpose, other types of groups have goals that are independent of a particular project objective. Groups with longer life spans such as communities or stable teams, tend to have general goals, that are more similar to the goals of individual personas

Despite sometimes having a more specific goal than individual personas, collaboration personas are more general than scenarios. Scenarios are concrete descriptions of how people accomplish particular tasks [4]. Collaboration personas set the stage for a group of people with a collective and potentially time-bounded goal to enact various scenarios. How exactly they accomplish even the most specific goals is sketched out at a high level. Also, the way a group does something *now* does not preclude them changing, e.g., if a new tool were introduced or a wrench thrown in their path by their customers or management.

Thus, collaboration personas can include specific goals that are representative of other goals the same type of team could address. These goals should not preclude the team doing different tasks or using different tools/features.

Group goal

This group of Global Corp sales professionals was formed for a

single, temporally-bounded purpose: addressing a customer need to make a sale. The customer, Rainbow Bank, has put out a request for proposals (RFP) describing a technical need for which they are accepting bids. Jeff and Quan, Global Corp's client relationship leaders for Rainbow Bank, have decided they have the time to respond and can provide a quality response. They need to pull together a rock star team to prepare a proof of concept demo and request for proposal (RFP) submission. Jeff already has a great relationship with Rainbow Bank's CIO and feels optimistic about their chances to win the sale by showing that Global Corp products will improve Rainbow Bank's operations.

- The team was formed to address a customer opportunity with Rainbow Bank. The ultimate goal is to close the sale.

Member goals

All members are aligned around a single goal—making the sale—since all sales employees are evaluated on the revenue they bring in. Each member is also motivated to improve his/her reputation as a good team member and strong expert in their areas, since this increases the number of sales opportunities they are asked to contribute to in the future (and also the revenue they bring in).

- Each member wants to ensure that their duties are fulfilled.
- As future dynamic team membership relies on reputation and expertise, each member wants to be helpful to team members and prove themselves as knowledgeable in their area. If they lack knowledge relevant to their area, they will seek help from their professional networks and communities of practice.

Typical tasks to accomplish the goal are also included. These are important to add concreteness, so that anyone presented with this collaboration persona can understand what the group needs to do to accomplish the goal. The tasks should be high-level enough that they make it possible to walk the collaboration persona through various scenarios.

Group tasks

- The team needs to develop a solid proof of concept demo and request for proposal (RFP) submission. The proposal consists of a presentation and a document describing Global Corp's best solution to the client's requirements.
- If Global Corp's proposal is accepted by Rainbow Bank, a pilot will need to be deployed and maintained on-site at the bank.
- The team needs to carry out extensive discussions and negotiations with the client, which tends to require several months.
- Throughout the project lifespan, customer questions and requests need to be addressed in a timely fashion.

Members and Roles

Lesson 1 tells us to include *multiple people* playing interlocking roles and providing different expertise. A group can comprise many people, but personas are labor intensive to create. Thus it is not feasible for design teams to fully specify each individual within a collaboration persona. Persona literature argues that details should be carefully limited to those relevant to the product being designed or that make the persona a generative tool, i.e., a tool to predict behavior in different situations [8,10,21]. For a collaboration persona, it is sufficient to include only member details that directly pertain to their participation in the group. At mini-

mum, this should include an individual member's name, role (including organizational details when appropriate), expertise, and goals that affect their group participation (see the "goals" section above for member goals). Sometimes select details about an individual's attitudes or skills may be relevant (e.g., that someone is a technology champion).

The presentation of members should also include a description of whether they are stable or dynamic. Stable group members remain for the group's entire lifespan. Dynamic members come and go depending on the group's need for their expertise. Other candidate information to include, depending on the product needs, is a description of the geographic distribution of members and their organizational relationships (both are included in the example below).

Members & roles

Members are either from the Sales division of Global Corp or the customer, Rainbow Bank. The team consists of a stable leadership sub-team, which comprises the original client relationship group (Jeff and Quan), and provides an importantly consistent point-of-contact for the customers (Sophie and Marie). However, these stable members do not have the range of expertise needed to close the sale alone, so it is critical to reach out and recruit other dynamic members with that expertise on an 'as needed' basis. Hence, this team is incredibly dynamic and flexible.

