Online Social Networks for Meaningful Social Reform

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Abstract— **Online social networks offer valuable tools to foster a variety of connections. In recent years, these networks have served as a hotbed for the expression of human behavior on the entire spectrum of human emotion. Online social networks have offered avenues to connect with family, friends and strangers, served as hotbeds for activism, crowdfunding and dissemination of viral information. However, these networks have also been hosts to malignant behavior manifest in many ways, including cyberbullying, hacking, trolling and fake news. This range of human behavior on online social networks is in large part, a function of the affordances on the networks. In this paper, we study the affordances on a range of current online social networks and propose a framework for the design of social networks that incorporates affordances for meaningful social reform and the mitigation of social unrest. The design of such networks has important consequences for the next generation of online social networks, since a significant share of the world population is not yet online and thus, has yet to experience the power of online social networks.**

Keywords—theories of social exchange; online social networks;

I. INTRODUCTION (*HEADING 1*)

The popularity of social networking sites spans across various demographics, nationalities and ideologies. Recent statistics about the breadth of social network usage indicates that there are more than 3 billion users of social networking sites around the world, with a new user added to a social networking site every 15 seconds [1]. A multitude of factors can explain the worldwide appeal of online social networks (OSNs), including but not limited to the spread of smartphone usage around the world. Youtube, Facebook, Snapchat, Instagram and Twitter are the top five most widely used OSNs [1]. While the specific applications of these OSNs vary, one aspect that drives user engagement and therefore, growth within these OSNs is the availability of features for connecting with other users. The design of these features, or affordances, ultimately provide not just mechanisms for connecting with other users and interaction with the OSN – they also hold potential for rethinking ways in which people behave, both online and offline.

The term "affordance" was first coined in [2], where the author described an affordance as the set of features of an environment and the possible or intended uses of that set of features. Although first envisioned for the design space, affordances have been studied and used extensively in psychology, engineering design, human-computer interaction and artificial intelligence. Technological affordances on OSNs take many forms – perhaps the most popular of these is the Facebook "Like" button, whose use has spread beyond Facebook to other OSNs and websites. The use of technological affordances offers users novel ways of expression and creates opportunities for transforming the online space into an offline space, one that is complete with nuances of non-verbal and non-textual communication and one that is fully realized in conjunction with the environment. Technological affordances in OSNs have been extensively studied in HCI literature [3], and their role in facilitating intended and unintended use of the affordance is the subject of multiple investigations in the area of technology, society and ethics. For the rest of this paper, we refer to the term "technological affordance" simply as "affordance".

The obvious uses of OSN affordances lie in the design principles for the OSN platform – most of which center around increasing user engagement with the content on the platform and with other users. However, OSN affordances have been instrumental in orchestrating much more than benign inter-user connections. On the one hand they have redefined the modern vocabulary, associating new meanings and contexts to the terms *friends, followers, pins* and *tweets.* These OSN affordances have enabled viral dissemination of content, and catapulted regular users and obscure causes into brief, but sometimes ongoing cultural visibility. For example, the Kony 2012 viral video brought worldwide attention to the case of Joseph Kony, a Ugandan militia leader and the plight of the children he used in war. The virality of this video culminated in attracting the attention of celebrities and politicians and was instrumental in deploying military action against Kony. However, OSN affordances have also been leveraged for counter-social activities. Bullying, when aided by an online space, can become rampant and incessant, with OSN affordances amplifying the scale and reach of the attack. Other unintended consequences of OSN affordance use have been brought to the forefront of conversation on technology design. A user can share her thoughts on an OSN as a status update, comment on other user's content, produce a blog or video stream and talk directly to other users on the OSN platform using their handles (Twitter). The ease of content-generation

and the relative anonymity afforded by the identity-verification mechanisms of different OSNs can lead to an environment where users can "speak their mind" without being mindful of social norms. People can be traced quickly by rapid sharing of their photos, and entire character profile construction can be aided by the social media content of the user. Thus, while on one hand, OSN affordances have enabled crowdfunding, location of missing individuals, product recommendations, marketing research, political campaigning and citizen science, they are also being leveraged for organizing terrorist groups, cyberbullying, bot-generated content, misinformation, phishing and other forms of algorithmic nuisance that threaten user privacy and safety. In this paper, we propose a framework for "reformed OSNs" that are designed with affordances based on the norms of social exchange theory. The norms of social exchange theory in [4] were developed on a game-theoretic foundation, where every action has an associated payoff. Players, thus, choose actions that result in the most payoff or achieve equilibrium – a scenario of maximum payoff for all players in the game. User activities on OSNs can also be viewed through the lens of game-theoretic constructs. It has been shown that users prefer anonymous networks for more uninhibited expression [5], thus associating a higher payoff for such content on anonymous networks. Our framework for reformed OSNs uses the principles of social exchange to rethink the design of OSN affordances, thus creating avenues to combine the best of social networking websites and the best of social human behavior, thereby engineering peaceful societies, both online and offline.

