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Design Considerations for a Virtual Community of Practice for Health Practitioners: A Learner Centred Design Approach

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Abstract

Online social networks are increasingly utilised by health practitioners, leading to development of virtual communities of practice (VCoP) where practitioners share knowledge and learn from other peers in the network. Yet, there is limited research on identifying design methods to retain participation in health VCoPs based on the learning theory imposed. Currently, research is focused more on health practitioners' behaviour when using the virtual community and not the tool itself. In this study, we propose a conceptual model based on the Learner Centred Design approach to designing a health VCoP in order to increase participation sustainment of the learning community. Expected outcomes of this study would validate the design considerations put forth and can be used as guidelines for future research as an evaluation metric for current and future Health VCoP projects.

Keywords Virtual Community of Practice, Health Practitioners, Learner Centred Design, Social Constructivism Learning

1 Introduction

There has been widespread use of new communication technologies that support groups of individuals with related interests to gather online and pursue their shared interests (Cummings et al. 2002; Fan et al. 2014a; Lederman et al. 2014; Preece 2000; Sproull and Arriaga 2007). Online communities have a strong impact on learning and knowledge sharing/creation competencies (Holmström and Henfridsson 2006; Majchrzak et al. 2013; Yoo et al. 2010). The concept of having a group of individual professionals working together to learn and increase their knowledge about a shared topic on a continuous basis is called a “Community of Practice” (CoP) (Wenger 1998; Wenger et al. 2002). In this research-in-progress paper, CoPs using the Internet as a platform become a “Virtual Community of Practice” (VCoP) (Snyder and Wenger 2010).

Previous studies on health practitioners using VCoPs, however, focused more on members’ behaviour on using these communities (Lederman et al. 2014; Rolls et al. 2016) rather than the tool itself and how it can increase participation that fosters learning habits. To maximise the potential of healthcare in CoPs, a greater understanding of how to sustain CoPs is needed (Ranmuthugala et al. 2011). Sustainment is keeping members of a VCoP engaged to contribute in discussions (Wenger et al. 2002). Interaction is vital to increase the learning experience (Dewey 1938; Vygotsky 1978) especially in a VCoP environment with a specific learning theory (Snyder and Wenger 2010; Wenger et al. 2002). Hence, to create and maximise the effective use of VCoPs, a greater understanding of the influence of the learning theory imposed needs to be recognised and utilised.

Social constructivism is a form of learning in a CoP (Wenger 1998; Wenger et al. 2002) and can be seen as valuable for the learning process, yet limited guidelines exist for its application and evaluation in VCoPs (Bonk and Cunningham 1998; Kukla 2000) as researchers are still developing frameworks to gauge the learning usability (Barak 2016; Phillips et al. 2016). Social constructivism learning theory states that learners need to develop an understanding of the work context and culture by being actively engaged (Quintana et al. 2000). The Learner Centred Design (LCD) approach, by Soloway et al. (1994), encapsulates social constructivism as a fundamental building block for designing software. LCD relies on the audience, the problem, issue or barriers, and the solution to each problem, issue or barrier design paradigm mediated by scaffolding (Quintana et al. 2000). Scaffolding refers to elements that provide support (human or computer support) to learners via tools that increase or enhance their learning outcomes (Quintana et al. 2000). However, a VCoP must take into consideration both individual and group users’ needs (Snyder and Wenger 2010; Wenger 1998; Wenger et al. 2002).

This research-in-progress paper does not focus on the behaviour of using a VCoP but rather on the design considerations for a Health VCoP, derived from the literature, to sustain the learning community. The main research question is: *How do key individual and group Virtual Community of Practice (VCoP) design considerations impact on the sustained learning practices of practitioners in a Health VCoP?*

To answer this question, this research-in-progress paper will use the proposed conceptual model in guiding researchers and developers in designing a Health VCoP prototype. Then, a group of health practitioners will give feedback on the prototype in a qualitative focus group session. A re-evaluation of the proposed conceptual model and validation will occur. Finally, the prototype will be launched for a period of three months to evaluate and validate the proposed design considerations. Identifying and understanding the needed design for a learner centric Health VCoP can aid future researchers in developing their own Health VCoPs and can be used as an evaluation metric for current and future Health VCoPs.