Most members are already trusted by the leadership team, and are recruited because of previous working relationships. A few members have not worked together previously, and are recruited by referral. People with particular expertise (e.g., brand specialists, subject-matter experts) are brought onto the team to contribute their expertise, e.g., to deliverables or to customer discussions. These dynamic members will only stay as long as they are needed.

Members are related by a matrix organization, so the team does not have a name or formal organizational identity. All members of the group work in different sites across three countries: the United States, Germany, and France. Global Corp is based in the United States and Rainbow Bank is based in France.

Leaders (stable):

- Jeffrey Thompson (Global Corp, Coverage Sales Rep): Rainbow Bank relationship leader for all software and hardware sales. Needs to be aware of all Rainbow Bank opportunities and is involved in any that include multiple products.
- Quan Lee (Global Corp, Coverage Technical Sales Specialist (TSS)): Technical leader for all software and hardware sales to Rainbow Bank. Needs to be aware of all Rainbow Bank opportunities and is involved in any that include multiple products.

Global Corp members (dynamic):

- Diane Stallman (EfficientWorker Sales Rep), Hans Strobbach (FastServer Sales Rep), and Wendy Liu (BestMiddleware Sales Rep): Handle sales related to their specific brands. Once introduced to a new client, they will maintain the management relationship pertaining to their brand's products.
- Brian Worther (EfficientWorker TSS), Hannah Bergmann (FastServer TSS), and Mateo Badillo (BestMiddleware TSS): Handle customers' technical issues related to their specific brands. Once introduced to a new client, they will maintain the technical relationship pertaining to their brand's products.

- Helen Johnson (Delivery Services): Works with the customer's IT specialists to deploy technology at customer sites.
- Tamam Srour, Elke Schmidt, and Stella Herbert. (Subject Matter Experts or SMEs): SMEs are recruited by members to provide expertise. Involvement ranges from answering a question to joining the team for a period of time to help with development or customer discussions.

Rainbow Bank members (stable):

- Sophie Bessette (CIO): The Rainbow Bank person who makes technology purchasing decisions.
- Marie Simon (IT Specialist): Rainbow Bank's technical person in charge of helping Sophie decide what the right technology is to purchase, issuing the RFP, and deploying new technology.

Work Style

Lesson 3 argues for introducing new attributes that characterize the group's work style. Since certain tasks demand specific expertise, we stipulate who will do the major group tasks and how they will work together (specifying pooled, co-created, or communication focused work).

Group work style

Work is highly collaborative and Global Corp sales people work closely with Rainbow Bank to define requirements. Production of the proposal and demo are the result of co-creation, with SMEs contributing elements to both, in line with their areas of expertise, and the core team unifying and critiquing the results of their work.

Because of their dynamicism and the RFP deadline, the team is high-energy and fast-moving. They quickly react and adapt to new customer requests and questions.

- The RFP response presentation and document will be co-created by the coverage sales rep and brand sales reps.
- The demo will be co-created by the coverage technical specialist and brand technical specialists.
- The final RFP response and demo will be pooled together by the entire team before being presented to the customer.
- A deployed pilot will be co-created by delivery services and the demo creators. Then the pilot will be deployed by delivery services and Rainbow Bank IT specialists.
- Additional requirements will be co-created by the Rainbow Bank members and the Global Corp leaders.
- Updates to the pilot will be co-created by technical specialists from both Global Corp and Rainbow Bank.

The next persona sub-sections are current tool use and collaboration needs. Several attributes of a dynamic project team—its focus on a core work deliverable, the dynamic nature of its personnel, and its work style combining pooling and co-creating—lead to specific collaboration needs. For example, dynamic members need to be found, recruited, and on-boarded. The team in this example is client focused, which also introduces collaboration needs, like maintaining communication with the customer.

Our example team currently addresses these collaboration needs with specific tools, which are discussed in the persona. The key objective of collaboration personas is to de-

sign tools that effectively address collaboration needs. Our persona captures representative tools used now, but also provides clear information about the frustrations and pain points experienced with those tools. We also characterize the team's more general technology attitudes.