The rest of this paper is organized as follows. Section 2 describes related work in the area of social networking for engineering individual and social behavior. Section 3 describes our framework for reformed OSNs. Section 4 concludes this paper and presents directions for further work.

II. Related Work

Social networking sites (SNSs) and the motivations for their use have been extensively studied [6], where the authors outline several areas of interest in the burgeoning field of SNS research including reasons for SNS usage (impression management, creating and maintaining social links for online and offline friendships), structure of SNS networks and challenges (privacy and identity). In [7], the authors studied the motivations of college students for using Facebook Groups. Their work showed that the main categories of user motivations were for socializing, entertainment, self-status seeking (succumbing to peer pressure to use Facebook, maintaining status and career development) and obtaining information. In [8], the authors studied usage patterns in various SNSs, where they found that users spent considerable time in browsing through profiles of their friends, in addition to direct interaction activities which was found to be an order of magnitude lower than browsing through profiles. In [9], the authors studied the choice of platform for communicating on social media. They found that users preferred to use easily accessible and non-intrusive media such as text messages and Twitter for sharing highly positive events and preferred the use of intrusive and rich media such as phone calls to share highly negative events. They also found that people felt more positive after sharing positive events, and more negative after sharing negative events. Another study [10] found that users with larger networks shared less than users with smaller networks, providing further evidence of users wanting to share less with weak ties [11]. In [12], the authors studied empirical data from Facebook to study correlation between time spent online and loneliness. They found that increased time spent online was related to reduced feelings of loneliness and increased social capital, unlike previous self-reported survey-based findings [13]. SNSs have been used for more than social interaction. In [14], the authors studied the correlation between the phases of crowdfunding projects (launch, inactivity, final delivery) and the corresponding social media campaigns for these projects. They found that successful crowdfunded projects evoked strong interest from donors during both initial and final stages of the project and had a strong social media presence (concurrent campaigns from multiple social media sources). The use of SNSs for organizing during crisis was further investigated in [15], where the authors coined a term "voluntweeters" to describe participants who tweeted and self-organized disaster relief efforts in the aftermath of the Haiti earthquake. OSN affordances have also been used to further cyberbullying. In [16], the authors studied the use of SNSs in gang activity and describe the increased use of SNSs by gang members as "Internet banging" and examined the role of social media in urban communities. The increased ability to lurk, browse and infer was also shown in [17] to elicit feelings of jealousy in relationships, which was tested using a *Facebook jealousy scale*.

Technology affordances as a "tool for potential action given actor intentions and technology capabilities" was studied in [18]. They showed that technology affordances in SNSs enabled users to engage in online conversations on a continual, as-needed basis, and be aware of the networks of themselves and of the contacts in their network. The design of social media features was investigated in [19]. The authors defined "true commitment" from users as one where they are actively engaged with the platform by creating new connections and content. They showed true commitment was a significant function of the SNS's features, that caused users to display a particular pattern of behaviors. In [20], the authors propose Facecloak, an encryption-based architecture for enhanced privacy that can be used on social networking sites and web browsers. In [21], the authors describe the design of a secure networking platform, where the user can assign privacy labels to specific contacts on the network. A privacy wizard then uses a classifier to infer high-accuracy privacy settings, without the user having to actively manage privacy settings in a time-consuming fashion. Further research on the affordances of SNSs and their applicability for nonprofit advocacy was conducted in [22]. In [23], the authors studied motivations of users for asking questions of their networks. They found that altruism, expertise of the network and a desire to form social connections, inadequacy of search engines, trust and the formation of social capital were among the greatest motivators for using SNS affordances to ask questions.