This research-in-progress paper is structured as follow: First, it reviews the background literature. Second it presents the theory and methodology used to derive the design considerations from the literature to sustain learning in a Health VCoP. Finally, the study outlines current and future work, potential contributions, and implications for future studies.

2 Background Literature

2.1 Virtual Community of Practice and Social Constructivism Learning

2.1.1 Learning in a Virtual Community of Practice

Wenger et al. (2002) define a CoP as “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in the area by interacting on an ongoing basis”. The idea of CoP takes the literal meaning of community and extends it to include

deepening ones knowledge and expertise with an ongoing process of communication between the participants (Wenger et al. 2002). This concept has been extended to businesses (Hildreth et al. 2000; Wenger and Snyder 2000), education (Boulos et al. 2006; Tight 2004; Wenger and Snyder 2000), and health (Boulos et al. 2006; Li et al. 2009; Rolls et al. 2016). CoP has become a conceptual framework to understand learning activities in work practices. It consists of three dimensions which are: domain, community, and practice (Snyder and Wenger 2010), these three dimensions explain the strength and effectiveness of a community's social learning system:

- **Domain:** A CoP concentrates on a specific “domain”, which gives it identity and meaning (such as reducing global warming, increasing science advancement in stem cell research, etc) (Snyder and Wenger 2010). Dedication and devotion to the domain is important by members of the CoP and must not be an abstract, uninteresting experience (Snyder and Wenger 2010). The domain is usually a deep part of the member's personal identity and gives meaning to their life's work (Snyder and Wenger 2010).
- **Community:** This element consists of the community itself and the relationship quality that connects the members together (Snyder and Wenger 2010). Ideally, the diverse amount of background involved in the community would lead members to be up front with leading-edge innovation in their domain (Snyder and Wenger 2010). Community coordinator and a core group are key success factors for an effective leadership in the CoP. Diversity of the community leads to a strong foundation in learning and collaborative instances, this is fuelled by members “feeling of community” (Snyder and Wenger 2010).
- **Practice:** The practice develops as members of the community start sharing their knowledge about a specific domain and over time this develops into the CoP's specific practice (Snyder and Wenger 2010). Elements of a CoPs' practice can come from its collection of tools used in the practice, frameworks that members' use, methods being used, and stories being shared among the members – as well as any activity that involves learning and innovation (Snyder and Wenger 2010).

All previous mentioned dimensions are used as an analytical lens for understanding CoP in general and their learning behaviour specifically. A CoP evolves via social networking sites into a “Virtual Community of Practice” (VCoP) (Snyder and Wenger 2010; Wenger et al. 2002).

Health VCoPs are currently used for the purpose of learning were either created by using an already developed social network (i.e. Yahoo! Groups) (Hara and Hew 2007), or using an online social software based on simplicity of using and administering the technology (Barnett et al. 2014). Another study by Mendizabal et al. (2013) used a customizable software for adapting to requirements from participants, but failed to mention what type of factors were needed to sustain the learning in the Health VCoP from a tool perspective. This can be explained by having current research focused on a medical view-point in behaviours in using Health VCoPs (Rolls et al. 2016) rather than the VCoP itself as a catalyst for increasing the learning process to sustain the Health VCoP. Generally, the learning process and participation of individuals in a VCoP is based on the social constructivism learning theory (Wenger 1998; Wenger et al. 2002).

2.1.2 Social Constructivism Learning

Social constructivism learning theory explains that learning does not happen in a vacuum, but must happen within some domain context so that over time learners develop an understanding of the domain context and culture (Quintana et al. 2000). The learners gain knowledge of the domain context by continuous participation so they can understand the common practices, tools, languages, and values of the professional culture of the said domain (Soloway et al. 1996). This gradual learning process was categorized by Lave and Wenger (1991) as “legitimate peripheral participation” and identified this relational context to occur in a CoP. The learning procedure in a CoP can be understood from a social constructivist viewpoint (Jeon et al. 2011).

One factor to consider for learning in a VCoP is the ability to sustain the learning activity especially for a community of practitioners with specific requirements (Snyder and Wenger 2010; Wenger 1998; Wenger et al. 2002). Information Systems (IS) professionals have had to make choices about technologies that facilitate online discussion communities, and such communities are naturally difficult to develop, manage, and sustain over time (Butler et al. 2014). In healthcare, how learning is occurring in online social networks is yet to be understood, and it is a challenge to design and facilitate the learning that transpires (Li et al. 2016). Thus, the need to increase the learning online participation between the participants is important (Snyder and Wenger 2010; Wenger 1998; Wenger et al. 2002).