Current Tools and their Problems

The team is somewhat old fashioned in their use of current technology, partly because they are just too busy to try and learn new tools. They rely on conference calls, email, and more conference calls. Occasionally, they use instant messaging for quick communication and to guarantee a response. They share information via email, but this is often frustrating as key information is buried in emails or attachments that are "somewhere" in people's inboxes.

Another problem is that dynamic members, who are coming and going, need an easy way to get up to speed with core project materials. They've tried to solve this problem by setting up a repository to share files, but Jeff is frustrated since he feels like he is the only one adding files and is constantly nagging others to do so. Most of the time, people just send around files as email attachments. This is compounded by not having a repository that works across organizational boundaries, so when they share with customer members, they are forced to use email.

Conference calls are frustrating: slides for meetings are often sent via email minutes before, and the group has trouble co-creating without a good tool to interactively share materials in real time.

Collaboration needs

- Easily and securely share materials (e.g., documents, demo code) with internal and external members.
- Find and recruit trustworthy people, who have specific expertise and good reputations.
- On-board new members, i.e., get them up-to-speed on necessary client information and the status of the project.
- Capture outputs and required knowledge from dynamic members who have completed their tasks for the group.
- Co-create materials, e.g., the RFP document and demo code.
- Maintain awareness of members' task status.
- Keep an open communication channel with the customer.

Other Attributes

So far our collaboration personas have included only attributes that are essential to behaviorally distinguishing collaborative groups. However, a key property of individual personas is that these need to be concrete, memorable, and distinct [21]. Two important attributes discussed in prior literature are a name and photo [6,21]. Collaboration personas should also have a name when appropriate. One dilemma is whether the team should be named as its members would refer to it (in this case our example might be called "Rainbow Bank RFP Team") or with a name memorable and meaningful to the development team (our example might then be called "The Dynamic Sales Team"). We recommend a combination approach: "Rainbow Bank RFP Team (a dynamic sales team)."

A photo for a group is more challenging than for an individual persona, though valuable for all the same reasons.

The best approach would be to have one photo per member as well as photos of the appropriate members interacting on the main group tasks. We exclude photos in this paper due to space constraints.

Other attributes could be supplied to help development teams explore characteristics that are important within their specific user population. For example, these could include national culture, corporate culture, certain skills or expertise, technology adoption tendencies, how well group members get along, and so on.

COLLABORATION TYPES

To illustrate collaboration personas, we have discussed a single example based on dynamic project teams. However, the standard individual personas approach involves preliminary user research to identify *categories of users* based on user roles, goals, or market segments (which can be defined by any attributes of interest to stakeholders) [21]. Our research identified other *collaboration types* that are distinguished by collaboration-specific behaviors [17]:

1. **Dynamic project team.** A group of people, where some members stay the same but most members come and go during the life of the project, working closely together toward a common deliverable that is a job related focus for its members.
2. **Stable project team.** A group of people, where most members stay the same, working closely together toward a common deliverable that is a job related focus for its members.
3. **Committee.** A group of people working closely together toward a common deliverable that is secondary to most members' main job focus.
4. **Client-supplier relationship group.** A stable group of people from both client and supplier who communicate on an ongoing basis to ensure the supplier meets the needs of the client.
5. **Community.** A group of people with similar job functions or a shared interest, who come together to exchange knowledge, information, best practices, and possibly to

spark new collaborations.

6. **Professional relationships.** A professional relationship focused on communication between two individuals, typically with minimal formality or structure. Common purposes for professional relationships include mentoring, finding collaborators, building one's reputation, and/or getting answers and feedback

Consistent with the collaboration personas approach, our study revealed four main attributes that distinguished collaborative behaviors, leading to the types above (see Table 1 for how these attributes apply to collaboration types):

- their *goals* (which can be objective-, interest-, or relationship-oriented; and core or secondary to most members' job responsibilities),
- whether *personnel* are stable or dynamic,
- their *work style* which can involve pooling work, co-creating, or communication around relationships or information sharing, and
- their *leadership style* (having designated leader(s) or being democratically run).

So far we have presented examples from a single type of collaboration, the dynamic project team. We now present examples from other team types to illustrate further aspects of the collaboration personas approach. The examples show how the approach generalizes to different collaboration types, and how key differences between collaboration types can be represented in different collaboration personas.