TABLE I. AFFORDANCES IN POPULAR OSNS

OSN	Affordances
Facebook	Reactions, comments, share, tags, recommendations, groups, events, checked in, disaster relief, memories, notifications of birthdays, anniversaries, events, discover new friends
LinkedIn	Career advancement (Job titles and education) are prominently displayed on the profile, a digital resume, ability to solicit recommendations from colleagues, create networks, notifications of birthdays and work anniversaries, used by recruiters to attract talent, jobs section to post and look for openings
Twitter	Tweets, retweets and quote-tweets, following, followers, addressivity (@), moments that highlight trending news stories, notifications, messages, hashtags
Snapchat	Posts disappear after viewing (ephemeral), Create stories that last for 24 hours, Create custom stories with collaborators, filters and lenses, memories, discover new content, sustain connections with Snapstreak, geolocation enabled content generation
Pinterest	Create pins, boards, explore new content, follow pinned boards of other users
Instagram	Post photos/videos, filters, explore new content, influencers, tag people, add location information, create stories that last 24 hours, amass followers, like and other engagement metrics

The role of software in triggering social behavior was studied in [24], where the authors developed a design framework for building social software. This framework proposed multiple design criteria, principles, domains, parameters and dilemmas and presents a thorough approach to the design of social networking software. The morality of technology was explored in [25], where the authors argue that social network spaces are transformed by the users and the design of these sites; consequently developers and users have a moral responsibility for the benefit of others and the self. A framework for policy centering on SNS design was presented in [26], where the authors discussed the implications of design with an emphasis on children's safety, given their limited scope of digital literacy. Two broad categories of SNSs were studied in [27], where the authors categorized SNSs as people-focused or activity-based and evaluated the sociability afforded by these categories of SNSs.

The affordances in social networking sites lend themselves well to disaster relief efforts [28], since users are able to keep in touch with their network in a distributed manner, post updates about their environment. These affordances are also helpful in creating crowdfunding campaigns directed for disaster relief. The role of SNSs in politics by influencing democratic outcomes, catalyzing social uprising, and government policy was influenced in [29]. The role of social networking in civic participation and political action was also studied in [30] and through the informal dissemination of ideas in [31]. The role of SNS as an apparatus in political uprisings was studied in [32] and their use as a source of news was studied in [33].

OSNs, therefore, represent potent means for facilitating mechanisms of both robust development and social unrest. This paper focuses on the use of OSNs for peace engineering. In [34], the authors describe the Engineering, Social Justice and Peace initiative undertaken by several universities in Canada and the United States that focused on enhancing engineering education by incorporating peace engineering in the ABET criteria for engineering education. The authors describe a revised engineering code of ethics as well as a novel design algorithm that is focused on achieving peace through proactive engineering design. Additionally, corporate efforts have focused on envisioning the role of technology for malice and taking proactive steps to stem such initiatives. One such attempt is in [35], where AI researchers have promised not to use AI tools for weapons development. The next section presents our framework for reformed OSNs.

III. A FRAMEWORK FOR REFORMED OSNS

OSNs offer several affordances, with the aim of transforming the network into a space similar to offline social networks. For example, the Reactions offered by Facebook offer users a choice of six reactions – Like, Love, Sad, Angry, Haha and Wow – through which users can engage with content on the network. These icons to elicit communication, called paralinguistic digital affordances [36], offer users the option to communicate with less, much like in an offline environment, where non-verbal cues like facial expression and posture convey valuable information to others in the group. Most OSNs enable users to comment on content, continue the conversation with threads of comments and share content, much like in an offline social network, where people carry on conversations, complete each other's sentences and share news. Friends of friends are introduced via mutual connections, and journals and photo albums serve as records of memories. A list of technological affordances in OSNs is provided in Table 1, where we highlight the affordances of the top most used OSNs [37] – Facebook, LinkedIn, Twitter, Pinterest, Instagram and SnapChat. Each of these OSNs offers unique ways to create a seamless offline social network experience, while also infusing the user experience with novel affordances such as an ability to engage directly with anybody on the network, using the @ - addressivity mechanism on Twitter [38].

However, two key differences between online and offline social networks remain. First, the audience in an online social network is often wider than expected [39]. A user's content can be shared and retweeted several times, spanning the networks of friends and friends of friends, causing content to go viral often resulting in thousands of views in a matter of hours or days. It is rare for an offline, traditional social network to have a similar impact with the news generated by its members. Second, OSNs are always available. It is possible for a user to login to the network, view activity of friends in the network, generate content and depending on the kind of network, the user can stay relatively anonymous while engaging in the activity. Thus, these networks are always available for the user, but also allow the user to be detached from the immediacy of consequences. In contrast, in offline social networks, connections take time and are rarely anonymous.