Woo and Reeves (2007) propose in their Human-Computer Interaction (HCI) study, a method on how to increase the participation of learners within Web-based learning environments, in this case a VCoP for health practitioners, by gaining an understanding of the learners involved (e.g. health practitioners) and then identifying required design considerations for implementing a Web-based learning environment. The learning theory imposed on the VCoP entails that designing needs to be distinct for individual and group learning (Wenger 1998; Wenger et al. 2002), thus the design considerations would need to be distinct for individual and group designs, and both combined would form the Health VCoP design considerations.

3 Theoretical Perspective

A theory that can meet users specific needs is the Learner-Centred Design (LCD) approach for software development commonly used in asynchronous interactions (Hsi and Soloway 1998). LCD, by Soloway et al. (1994), aims to “support individuals and groups of individuals in developing expertise in their professions, in developing richer and deeper understandings of content and practices.” The challenge is the enhancement of users learning by using computers and that is the goal of the LCD approach (Soloway et al. 1994). LCD involves designing software (i.e. an online learning Web site) that integrates work assistance tools (or scaffolding tools) informed by the social constructivism learning theory (Blumenfeld et al. 1991; Quintana et al. 2000; Soloway et al. 1996).

The LCD approach relies on three features: the targeted audience of each design paradigm, the main issue being addressed in each design paradigm, and the primary solution by each designed paradigm that takes to solve the problem (Quintana et al. 2000). The solved design paradigms need to focus on three main functions to reach its goal of developing the learner’s comprehension and expertise: 1) Tasks that the learners need to do; 2) Necessary learner tools to use for given tasks; and 3) The interface for these tools that act as the system for the learners involved (Soloway et al. 1994). In addition, scaffolding supporting individuals’ learning is needed for all three main functions as learners usually lack an understanding of the work domain and mediators are there to support the learning process (Quintana et al. 2000; Soloway et al. 1994). Scaffolding commonly found in the literature are either expert users, moderators, administrators/technical staff, or objects on the interface (e.g. help tips and hints), all working to support and increase the learners learning processes in the environment (Choi and Hannafin 1995; Soloway et al. 1994).

4 Methodology

4.1 Research Methodology

This research-in-progress paper follows a qualitative research methodology consisting of three major phases: 1) A detailed literature review; 2) Synthesis of a conceptual model of a Health VCoP design considerations; and 3) Testing of the conceptual model through a series of in-depth qualitative interviews as part of case study work. Having completed phase 1, this research-in-progress is currently in its second phase and reports on this phase in this paper. By combining from the literature the understanding of a VCoP, the learning process of social constructivism, the need to use a method to increase participation to sustain learning in a VCoP, and the use of LCD to compliment all previous mentioned concepts, we synthesized from the former bodies of the literature a conceptual model (see right-hand side of Figure 1 below) that identifies the key design considerations that influence the design of a VCoP for health practitioners.

For phase 3, a qualitative data collection and a case study method will be used. Data will be gathered from focus group semi-structured interviews, online discussion transcripts, and face-to-face semi-structured interviews. The interview transcripts will be made into themes and analysed via discourse analysis (Fairclough 2013). Participants’ online discussion transcripts will be made into themes and analysed to obtain frequency of use and to observe their navigation pattern in order to get their interaction and participation patterns in the online learning environment. Face-to-face interviews of some participants will also be conducted for further insights. Interviews will be 30-40 minutes long and 2-3 focus groups will occur. Resulting themes will be grouped into the relevant propositions mentioned previously and the design considerations will be evaluated. The case study approach (Yin 2003) will be used. A case study approach helps in understanding a phenomenon in a real-life context especially a complex social phenomena involving a group of people (Yin 2003).

4.2 Conceptual Model

From Figure 1, the target audience of the LCD are broken into individual and group design considerations for the VCoP (Wenger 1998; Wenger et al. 2002). Each design consideration will discuss the problems/issues/barriers that impact on VCoP design and identify later in this section how these problems/issues/barriers can be solved. Expectations are that human roles will scaffold (or in this diagram as “moderators”) to achieve the aim of sustained learning in the context of a Health VCoP.