Other Examples of Collaboration Personas

In this section we include short sections from some of the other collaboration types—client-supplier relationship group, community, and committee—that illustrate their differences. We exclude stable project teams and professional relationships due to space constraints; stable teams are well-documented in the literature [10] and client-supplier relationship group shows the key aspects of a collaboration that is communication-focused toward a relationship. To save space, most of our examples relate to the people from our dynamic project team persona. Also, note that the examples below are not fully elaborated—they are snippets chosen to illustrate main differences.

Client-Supplier Relationship Group

Client-supplier relationship groups are different from project teams in their main work *goal*. This focuses on maintaining a critical work relationship with the client (see “group goals” in the example below). This goal affects the *work style*: interaction centers around communication between the client and supplier since there are no concrete deliverables to work toward (see “group work style” below). However, when new engagement opportunities arise, the relationship leader on the supplier's side will want to take action by initiating a dynamic project team. These goals and work style lead to “collaboration needs” focused on communication and awareness.

Table 1. Collaboration types and their distinguishing dimensions.

| | Goal | Personnel | Work Style | Leadership |
|-------------------------------------|-------------------------|---------------------|-----------------------|--------------------|
| Dynamic project team | Core deliverable | Dynamic | Pooling & Co-creating | Designated leaders |
| Stable project team | Core deliverable | Stable | Pooling & Co-creating | Designated leaders |
| Client-supplier relationship | Core relationship | Stable | Communication-focused | Designated leaders |
| Committee | Secondary deliverable | Stable | Pooling & Co-creating | Democratic |
| Community | Secondary interest/role | Stable &/or Dynamic | Communication-focused | Designated leaders |
| Professional relationships | Secondary relationship | Dynamic | Communication-focused | N/A |

Our example below is the stable client-supplier relationship group that initiated our dynamic project team persona: it comprises the Global Corp leaders (Jeff and Quan) and the Rainbow Bank delegates (Sophie and Marie).

Group name: Rainbow Bank - Global Corp Relationship Team

Group goals

- Maintain a positive relationship between Global Corp (supplier) and Rainbow Bank (client).
- Ensure Rainbow Bank’s needs related to Global Corp solutions are being met.
- Identify new solutions, or upgrades to existing solutions, that Global Corp can offer Rainbow Bank to improve their business (i.e., opportunities for new sales to Rainbow Bank).

Group work style

- Jeff will regularly ask Sophie about Rainbow Bank needs and inform her of relevant new Global Corp offerings.
- Marie will sporadically contact Quan with technical questions regarding Global Corp technology.
- Jeff and Quan will regularly, informally communicate to keep each other aware of sales leads.
- When new opportunities arise, Jeff and Quan will meet to decide whether to pursue it and to plan the initiation of a dynamic project team to go after it.

Collaboration needs

- Keep open communication channel between client and supplier.
- Maintain awareness of client changes that open sales prospects.

Community

Communities are very different from project teams because they are not focused on core work deliverables. Instead, communities are focused on the exchange of ideas and best practices (see “group goals” in the example below). This affects their *work style*: members work independently and come together mainly to share information (see “group work style” below). Because of this independent work style, multiple sections of the persona are broken down by role (sponsors, members, and community leaders): work style (see example below) member goals, group tasks, tools, and collaboration needs (not shown due to space constraints).

Our example is the Financial Industry Community in which many members of our dynamic team persona participate.

Group name: Financial Industry Community (a.k.a. “Financial”)

Group goals

The financial industry is a large source of income for Global Corp, who develops servers for storing financial data and software for managing the data. It is critical to keep employees up to date on Financial-relevant information, technology updates, process changes, and so on. Due to Global Corp’s highly matrixed organization, employees work on projects across departmental boundaries. Financial-focused employees cannot always turn to peers in their own department with Financial-related questions or requests. Thus, those who work with the financial industry form a loosely-knit community of practice who need to manage their own knowl-

edge repository and educational programs.

- Allow Global Corp employees to share information, Q&A, and best practices related to the financial industry and clients.
- Connect workers for networking, social, awareness, and project opportunities (in particular, the large number of dynamic project teams that work on solutions for Financial customers).

