

# Open Social Design for Behavior Change

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## EXECUTIVE SUMMARY

Designing health, wellness, and well-being applications that effectively drive behavior change is extremely challenging. Although many organizations try to enhance engagement or increase effect by adding social layers to basic behavior change strategies, few do this strategically or make use of existing evidence or best practices. Creating effective social products or “therapeutic communities” means integrating a working intervention with a social system that can drive norms and accountability. Solving for design issues fixes only half the problem, though. In order for this underlying work to generate impact, there need to be enough participants in the network to develop shared norms and hold each other accountable.

Open Social is the term that MeYou Health has coined to describe an implementation principle at the core of its behavior change applications. It prioritizes the efficient evolution of a product’s social network *by ensuring that anyone can become a member and take part, regardless of that person’s organizational membership, insurer, or ability to pay*. When implemented correctly, an Open Social approach increases the network’s power to effect change on individual participants, making it more likely that any given participant will be exposed to the appropriate influences at the right time and in the best way. Successfully implementing the Open Social approach requires a multidisciplinary team working from the outset to solve the intertwined problems of reach (i.e., dissemination, adoption, and engagement), effectiveness, and social network structure.

## INTRODUCTION

Online, or digital, interventions for behavior change are not a new field. Implementations are nearly as old as computers themselves, and examples of social, network-based interventions pre-date the Internet (for example early work in developing smoking cessation programs on CompuServe<sup>1</sup>). Yet successful implementations, as shown by randomized control trials and large scale deployments, are rare. It's more common for systems to succeed on one front or the other – in other words, they show an effect in clinical trials but are unable to draw participants in the real world, or vice versa.

There are many factors that play a part in this, but a critical one is the failure of designers and developers to think strategically about *impact*, or the overall change that can be credited to an intervention in a population. Impact is the product of *reach and effectiveness*, where reach is the number of people who actually use the intervention and effectiveness is how well it works in a real-world population.

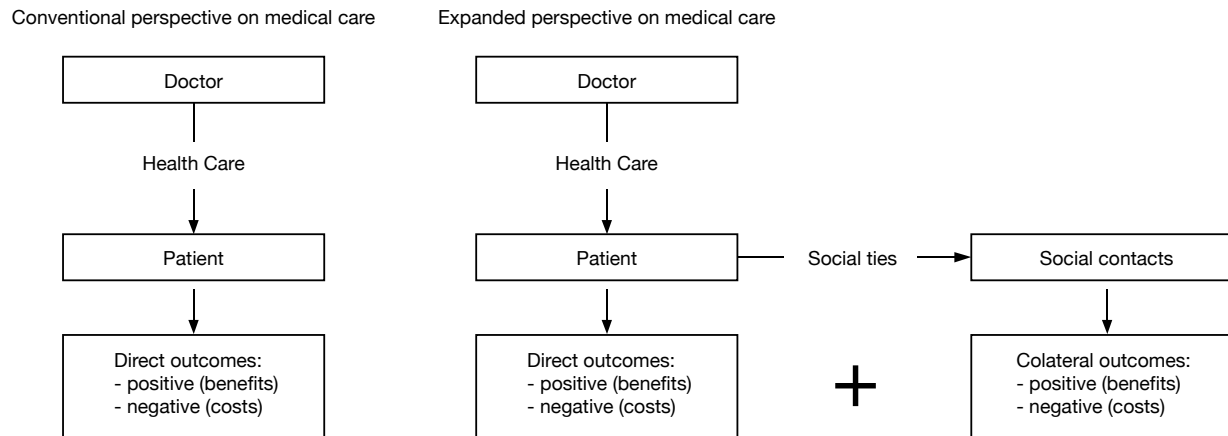
$$\text{Impact} = \text{Reach} \times \text{Effectiveness}$$