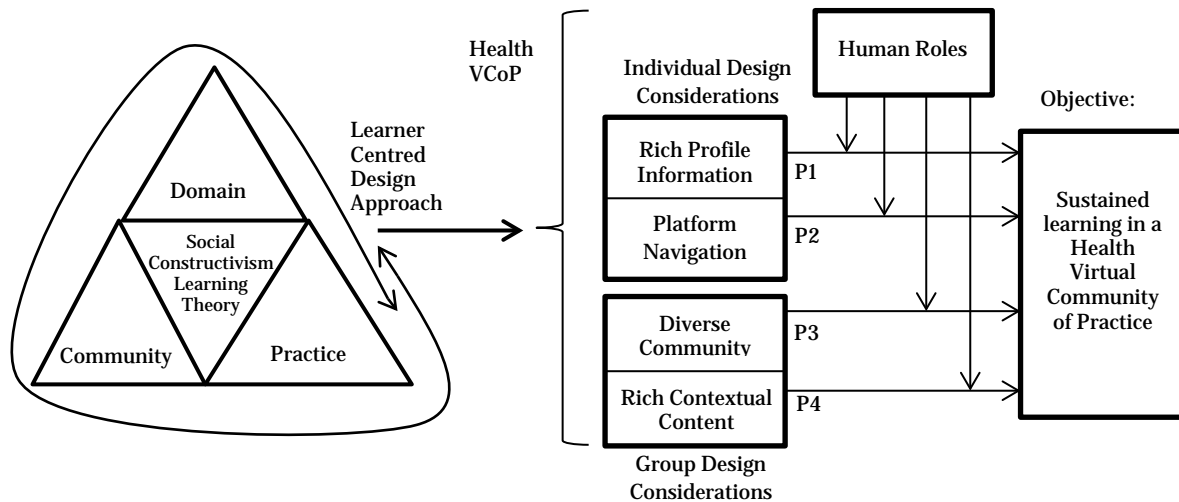


Figure 1: Proposed conceptual model for designing a Health VCoP

4.2.1 Individual Design Consideration: Rich Profile Information

Health practitioners may not consider identity development important and rather focus on information-sharing and creation as CoPs are mostly used as a managerial tool for improving quality of care or continuing professional development (Li et al. 2009). A mixture of online and face-to-face meetings is sometimes needed to establish some form of identity yet it can still be difficult when dealing with health practitioners in remote and rural areas due to time constraints (Barnett et al. 2012; Barnett et al. 2014). Another issue is building trust with other participants in a VCoP, participants can stop trusting other members when they lack credentials or sources of the information given (Tunnecliff et al. 2015) especially evidence-based research (Ho et al. 2010) and may pose risks of communicating or receiving harmful advice effecting their overall satisfaction and participation in a VCoP (Jiménez Zarco et al. 2014). In a CoP, establishing individual identity can help mitigate issues such as remote and rural practitioners and trust issues with participants (Wenger 1998; Wenger et al. 2002).

A customized profile can help in providing individual identity for users' personal style and opens up social networking opportunities for those involved in the network (Toma 2010), leading to enriching the presentation of content for the users and increasing their self-experience in social networks (Stephanidis 2001), and acts as a core component for sociability with other participating users (Merolli et al. 2013). Tasks such as adding the first and last name can increase participants' reputation which is important in creating an identity in an online network leading to increasing trust (Ardichvili et al. 2003) and embedding themselves in the network (Wasko and Faraj 2005). Simple editing tools available for users can help in customizing their own profile with ease and increasing their perception on their user experience in using the interface tools (Stephanidis 2001). Human roles will moderate and assist new and current learners in adding profile information that is needed (i.e. via email, private notifications) (Hansen et al. 2010; Safko 2010).

Proposition 1: Rich user/learner profiles, moderated by human roles, increases user participation in a Health VCoP, leading to a sustained learning community.

