Network Effects and Valuing Social Network Services

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Abstract
Models including network effects are often invoked to justify the high value of social network services like Facebook. Yet as time passes and user numbers grow, inevitably so does reach across social circles, creating "online tension" or, as we term it, mismatch of social display. This leads to reduced participation. Social network services respond with efforts to segment networks through efforts like separate 'friend lists'. We provide a conceptual framework and a visualization to incorporate these insights into models of network effects and social network value.

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Network effects; Social display; Social network services

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H.5.3 [Group and Organization Interfaces]: Computer-supported cooperative work

Introduction
Network effects underlie many discussions of the value of online social network services. Beginning with an observation—the more members, the more possible interactions—models of network effects propose that network value is proportional to the number of connected individuals on a network in the form of logarithmic, linear, or exponential growth [6-8].
This logic is useful in breaking out of linear thinking about network value but it assumes that interactions between nodes are either equally valuable or distributed between zero and some high value. The models do not consider situations in which interactions have negative value to network participants. This is problematic when considering their application to social network services (SNS) like Facebook.

Binder et al (2009) crystallized the anecdotal experience of many by pointing out that the presence of “conflicting social spheres” led to “online social tension”, and there is evidence that SNS can cause social anxiety and tension in social spheres [5]. In particular their results [1] highlighted the impact of presence of family members: participants are worried about the visibility of their displays across social spheres and reduce their activity on SNS when they perceive these risks. Since the value of SNS is directly related to participation, usually through page-views and advertising, such a chilling effect is important for valuing SNS.

The reality and importance of this effect is demonstrated by change in SNS systems to allow participants to segment their network and restrict the visibility of their posts to sub-sets of the network (e.g., Facebook’s “friend lists.”).

What is not well appreciated is how these realities relate to the intuition underlying valuations that rely on network effects. The key insight is that the very processes that facilitate network growth inevitably ensure the presence of different social circles, requiring modified presentations of self. We illustrate this visually by comparing traditional models of network value with curves that incorporate the modeling of overlapping social circles and the resulting mismatch of social display.

Two Phase Network Model
We approach this an analysis in two-phases. The first phase conceptualizes value without allowing network segmentation through Friend lists, thus illustrating the effect of mismatched social display. The second phase examines how network segmentation affects this process.

Phase 1: Baseline
Phase 1 model explains the baseline, when OSNS users put all of their audiences into only one bucket. Given that OSNS are typically signed up to in a particular social context, establishing friendships increases network value. Thus, existing models with network effects are likely to explain network value. However, especially over time, all the social connections do not have the same value and some may have negative value. That is, OSNS user’s social display has different values, depending on to whom it is exposed, raising the possibility of what Binder et al (2009) called “online social tension.” Goffman’s dramaturgical theory [4] accounts for such dynamic value of social display. Some parts of an OSNS user’s audience would disapprove of particular social displays, seeing them as face-threatening acts [2]. This could occur whether the user themselves committed the act or merely watched another’s social display reaching an inappropriate audience.

To clarify the origin of these tensions we name this mismatch of social display. Mismatch occurs when a social display has negative value to audiences. Examples would include risqué presentations valued by
college friends viewed by work colleagues or by family members.

Causes of mismatch in phase 1 are: 1) major life change and social relationship change, and 2) social display threatening face. Burke and colleagues [3] found some major life changes are associated with the changes in OSNS users’ bridging social capital. Major life changes such as getting a new job bring about changes in social relationships, simultaneously growing the social network and incorporating new social circles and changed behavioral expectations. Thus there is increased risk that these offline social changes result in performances of self other than expected by audiences [4], and mismatch of social display occurs.

As a result, participants would reduce their network size and/or activity in OSNS by de-friending, or reducing social display in OSNS, or even retreating to passive consumption of others’ social display. Accordingly, the value of that user’s participation in the OSNS would become lower despite the increase of network size. This is illustrated in the decrease of “actual” network size (Graph 1).

During $t_1$ in graph 1, mismatch of social display alters the direction of the relationship between the number of connected user and network value.

Our proposed model is represented in Figure 1. In explaining the relationship between the number of connected users and the network value, we propose mismatch of social display as a moderator, and effects of mismatch as a mediator. The presence or absence of mismatch of social display alters the relationship between then number of connected users and effects of mismatch, depending on the direction (negative, neutral, positive) and strength (offensive, neutral, happy) of social display. To what extent mismatch of social display negatively effects value vary depending on the context of user’s audiences. The decreased network value is the outcome mediated by effect of mismatch such as de-friending or a reduction in talking to certain social circles. Thus, the effect of mismatch has a mediating role between the number of connected users and the network value. When the increase of number of connected users (input) negatively impacts the effects of mismatch due to the mismatch of social display, then the growth of network value (output) would be hindered.

![Graph 1. Aggregate network value over time](image)
**Phase 2: Segmentation of Networks**

Phase 2 model describes when users segment their network using, for example, friend lists and circles. The segmentation of the social network mitigates the decrease of network value ($t_2$). This is because users can restrict the flow of visibility on the basis of segmented social groups. During $t_2$ period, the value of social display also increases by the mitigated tensions that threaten audience's face. Accordingly, the network value of each social group increases more than when social network was not segmented. Nonetheless, the aggregated network value of each social group will not be higher than when social network was not segmented. Potential network effects are lost and not wholly recovered through network segmentation. This is shown in Graph 1 and Graph 2.

**Graph 1. Change in network value over time**

During $t_1$, mismatch of social display alters the direction of the relationship between the number of connected user and the network value. The degree of decreased network value depends on the impact of mismatch (e.g., how offensive it is). During $t_2$, the segmentation of
social network mitigates the mismatch of social display so that the direction of the relationship becomes positive with the gradual increase of network value.

**Conclusion**

We argue that traditional network effects models are a limited intuition for understanding network value in OSNS. This is because of the inevitable link between network growth over time and the presence of more diverse social circles. We conceptualize interactions as presentations of self [2,4] improving the conceptualization of Binder et al’s (2009) “online social tension” as the mismatch of social display. We illustrate the impact of these insights visually through comparison with curves derived from existing models of network value. Future research would operationalize mismatched social display and gauge its impact on real-world participation in OSNS as well as the success of network segmentation as a mitigation strategy.

**References**


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