The impact equation's most important lesson for academic designers is that if they fail to design for reach in the early phases of development, it may hamper their dissemination efforts later on. Although patients with pneumonia may accept it when their doctors tell them to swallow a bad-tasting pill twice a day for 10 days, people struggling with behavioral issues like smoking, early diabetes, unhealthy eating habits, or problems with sleep will be less likely to adopt an intervention that's out of sync with their own needs, beliefs, and daily routines. On the flip side, industry developers who focus only on reach ("eyeballs" in the lingo of Silicon Valley) may find that they develop a system that consumers passionately love but is fundamentally unable to change behavior no matter how aggressively they modify it. Effect and reach are co-equal partners in driving population health goals, and for digital interventions to deliver on their promises, the two must be intentionally integrated into the design of these programs from the beginning.

Notably, networked, social interventions for behavior change (including behaviors unrelated to health, such

<sup>1</sup> <http://opower.com/designprinciples/index.html>

as energy conservation (OPower<sup>1</sup>) can harness effects above and beyond traditional social support. Economists and social scientists use the term “externalities” to refer to a benefit (or cost) to a person who chose not to take part in the process.<sup>2</sup>



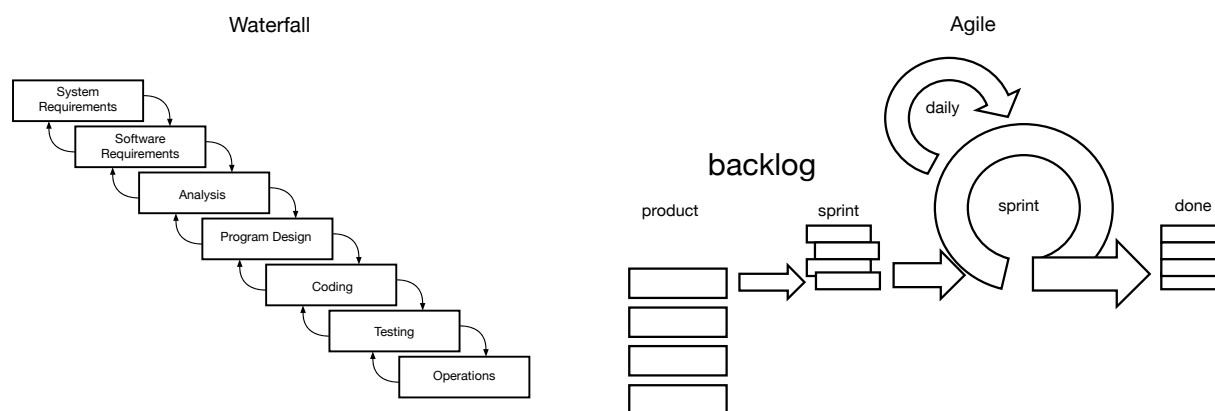
**Figure 1 - The impact of externalities on health behaviors; adapted from Christakis 2004.**

For example, if Harry approaches his doctor about quitting smoking, receives a prescription for a medication, and then quits for two weeks before he relapses, we would normally count this as a failure. But imagine instead that Harry’s best friend Bob, inspired by Harry, also decides to quit. Bob may wind up being successful in the long run, and in fact may then have the same effect on others.

In traditional models, we don’t account for “Bob”; in academic studies, these effects are hard to detect and are often actively discouraged because of privacy concerns around non-participants. In commercial implementations, externalities are often ignored because the benefit may increase outside of the defined population. If Bob works for a different company than Harry and is covered by a different insurer, the benefit of his quitting smoking goes to another organization and may ironically hold little perceived value. Unless designers anticipate and value externalities from the outset of their development process, it’s unlikely that they will accrue independently. Designing for large-scale network interventions requires a fundamental shift from an individual-focused perspective to a holistic, network-focused perspective.