4.2.2 Individual Design Consideration: Platform Navigation

Lack of computer and internet skills is reported as a barrier to online learning opportunities (Gagnon et al. 2007; Ghosh et al. 2016). Lack of technical skills for some health practitioners also had an impact on knowledge and skills in accessing VCoPs (i.e. password problems not registering) and posting (discussion boards not responsive) (Curran et al. 2009). This forces health practitioners in not

using a VCoP for learning purposes and rather choose the safe option of traditional learning (conference learning) (Ruf et al. 2009), or worse focusing on alienating the older generation of health practitioners and focusing research on the younger generation who are more tech savvy (Wang et al. 2012). Some knowledge repositories for a specific group of health practitioners to access evidence-based research have failed due to difficult navigation of the platform (Fan et al. 2014b).

Designing a virtual community requires users' needs as input for an easy to use platform to navigate through (Munro et al. 2012; Xu et al. 2006) as there is a need to assess the users' technical skills when designing a VCoP (Guldberg and Mackness 2009). Tasks in providing help tips, hints (Öksüz et al. 2014; Sammel et al. 2014), or a video tutorial embedded in the interface for new users can help participants learn how to navigate the platform (Grossman and Fitzmaurice 2010). Positioning of tools is important for participants as illogical settings of tools for navigation can and will lower usage of any user (Hansen et al. 2010). Failure of navigation may cause networking members to stop using the network outright (Liu 2010) effecting both health practitioner curators and users alike (Fan et al. 2014b). Human roles will mediate and support any new or current users in learning about the platform navigation as it is one of the facilitator role for social media networks (Hansen et al. 2010; Safko 2010).

Proposition 2: An easily navigable platform, moderated by human roles, increases user participation in a Health VCoP, leading to a sustained learning community.

4.2.3 Group Design Consideration: Diverse Community

Studies report that a small group of health professionals are needed for the activity of the VCoP (Barnett et al. 2014; Curran et al. 2009; Mendizabal et al. 2013; Norman and Huerta 2006; Rolls et al. 2008; Thomas et al. 2010). Other studies also mention the "lurker", "passive", and "silent" role that many users have in the VCoP as they still see some benefit by observational learning from active peers (Barnett et al. 2014; Brooks and Scott 2006; Curran et al. 2009; Mendizabal et al. 2013; Milne and Lalonde 2007; Rolls et al. 2008; Sharma et al. 2006; Thomas et al. 2010; Valaitis et al. 2011). However, this activity and sustainment of learning hinges on the activity of the small or core group of the VCoP (Rolls et al. 2008), and may lead to dominance of one specific health profession demotivating other health professions in the learning process (Curran et al. 2009). Another issue is having the same stream of health professionals learning together (i.e. General Practitioner Trainees only), which leads to lower participation due to no benchmarking of their learning with expert users and senior peers (Barnett et al. 2014).

Providing a diverse non-competing community of health professionals to learn together can increase their satisfaction due to the opportunity of making a network of new connections, results an increase in their participation in the VCoP (Barnett et al. 2014; Jiménez Zarco et al. 2014). Tasks for instilling some form of non-competitiveness and empowering users' identity can come in the form of posting an introductory topic and inviting everyone to post a welcoming message for all to see (Barnett et al. 2014; Brooks and Scott 2006; Curran et al. 2009; Mendizabal et al. 2013). The topics of introduction should be visible for all users and usually pinned at the top for easy access to everyone (Hansen et al. 2010). Human roles need to promote the community (via social media outlets) to raise awareness of the benefits of joining a VCoP for learning and making new contacts with trusted peers (Barnett et al. 2013). Human roles also need to moderate the discussions with the right tools to stop and block users' actions to maintain the community's integrity and worth (e.g. sharing patient information) (Faraj et al. 2015; Wasko and Faraj 2005).

Proposition 3: A diverse community, moderated by human roles, increases user participation in a Health VCoP, leading to a sustained learning community.

4.2.4 Group Design Consideration: Rich Contextual Content

Health practitioners may lack confidence in their own knowledge and eschew in sharing their knowledge for the learning community (Barnett et al. 2012; Rolls et al. 2008). This can stem from the quality of content provided in the VCoP as not useful or already known which lowers participation for health practitioners involved (Kaufman and Mann 2010). Health practitioners perceive that quality of content in online settings pose a great problem when not knowing which criteria could be consulted to differentiate low quality from high quality (Ruf et al. 2009; Young et al. 2011). Organisation of content and material can also hinder the learning process of health practitioners especially when faced with limited time constraints for usage (Bloomfield and Jones 2013) and is important as some studies reported that quality of content is a motivation to use a VCoP (Barnett et al. 2014; Curran et al. 2009; Sharma et al. 2006; Valaitis et al. 2011).