Group work style (*Note: we exclude the section on roles due to space constraints, but the roles are also listed here.*)

Financial is an active and successful community. It has nearly 200 members, with a relatively small number of active members (about a dozen) contributing most of the content. Members work almost entirely on their own projects, mainly sharing outcomes, knowledge gained, and best practices with the community. Members are active in responding to others’ questions, too—usually someone can find the time to contribute. Sometimes members will collaborate. This typically happens when a member is part of a dynamic team that needs someone with specific financial industry expertise and they use the community to find such an expert. Participation in the community is often seen as “career enhancement,” since it opens the door for future beneficial collaborations.

- *All members:* (1) Independently consume shared content. (2) Some independently contribute content to the community’s shared space. (3) Some will discover others and initiate friendships or collaborations.
- *Community leaders* co-create materials and co-organize events for the community.
- *Sponsors* meet with community leaders to assess progress.

Committee

Committees are the only collaboration type that has a democratic *management style* (see “members & roles” and “work style” below). The effect on committees’ *work style* is that they are discussion-oriented and consensus-driven. This often proves less than ideal for producing a deliverable since it can lead to inefficiencies (see “work style” below).

Group name: Global Corp Services Dept. Promotion Committee

Group goal

- Identify outstanding performers within the Services Department and make decisions about who to promote.

Members & roles.

- *Leader:* Lucille Boltz (Services Dept. VP). Lucille is the “lead cat herder.” As this title hints, she must use her charismatic personality to wrangle decisions out of sub-committees and manage decision deadlocks when the full committee meets.
- *Members:* Tony Maldonado, Diana Rios, Chen Liu, Stacy Burke, Jose Vega, Blake Norman. Each member is a manager representing a group within the Services Department.

Group work style

The group is run as a democracy, i.e., it is consensus-driven. With the set of personalities assembled, consensus is often hard to come by and debates tend to be drawn out. All members are incredibly busy, so Lucille initiates the process long before decisions are due. Members live around the world, so all collaboration happens on the phone and via email. They follow this process once per year:

- Independently, each member identifies promotion candidates from their department and ensures that the committee has a

promotion application for each candidate.

- The members split up into three sub-committees of two people each. Each sub-committee reviews a set of candidates and puts forth recommendations to the full committee. Sub-committee pairs pool what they know about each candidate and work very closely in meetings to make decisions.
- Sub-committee members present their recommendations and the entire committee discusses in order to whittle the list of candidates down. Long debates ensue and the group often falls behind schedule. If no consensus can be reached over a particular candidate, the group will vote. Lucille mediates the votes.

DISCUSSION

We have developed a new, empirically motivated design approach to address adoption problems with collaboration tools. We believe that collaboration personas can transform the design process for collaboration tools. In the following, we discuss how collaboration personas differ from individual personas in what makes them generative, when and how to create new collaboration personas, and design implications that collaboration personas highlight.

Distinguishing Collaboration and Individual Personas

Collaboration personas are better suited to support design for collaboration than individual personas because they model distinct types of collaborating groups. In particular, they (1) include multiple inter-related personas playing different *roles* in the same group; (2) focus on the *collective goals* that affect the accomplishment of this collective goal; and (3) introduce new attributes to personas which characterize *collaborative aspects* of the group's work.

Personas work because they evoke our human ability to create and use unconscious *models* of other real and fictional people [10]. These models are generative, i.e., they enable us to predict how the modeled person would feel or act in different situations [10]. Abstract methods, like scenarios and task analysis, do not evoke the same empathetic thinking [7,10]. The attributes that are most critical to creating a generative persona are *goals*, because they are the primary drivers behind behavior [7,10]. Their full predictive quality comes from helping designers internalize a holistic model of the persona. This requires enough detail to enable designers to feel they “know” the persona [10].

