

Computing and Social Systems: A Family Systems Approach

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ABSTRACT

The Social-Computational Systems (SoCS) community seeks deeper understanding of systems of people and technologies in order to develop new understanding of the properties and emerging behaviors from these novel and complex systems, and eventually, design practical and purposeful interventions to facilitate desired outcomes (NSF 2010). However, very little, if any, of the existing research on SoCS focuses on a fundamental social system: *the family*. Family systems research is comprised of an emerging set of methods for studying families as a system; three main tenets of family systems theory include: 1) a focus on transactional and bidirectional processes, 2) longitudinal effects, and 3) multi-level analysis (Cummings et al. 2012). We demonstrate how family systems approaches can be applied to the research domain of adolescent online safety; however, we suggest that a family systems paradigm can be leveraged for other family issues as well as within broader social contexts that extend to social systems beyond the family.

INTRODUCTION

Computing and communication technologies have transformed how we create knowledge, learn, solve problems, collaborate, and interact with one another. The impact is so profound that it has irrevocably changed underlying social systems that govern how we relate to one another, through and with technology. These complex social systems give rise to new behaviors and interactions that would have not otherwise have been possible, but they also create new challenges for design. Therefore, the Social-Computational Systems (SoCS) community seeks deeper understanding of systems of people and technologies in order to develop new understanding of the properties and emerging behaviors from these novel and complex systems, and eventually, design practical and purposeful interventions to facilitate desired outcomes (NSF 2010).

However, very little, if any, of the existing research on SoCS focuses on a fundamental social system: *the family*. Our position is that the family system, as it relates to human-computer and human-human (parent-child) interactions that promote the well-being of families, is an often overlook, yet pivotal social system. Computing and communication technologies are ultimately shaping how new generations engage with the world. Children and adolescents are growing up in a world that is always connected, and for the most part, this is the only reality they have ever known. As of 2013, 95% of teens in the U.S. are online and 74% access the Internet on their mobile phones (Madden et al. 2013). The pervasive integration of digital resources into the developmental growth process of adolescents has afforded great opportunities, but has undeniable costs and threats such as privacy breaches, cyberbullying, sexual predation, and other types of risk exposure (ISTTF 2008). In the news, we see catastrophic events, such as a teen suicide from cyberbullying due to sexual preference (Press 2013) or after rape (Giammona 2013). These tragedies are enough empirical evidence to prove that adolescents are facing various online dangers. However, as researchers, we will not be able to prevent future tragic events unless we can identify the pre-cursors and antecedents associated with such events and purposefully build theoretically based frameworks that can address the problem.

Relatively few researchers have studied adolescent online engagement and safety issues from a family systems approach. It is through a family systems approach that we can understand the dynamic interplay of technologies, children developmental growth and parental mediation, so the paucity of studies with this approach strikes us as a significant weakness in SoCS community. Existing research in this domain has predominantly focused on the *individual* as the unit of analysis, often using cross-informant, cross-sectional reports between parents and adolescents. The family systems movement, however, arose out of developmental psychology and recognizes that we cannot model family systems as unidirectional and bivariate influence of parents on children. Instead, a family system is more accurately portrayed as a dynamic process where parents and children are iteratively and bidirectionally influencing one another over time (Cummings et al. 2012). In this paper, we will first introduce a sample project on adolescent online safety. Second, we will discuss how a family systems approach can be applied to this specific domain. Third, we will discuss how a family systems approach could be applied to other domains within social computing, beyond adolescent online safety.

ADOLESCENT ONLINE SAFETY

Adolescence (ages 13-17) has always been considered an awkward stage of life. Adolescents are by nature sensation-seeking and more likely to take greater risks than children and adults (Lerner 2002). Adolescents are also intensely focused on social life during this time, and consequently have been eager and early adopters of the Internet and social networking applications that help them engage with their peers (ISTTF 2008). As adolescents demonstrate increased independence and higher risk-taking characteristics, protecting their online safety remains a critical challenge. Overall, the end goal is to protect adolescents from information breaches and harmful interactions while still allowing them to engage in beneficial online activities. Thus far, the majority of adolescent online safety research has put the onus on protecting adolescents through parental mediation strategies that often limit risk exposure through some sort of restriction (Crossler et al. 2008; Dürager et al. 2012; Eastin et al. 2006; Leung et al. 2012; Lwin et al. 2008; Sorbring et al. 2012; Valcke et al. 2010; Yardi 2012). This approach does not take into account the reality that adolescents cannot be shielded from all risks; in fact, doing so may be detrimental to their overall developmental growth (Baumrind 1987). Therefore, we frame adolescent online safety as a *developmental process* of adolescent growth, such that failing to prepare an adolescent for the real world is as equally damaging to an adolescent as failing to protect them from immense online dangers. To date, very little research has used a developmental psychology perspective to frame adolescent online safety. Such an approach implies that adolescents are engaged participants of their own online safety and that navigating the dangers associated with online interactions is a part of maturing into adulthood. By combining well-established development psychology findings and methodologies that have been established over the last century to the relatively new social computing problems of adolescent online safety, we can be better equipped to surmount the limitations that exist within current social computing research.