## DESIGN PRINCIPLES FOR EFFECTIVE PROGRAMS

Effective digital programs usually begin with both a deep understanding of the problem space (tobacco use behavior and cessation, for example), certain theoretical principles (social cognitive theory or the theory of planned behavior, for example) that inform the design process, and an iterative approach to learning from the target population for the intervention. Traditional software engineering approaches (such as a “waterfall” design that lays out the final product specification at the beginning) can be very useful for focused implementation of a given theory, or the construction of an intervention built purposely for an academic trial. Yet the waterfall approach is especially poorly suited to social interventions that require observation and iterative response to the network’s reaction to features, tools, and components. Social and network-based interventions instead benefit from an approach where features evolve and are evaluated alongside their use by participants. Similar approaches have been developed in software engineering and in academic development of behavioral interventions. An “agile” approach that stresses rapid cycles of data analysis and A/B testing is fundamentally similar to the “multiphase optimization strategy” used in many modern intervention trials.



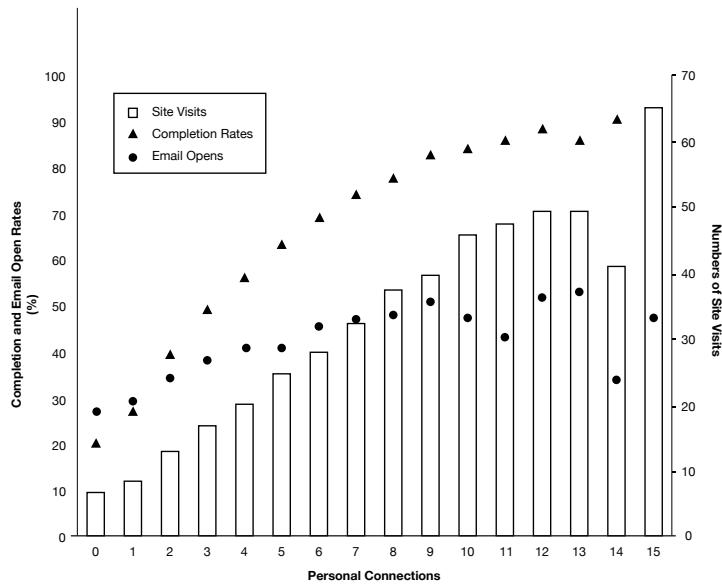
**Figure 2 Waterfall versus agile software development models.**

An example of a systematic approach is the development of the Daily Challenge application from MeYou Health. Daily Challenge is a deceptively straightforward program in which people receive a “challenge” each morning to complete one small action that relates to their well-being. For example, they may try a new type of stretch one day and then check the salt content on a can of soup the next. Completing the challenge, however, happens within a social context, both in the larger network of all participants in the program and within smaller self-defined networks of friendships that form within the social network of the program. Over time, the program has intentionally evolved from a simple daily appointment mechanic via email to a sophisticated, multi-platform behavior change intervention.

Early in the intervention’s development lifecycle, research showed that as participants formed friendships within Daily Challenge (allowing people to keep track of each other, see more detailed information about

a friend’s progress and activities, and engage in additional social activities as a pair), they became more likely to read their morning emails, more likely to return to the site, and even more likely to complete their assigned challenges.<sup>3</sup>

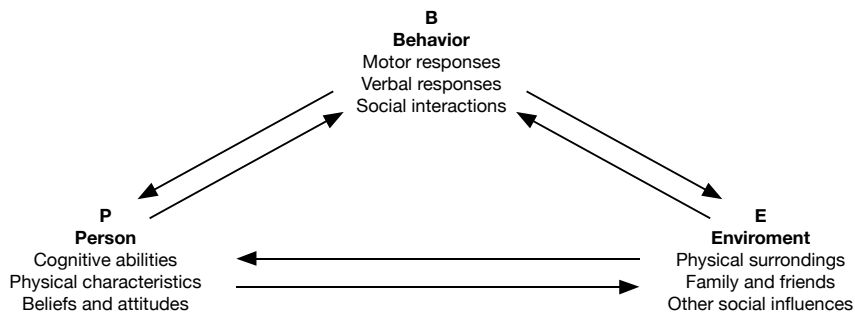
This finding was consistent with social cognitive theory, which informed the overall system architecture. Social cognitive theory, which MeYou Health uses extensively to inform product design, states that individuals