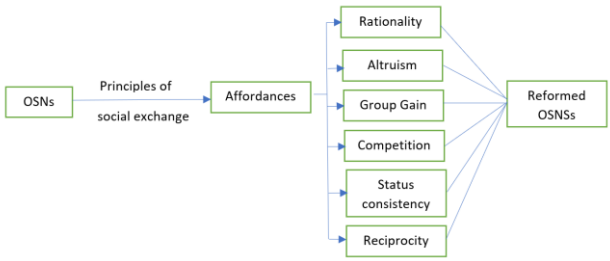

Fig. 1. A framework for Reformed OSNs based on the principles of social exchange.

In an effort to promote meaningful social reform, we propose a framework that combines the best of technological affordances in OSNs while still transforming them into seamless, traditional offline networks. We propose a framework for the design of OSNs, that is based on the principles of social exchange [4]. In [4], the author proposes six rules of social exchange based on a game-theoretic framework that assigns a payoff to the player for every action. These six rules are rationality (maximize the payoff of self), altruism (maximize the payoff for other users), group gain (maximize the payoff of the entire group, including self), competition (minimizing the payoff between self and others), status consistency (maintaining the difference in status) and choosing actions to ensure reciprocity of payoffs between the user and others in the group. The work in [4] was developed for the context of traditional two-person offline social network, by assigning a payoff to each person's action and the corresponding implications of that action on the user and the other player. We extend this framework to that of OSNs, where we view a user's actions on the network as being motivated by payoffs. For example, users on a non-anonymous, profile-centric network such as Facebook or LinkedIn choose their actions to align with their perceptions of what is normal and beneficial for them by not posting or sharing content that other might deem offensive or insensitive. However, in anonymous networks, research has shown that users post content that is generally more intimate, negative in sentiment and more expressive of needs and wants [5]. This lack of inhibition on anonymous networks has been studied in [40] as the "online disinhibition effect" and is often conducive to counter-social behaviors such as trolling and spam [41].

Our framework for reformed OSNs will build upon these principles of social exchange while associating them with reformed affordances to engineer peaceful societies (Figure 1). Below, we discuss OSN affordances for these exchange principles.

i. Rationality: Although certain social networks have evolved into broad online meeting spaces for forming informal and formal networks (e.g. Facebook), others such as LinkedIn and Pinterest serve very specific audiences. Consequently, a user might have accounts on multiple OSNs to serve different purposes. For example, a user might have a Facebook account to keep in touch with friends and family and connect with acquaintances. A LinkedIn account might serve as a digital resume with opportunities for career advancement, and a picture-sharing network such as Instagram and Snapchat might serve as digital records of the user's and her friends' pictures. Existing tools to manage multiple social media accounts exist, however, they are disparate and do not allow for manipulation of platform-specific privacy settings. The motives of OSN users vary – connecting with others, career advancement, leisure, lurking, marketing and research are some [42]. Affordances that enable a user to maximize her payoff on various platforms, whether it be increased privacy, a period of consistent time-out or disconnection from OSNs, or disclosure of data usage or self-improvement should be incorporated into the design of OSNs. Further, enabling affordances for a user to derive value from responsible content-generation can help create an Internet of value, providing users with incentives to actively engage with the platform and other users on the network.

ii. Altruism: The phenomenon of fake news and echo chambers made news during the 2016 US Presidential election, where it was estimated that bots were responsible for a significant amount of content on Twitter [43]. The ability to construct news [44] and distribute it widely, coupled with the recommendation algorithms used by an OSN that generate content that resemble what a user was most likely to engage with, and a user's preferences to align with others of similar intent [45] can create a space where contrasting opinions online can be effectively filtered out. This phenomenon has the two-fold effect of (i) affirming the user's thoughts on a topic such as the choice of a candidate for public office, the impact of climate change or support for conspiracy theories and (ii) creating a virtual community of like-minded individuals whose news feeds look alike and who all subscribe to mostly homogeneous sources of information. These "echo chambers" serve to block out or mitigate the impact of external influences on a user's OSN activity. In order to maximize the payoff of other users on the network, we propose the altruistic component of affordances that contain vetting tools for recommendation algorithms that automatically populate the feeds of OSN users. This, coupled along with network-side tools to detect and remove accounts that indulge in intentional misinformation campaigns can serve to limit the scope of misinformation inflicted by OSNs. The altruistic component also should provide for affordances that limit algorithmic nuisance such as spam, trolling, phishing and cyberbullying, while also providing increased accountability for actions in anonymous networks.