A FAMILY SYSTEMS APPROACH

Family systems research is comprised of an emerging set of methods for studying families as a system; three main tenets of family systems theory include: 1) a focus on transactional, bidirectional processes, 2) longitudinal effects, and 3) multi-level analysis (Cummings et al. 2012). We compared literature from developmental psychology and family studies to the current research on adolescent online safety in order to understand how these tenets can be applied to our research domain. We reviewed studies dealing with sexual promiscuity and HIV (Li et al. 2002; Metzger et al. 2012), alcohol abuse (Barnes et al. 1994), and more generally, developmental psychology (Baumrind 1987; Baumrind 1991) and family systems research (Cook et al. 2005; Cummings et al. 2012; Goeke-Morey et al. 2007; Laurenceau et al. 2005). Based on this review, we have identified some key aspects of family systems research that can be used to strengthen research within adolescent online safety.

Transactional and Bidirectional Processes

One premise of family systems theory is a focus on underlying transactional processes that involve trying to untangle the complex influences from parent to child, from child to parent, and can even include influences between siblings. Better understanding of the nature of these multiple influences and processes can provide valuable insights for designing impactful interventions (Cummings et al. 2012). For example, family systems theory has been used to develop a process level understanding of interparental conflict and its impact the emotional security and adjustment of children. Researchers were able to provide evidence that how parents resolved conflict influenced child emotional response (Goeke-Morey et al. 2007). Similarly, adolescent online safety is not a single event or even a state of mind; instead, it is an interactional, developmental process. Online experiences are complex, evoking a wide array of psycho-social and emotional responses, both negative and positive, and that can happen instantaneously or over an extended period of time. How an adolescent responds to a negative online experience plays as important of a role as the fact that they were exposed. For instance, researchers from EU Kids Online found that adolescents who took active measures to protect themselves, such as blocking a person or deleting a message, or who talked to someone else about negative online experiences, tended to respond more positively to a negative experience than those who took a fatalistic approach, hoping the problem would go away on its own (2013). These researchers were one of the first to make the distinction that risk exposure does not necessarily result in harm (Livingstone et al. 2011). However, they also found that higher levels of parental active mediation for online safety was associated with more likelihood that a child was bothered by online risk exposure (Dürager et al. 2012). Because these results were uncovered through cross-sectional and analog surveys, we cannot fully understand the transactional and bidirectional influences underlying these family dynamics. Therefore, in order to understand the process of adolescent online safety from the perspective of experiencing, responding to, and being negatively impacted by negative online experiences so that proactive interventions can deter future catastrophic events before they occur, family systems approaches should be employed.

Longitudinal Analysis

Given the complex and bidirectional nature of process-level interactions within a family system, such phenomena must be studied longitudinally (Baumrind 1987). Cross-sectional data by nature allows us to only see a snap shot in time and prevents

us from analyzing transactional processes associated with causal relationships. Thus, studies from developmental psychology and family systems research often take a longitudinal approach (Cummings et al. 2012; Goeke-Morey et al. 2007; Laurenceau et al. 2005; Li et al. 2002; Metzger et al. 2012; Schermerhorn et al. 2008), ranging from a few weeks to a few years. In contrast, social computing research in adolescent online safety ranges from experimental design, survey, to qualitative interviews; however, in most cases, this research has all been cross-sectional in nature (Crossler et al. 2008; D'Haenens et al. 2013; Eastin et al. 2006; Leung et al. 2012; Livingstone et al. 2011; Lwin et al. 2008; Sorbring et al. 2012; Valcke et al. 2010; Wirth et al. ; Yardi 2012). As such, interesting correlations have been uncovered but may run the risk of misinterpretation. For example, this research suggests that more authoritative and authoritarian parenting is related to higher levels of adolescent risk behaviors and risk exposure for older teens (Livingstone et al. 2011; Lwin et al. 2008). This finding could lead us to conclude that teens with more restrictive parents exhibit a rebellious nature as they get older, seeking risk as a way to garner independence. However, we have to be careful that we do not assume that correlation implies causation. Through longitudinal analysis, we may find that adolescents who have had problems online in the past trigger a reactive parenting response, forcing parents to take a more active parenting role. However, through cross-sectional research, it is impossible to delineate these effects. Family systems research leverages more structured and methodologically robust techniques to understanding family dynamics in a way that can show evidence of causation, not just correlation and differences.