**Figure 3 Engagement as a function of social ties in Daily Challenge (Cobb 2014)**

learn and adopt behaviors by observing the behavior of others. Observing others in a behavior improves a person’s confidence (self-efficacy) to change themselves. And when they in turn change, the social environment changes with them, creating potential ripple effects. Norms within this social environment encourage certain behaviors and discourage others, and as the community or network evolves, these norms may become increasingly codified. This interplay between individuals and their social environment was termed “reciprocal determinism” by Albert Bandura, the father of social cognitive theory.

Although participants within social networks may find each other “randomly,” interface elements that are intentionally designed to surface social content can drive increasing tie formation and network density.



**Figure 4 Bandura’s reciprocal determinism theory**

In the case of Daily Challenge, these findings drove a series of A/B tests that manipulated participants' interactions with the surrounding network to increase engagement and interpersonal contact. After nearly three years of optimization, a randomized control trial involving 1,500 people showed that the program could not only increase a participant's well-being (primarily by changing health behaviors) but that the degree of improvement corresponded with the participant's level of social interactions.<sup>4</sup>

## **SOCIAL DESIGN PRINCIPLES**

Classic social support theory stresses that support comes in many ways: *emotional, informational, instrumental, and belonging*. Software design can be used to enable some or all of these processes. For example, forums within a weight loss community can help people share information about effective techniques and provide emotional support during times of stress. Yet these forums may not provide a sense of belonging without additional constructs around profiles, friend lists, and so on. Instrumental support – essentially physical or financial assistance provided through social contacts – isn't commonly seen in online interventions for obvious reasons.

Unfortunately, classic theories of social support fail in design in two critical areas:

- They don't give any guidance about how to structure networks to best provide the elements of support.
- They don't explain or guide us in how to design networks and interventions to drive influence or behavioral contagion.

In order for designers to create interventions that can leverage network effects, they must move beyond class theory and integrate lessons from everything from emerging network science to marketing and behavior change theory.

## **NETWORK DESIGN AND CONSTRUCTION**

All online social networks are guided by the decisions made by designers and evolve within their constraints. How many friends can someone maintain? Do the friendships need to be reciprocated? Are conversations public or private? Are they synchronous or asynchronous? Are lists of friends disclosed or hidden? These design decisions over time will drive the patterns that define the network.

## **HETEROPHILY AND HOMOPHILY**

Most networks stress finding people who are similar to you, or “homophilous.” They share common interests and may have similar traits or behaviors. An online network dedicated to sharing photos would want to encourage connections between people who take and enjoy similar kinds of pictures. Yet this assumption breaks down when we think about what drives behavior change. A person who walks into an Alcoholics Anonymous meeting encounters a range of people across the spectrum of abstinence, ranging from those who are still drinking to those who may have decades of sobriety. AA's own protocols enforce immediate behavioral “heterophily,” where a new member who is seeking sobriety is paired with a sponsor who is sober. The informational social support that a sponsor provides may be very different from that of another member who is still actively drinking, and in fact, it's easy to imagine that a meeting solely of active alcohol-

ics could be counterproductive. AA's pairing of people with dissimilar behavior is an example of intentional network construction to drive behavioral heterophily and likely plays a significant part in success.

Within QuitNet, we found that participants tend to cluster according to smoking status: as new users enter the system, the majority of connections they form are to other people who hope to quit. But they also form connections to people who have been stably quit and keep returning to the site for months or years. In fact, a formal analysis published in the American Journal of Public Health found that people who predominantly formed connections to other smokers continue to smoke, whereas people who formed connections with non-smokers were more likely to be quit.<sup>5</sup>