Providing high quality of content to health practitioners is needed to incentivise and increase their participation in a VCoP focused on learning opportunities (Wenger et al. 2002; Wenger and Snyder 2000). Good interface design helps in increasing the user experience for seeking relevant information (Fischer 2007). Tasks such as receiving feedback from health practitioners involved in the quality of content provided can help in updating and evolving the Health VCoP (Barnett et al. 2014; Curran et al. 2009; Merolli et al. 2013; Rolls et al. 2008). Adding a feedback option either through the main VCoP or sending an e-mail would suffice for privacy concerns (Hansen et al. 2010; Safko 2010). Human roles would need to facilitate discussions as it is important for health practitioners to maintain high quality content (Mendizabal et al. 2013; Wearne et al. 2011; Wenger et al. 2002). Human roles would need the necessary tools to moderate discussions (Faraj et al. 2015; Salmon 2003), such as gatekeeping content (Bosua and Evans 2012), as facilitators that change poorly managed content can incentivise the learning process in any online network leading to increased participation (Preece and Shneiderman 2009).

Proposition 4: Rich contextual content, moderated by human roles, increases user participation in a Health VCoP, leading to a sustained learning community.

4.2.5 Research Question

This research-in-progress study aims to answer the following question: *How do key individual and group Virtual Communities of Practice (VCoP) design considerations impact sustained learning practices of practitioners in a Health VCoP?*

5 Discussion and Conclusion

This research has proposed, from the current literature, a set of design considerations to increase interaction and participation among users to sustain learning in a Health VCoP. The design considerations proposed act as a set of guidelines for researchers and developers who want to design a Health VCoP to take into account human roles, rich profile information, platform navigation, diverse community, and rich contextual content.

A pilot study will go through three phases. Phase one involves using the proposed design considerations in this paper to guide external developers to design and develop a Health VCoP prototype; human roles will enrich the platform with rich content and modules for the learning processes. Phase two involves recruitment of a group of health practitioners to test the Health VCoP prototype and receive feedback to further enhance and validate the proposed design considerations; human roles will further enhance content, navigation, technical training, and any other elements that need further enhancement or appraising. Phase three consists of recruitment of health practitioners to join the Health VCoP and a full prototype launch will commence for a period of three months; pre and post focus group interview sessions with participants; further enhancement and validation of the current proposed design considerations will be made.

Currently, a pilot study has been initiated to design a prototype for a group of health practitioners in using a VCoP for their learning purposes. Human ethics approval has been granted to enlist a group of health practitioners to gain insight on their perceptions of a Health VCoP focused on continuing medical education (CME). Hence, phase one is underway and the proposed design considerations are now being used to guide external developers in designing a Health VCoP for a group of health practitioners. Human roles have begun enriching the Health VCoP with necessary content and modules to enhance the health practitioners' learning process. External stakeholders (e.g. public and private funders) have started funding for the pilot study.

Next steps for the future work include: initiation for phase two in recruiting of health practitioners to gain feedback on the developed Health VCoP and redevelop/enhance it if necessary. Continuing to phase three in recruitment of health practitioners to use the Health VCoP; pre-interview session about their perceptions before using the Health VCoP; observe learning in the Health VCoP; and post-interview session with participants to re-evaluate, enhance, and validate the design considerations.

With the dawn of online social networks, health practitioners are steadily and increasingly utilising these networks in their learning habits. This research-in-progress study proposes a set of design considerations in a conceptual model that would encapsulate VCoPs, the social constructivism learning theory, and the use of the LCD approach to increase the learner's participation, by supporting human roles, leading to sustained learning in the Health VCoP. This approach can also lead to an evaluation metric for current and future researchers that are developing their own Health VCoP. This work shows that there are greater implications in observing, understanding, analysing, and evaluating the

knowledge sharing that is ensuing between participants in terms of their tacit and explicit knowledge in the Health VCoP. Ultimately this work will lead to greater knowledge sharing opportunities between members.

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