Collaboration personas, in contrast, cannot completely rely on goals to provide the crux of their predictive power. We have found that the dimensions in Table 1—personnel dynamicism, work style, and management style—are particularly important for describing major differences in collaborative behavior. Reasoning about these attributes can help designers predict how groups will react to new technology. As with individual personas, the predictive power of collaboration personas is fully realized with enough concrete details to enable designers to build a complex, internal model of the group with which they can engage. This is why we included narratives at the beginning of most persona sections describing aspects of the group's personality,

such as their “old fashioned” technology attitudes or that the members were identified by the leaders as “rock stars.” In future work, we plan to make our personas even more concrete by scripting example dialogue from key interactions, something that is uniquely possible with collaboration personas since they include multiple members.

When and How to Create New Collaboration Personas

The four dimensions in Table 1 model differences in collaborative behavior, defining a minimal set of collaboration personas—i.e., one for each of the six types defined above. Other dimensions, such as national culture or technology attitudes, could lead to many more collaboration personas, although we would not expect these to dramatically change the *types* of collaboration. The importance of other dimensions is dependent on the design problem and population being designed for.

The collaboration dimensions listed in Table 1 also help us determine how to create new collaboration personas that are specific enough to work as personas but general enough to enact various scenarios. We should be able to create a new collaboration persona of the same collaboration type (e.g., a second dynamic project team) that has all the same behavioral attributes (e.g., focused on creating a core work deliverable, with dynamic personnel, etc.) with the same associated needs (e.g., ability to co-create, finding and onboarding personnel, etc.), with a *different specific goal*. In other words, there are a sizable number of specific goals that would be accomplished in the similar ways. For example, another dynamic project team might have a goal to *produce content for an online news website*. This goal works as long as it is a core work deliverable for members, dynamic members are asked to contribute, members need to work closely together, and there are designated leaders.

Design Implications of Different Collaboration Personas

The goal of personas is to guide design. Collaboration personas therefore need to capture the characteristics of different types of groups in ways that will allow developers to generate new designs. Here we illustrate how different personas lead to very differently designed collaborative tools.

The dimensions in Table 1 represent the main differences in collaborative behavior and also in tool needs. With regard to goals, deliverable-focused groups (stable and dynamic project teams, committees) need tools that support co-creating and pooling work. They will also need to closely coordinate activities around deliverables, such as project management tools. In contrast, communication-focused groups (client-supplier relationship groups, professional relationships, communities) need a variety of communication channels, ranging from a rich open channel for client requests to unobtrusive broadcasts for community news.

A critical aspect of groups with dynamic personnel (dynamic project teams, communities) is that SMEs are recruited as needed. Often, members recruit through personal connections, but expertise location and dedicated social networking tools would also help. Groups need ways to

bring dynamic members up-to-speed when they begin. These needs are not critical in groups with stable personnel.

Finally, groups that are not a primary work focus for workers (committees, communities, professional relationships) need help mitigating challenges of attention overload and motivation. These collaborations need to provide value and motivate participation, without overloading members.

Researchers could have drawn these implications from abstract models of the collaboration types. However collaboration personas bring these implications to life and make them concrete for product developers and stakeholders. Also, collaboration personas enable designers to predict how the group that is central to their design might react to specific new technologies. For example, would the Dynamic Sales RFP Team welcome a new tool to co-create documents? Given the time constraints of the group, combined with the fact that dynamic members are only part-time focused on this project, and that the team as a whole is old-fashioned with regard to technology, such a tool must be incredibly easy to learn and set up. When might this team use an SME location and recruitment tool? It could be invaluable if it made it easier to maintain their responsiveness with the customer, given the mission-critical nature of finding specific expertise quickly and the unpredictability of what Rainbow Bank might ask for. These examples illustrate how a precise, detailed collaboration persona can help designers reason about collaboration tool design.

Another way to identify design implication comes from analysis of each collaboration persona, comparing the disparity between collaboration needs and pain-points experienced by the group. For example, our dynamic team persona describes difficulties the team experience in sharing information and recruiting new members. In contrast, our committee experienced difficulties in making decisions.

CONCLUSION

We have introduced and motivated a new design tool: collaboration personas. This shifts the design focus away from *individuals* to *groups*, to address recurrent problems with the design of collaboration software. Ultimately we believe that the most stringent test for any persona is how well it enables designers and developers to design and evaluate potential new technology. In future work, we intend to implement and evaluate the designs collaboration personas have helped identify.

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