## **SOCIAL NORMS**

While informational social support likely explains part of the reason that heterophily matters, the development of social norms certainly represents a secondary influence not represented in social support theory. Norms can take many forms within a network or community, ranging from the style of communication (polite versus “flaming”) to behavior within the community (rituals or formalized communications) but also norms that affect the behavior in question. Over the years, QuitNet has developed a series of norms, buffered by the structure of the intervention and its content, that stress the appropriate use of medications. For example, few smokers take advantage of nicotine replacement products when quitting, whether due to costs, perceived risks, or otherwise. Within QuitNet, the rates of pharmaceutical use are much higher: use can be communicated automatically to the community by enabling participants to tag their profile with how long they've been quit (a measure of status) and the medication they used. Questions within the feed about medications generally receive positive reinforcement, whereas negative comments about NRT receive social censuring. The benefit of norms isn't just theoretical: When investigators studied communications within QuitNet, they found that participants who were exposed to positive communications around medications were more likely to adopt those therapies than participants exposed to negative communications from other members.<sup>6</sup>

## **SOCIAL ACCOUNTABILITY**

For many people, disappointing a peer can be more painful than disappointing ourselves. Carefully constructed social experiences can tap into this idea of social accountability by creating collaborative, interwoven networks of participants. These can be explicit and obvious, as with “pacts” within Daily Challenge, which allow two members to commit to finish a fixed number of challenges together. However, subtle constructs may be equally powerful. Small group or team dynamics working toward a common goal (for example, a fixed number of steps in a walking program) can be built so that each person feels that a failure to wear his or her pedometer would be letting the team down. This provides people with an incentive when they might be more likely to lapse.

## **NETWORK EVOLUTION**

Ultimately heterophily, norms, and a culture of accountability evolve with a network as it forms, and they require both time and scale. All social systems can suffer from an “empty room” syndrome as new partici-



pants enter the intervention and are presented with its social features but find few people to interact with. Jump-starting this process is often difficult, as it will front-load a network with homophilous participants, all struggling with the same behavior at the same time and lacking the seasoned “elders” within the community to guide them, demonstrate norms, and offer support.

Conversely, a behavioral intervention in which everyone “graduates” from the program would lack heterophily and participants who enforce the norms. A strong, stable network requires participants who remain engaged not just for months, but years.

## OPEN SOCIAL FOR SCALE

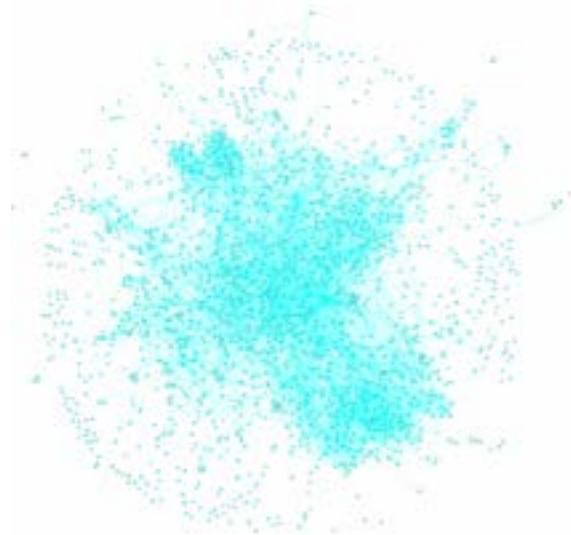
When taken as a whole – social influence, heterophily, accountability, and longitudinal network evolution – it becomes clear that building a product that contains an effective social network component is far more complex than just adding software features.

The traditional commercial (and academic) approach to deploying behavioral interventions is to do so within a defined population, whether it’s a recruited study cohort, an employer, or otherwise. Even large employers who deploy a given intervention over years may have a hard time reaching a critical mass of participants to enable their own social network to evolve to create the appropriate ties between participants, encourage heterophily, and drive social norms. Most groups will suffer from a cold start problem; in other words, as they enroll new participants in a behavior change program, those participants will find others who are in the same boat, actively seeking to change their behavior, connected to no one else in the program, and with no experience on how to best use the program. The experience for participants in a cold start can be so poor that it becomes difficult for the program to get off the ground.