Multi-Level Analysis

In order to capture bidirectional influences between family members, family systems research also relies upon multiple informants within the system and promotes the level of analysis beyond the individual to the dyad, triad, or group level (Cummings et al. 2012; Laurenceau et al. 2005). For example, longitudinal parent-child dyadic studies have used multi-level hierarchical linear modeling in order to understand the impact of marital conflict on children (Goeke-Morey et al. 2007) and the impact of parental monitoring strategies on risky sex behaviors concerning HIV (Metzger et al. 2012). Because these studies were both longitudinal and dyadic, the researchers were able to better understand family dynamics and outcomes as they pertained to the family unit. Through more multi-level and longitudinal techniques, these types of insights could be possible and greatly contribute to our understanding of family dynamics for adolescent online safety. Current adolescent online safety research tends to collect data from individual informants who provide cross informant data. For example, Leung et al. (2012) performed 718 semi-structured interviews with adolescents and had teens report on parenting style. Alternatively, Valcke et al. (2010) surveyed 533 parents and asked them to report their child's level of Internet usage. The concern with conducting studies using adolescents or parents as cross informants is that we do not get a complete and accurate picture of the family system. Research shows that parents and adolescents often have different perceptions on key constructs, such as parenting style and adolescent risk behaviors (Li et al. 2002; Lwin et al. 2008). Very few studies on adolescent online safety have captured perceptions from both adolescents and parents. By capturing data from multiple stakeholders, researchers can uncover key perceptual differences (Sorbring et al. 2012) and possibly show how these differences significantly affect various outcomes.

NEEDED INFRASTRUCTURE

While we propose that the approaches above can improve the current state of SoCS research regarding adolescent online safety, we also acknowledge that implementing them will not be without difficulties. Capturing complex social processes through longitudinal multi-level analysis is not something that will be easy to do. One of the main methodological challenges for SoCS researchers will be the lack of existing infrastructure for conducting such research. How do we recruit parents and adolescents to be engaged in the study longitudinally? How do we navigate the complexities of IRB approval when dealing with minors longitudinally? Without an existing infrastructure for this type of research, SoCS researchers are forced to spend a large majority of their time recruiting participants instead of finding theoretically robust and empirically validated solutions to keeping teens safe online. Furthermore, once solutions are proposed, social computing researchers will need a way to enact change. Adolescent online safety research should be action-based, prescriptive, and practical. Therefore, the needed infrastructure needs to provide mechanisms for researchers to openly engage the community of schools, parents, teens, policy makers, and other key stakeholders in a continuous and iterative way so that we can impact real outcomes. This is a great challenge indeed. We propose that a social network or coalition of social computing and family studies/developmental psychology researchers needs to be formed to help standardized measures and methodologies, promote collaborations, engage the community, and create synergies by complementing one another's weaknesses with strengths. Therefore, our position is that SoCS researchers, who may have more technical knowledge, need to collaborate with researchers from developmental psychology and family studies to address the issues of protecting adolescent online safety, as well as to study the human-computer and human-human (parent-child) interactions. However, it is as equally important that developmental psychologists and family studies researchers, who are already well-versed in family systems approaches, collaborate with SoCS researchers. In modern families, technology has become a key actor within the family system.

CONCLUSION

Through a family systems lens, we have demonstrated how research in the domain of adolescent online safety can be improved through the use of longitudinal and multi-level analysis of transactional and bidirectional family processes. However, we believe that the SoCS community can leverage family systems approaches beyond the domain of adolescent online safety. For example, current social computing research is exploring technology-mediated separation and how families reunite when one parent is away over an extended period of time (Kazakos et al. 2013). Other researchers are examining how romantic couples engage one another through social media (Zhao et al. 2012). Thus far, these and similar studies have employed predominantly qualitative techniques, such as interviews, and used thematic analysis to uncover emergent themes. We believe that the use of more robust family systems approaches could strengthen the current research and provide more meaningful insights that can inform improved design of future social systems.

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