iii. Group Gain: OSNs have taken giant strides in leveraging their inherent abilities of scale and rapid response in situations as diverse as disaster relief, fundraising, aiding democracy by encouraging voter turnout and fostering initiatives for

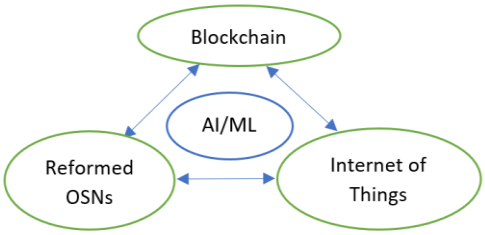

Fig. 2. Integration of Reformed OSNs with the IoT and Blockchain

the social good. These affordances serve to enable group gain, where the payoff of all users on the network is increased, by creating opportunities for users to communicate matters of vital importance to a wide audience by simple 1-click actions such as posting and sharing on a social network.

iv. Competition: Our framework for reformed OSNs calls for enabling healthy competition of resources and content-generation. The Internet has enabled monetization of a range of content, by enabling users to create and distribute content in the form of blogs, videos, art, music and commerce. However, most of these affordances can be used to generate revenue only by intentional efforts, such as actively creating an Etsy account and selling merchandise or by seeking advertisements for a blog website. To enable attribution of content and monetization, we propose the incorporation of affordances that uniquely identify and store records of content-generation and dissemination. Blockchain, with its emphasis on distributed record-keeping and inbuilt mechanisms for authentication and privacy can be used to create scaffolding for OSNs as they evolve into a secure space for Internet of value (Figure 2).

v. Status consistency: Status consistency in offline social networks in [4] focused on two players with different status (high and low) in a two-person exchange with different payoffs, where the final value of payoffs after the exchange maintained the difference in status of the players. OSN users are diverse, with some users amassing thousands of followers and whose content is more widely visible to the network. These high-status users encompass both individual users and institutions who influence the actions and opinions of the rest of the users on the network. OSNs affordances should leverage the status differential of users on the network, by enabling high-status users to engage more effectively with the network and use their platform for social good.

vi. Reciprocity: The principle of reciprocity as a social exchange norm states that an individual's actions impact the payoff of the other person. Thus, reciprocal actions that minimize the difference in payoffs are an effective mechanism to achieve equilibrium. Extending this principle to OSNs, categorization of user motives on the network can help in the design of affordances that can facilitate reciprocal actions. For example, some users with inhibitions about sharing often might bristle at their friends who often tag them in their posts, identify them in pictures or reveal other information about the user that she would not have shared on the platform. Thus, the lack of custom affordances for reciprocity leaves some users on the network without enough options to customize the reach and value of their content. The design of affordances for reciprocity could be aided with deep learning tools, where user preferences for content, reach and value can be inferred from past interaction with the OSN.

IV. Conclusions

This paper addresses societal wellbeing using OSNs. Reformed OSNs offer new mechanisms to envision online networks as not merely tools for connections and marketing, but as tools for social change. In this paper, we proposed a framework for OSNs that uses the rules of social exchange to create new affordances and leverage existing ones for meaningful social reform. Social networks have redefined basic societal constructs of forming and maintaining friendships, memberships in groups and even, the ability to transcend scale by forming connections with thousands of other users of the network. More importantly, OSNs have afforded their users with novel affordances to express emotion, sentiment and opinion. While the broad goal of these affordances is to transform the OSNs into a space that closely resembles a traditional, offline network of individuals, some of the affordances have changed the mechanisms in which people interact with each other. User-generated content has the potential to be widely disseminated, and individual privacy settings and motives for use of the OSN are not reflected accurately in the design of these affordances. Our proposed framework for reformed OSNs utilizes the principles of social exchange. In this framework, affordances assume a larger role in facilitating responsible user interaction on the OSN by creating opportunities for self-expression, individual growth and social advancement. Our framework also allows for scaling to include blockchain for increased privacy and record keeping, while integrating with IoT devices that are increasingly a part of users' environments. The implications of this work are two-fold. First, users are increasingly concerned about the audience that views or interacts with their content, and the need for privacy, while still intentionally or unintentionally revealing a lot about their lives and identities online. Second, as more and more of the world's population starts being connected online and using OSNs, it might be helpful to rethink the future of online networks by learning from the challenges that face the current generation of OSNs. Future work in this direction would include a combination of insights from the humanities and data science, to study how people define their experiences on social networks and how these experiences contribute to the rapidly-changing discourse of what it means to live well.

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