More importantly, when we think critically about the key elements of Open Social as they’re applied to behavior change, it becomes obvious that any dose effect may be mediated by the size of the network itself. When the MeYou Health research team examined network formation and topology in Daily Challenge, it found that even in an optimal employer population, the average number of ties that a participant formed with colleagues was well below the optimization target of 12 as shown in the social network plot.

Here the blue dots represent participants from a single large employer, while the lines are friendship connections. Individuals at the center are tend to have more connections, while those at the edge have fewer.

Daily Challenge was constructed with an Open Social approach, which means that not only can a participant interact with any other participant regardless of sponsor or segment, but that a free version of the program is also available to anyone.

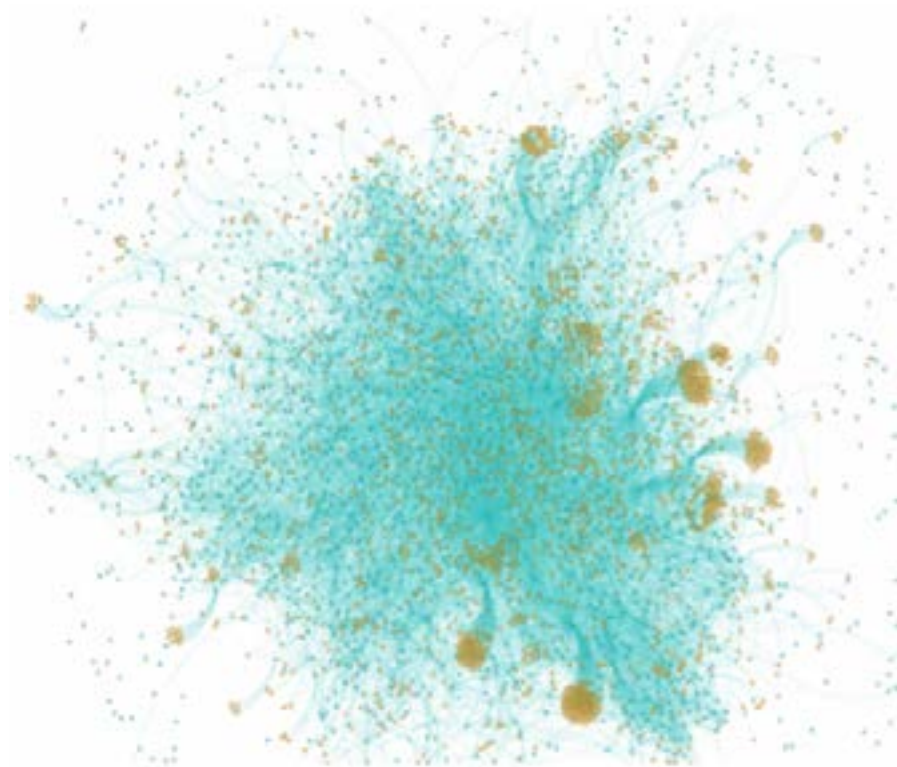


**Figure 5 Network plot of a mid-sized employer population in Daily Challenge; dots represent participating individuals while lines between them represent social ties.**

When the team looked at connections beyond just co-workers, it found that the number of connections markedly increased, bringing them up to the optimization target. In short, by constructing a larger network, they increased the number of potential connections that a participant might make. By opening up connections across segments, the development team produced a network that was more dense and effective.

## CONCLUSIONS

Although there are multiple ways to develop wellness, well-being, and behavior change interventions, there are no shortcuts to building effective social networks. Those who purchase and evaluate interventions that incorporate network techniques should insist on designs that leverage the broadest available populations, deliberately integrate them, and provide metrics to support the effect. Open Social provides an effective framework for developing powerful social interventions, solving for the problems of reach and scale while opening up additional modalities to drive effectiveness.



**Figure 6 Expanded network plot of same mid-size employer, including ties to individuals not within the employers segment.**

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