THE NATIONAL CENTER ON SCALING UP EFFECTIVE SCHOOLS

Another Set of ABCs for Scale:

Accountability, Brokers, and Churn in a District System
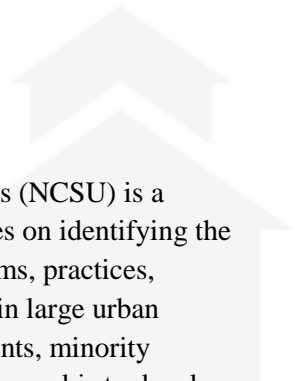
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The National Center on Scaling Up Effective Schools (NCSU) is a national research and development center that focuses on identifying the combination of essential components and the programs, practices, processes and policies that make some high schools in large urban districts particularly effective with low income students, minority students, and English language learners. The Center's goal is to develop, implement, and test new processes that other districts will be able to use to scale up effective practices within the context of their own goals and unique circumstances. Led by Vanderbilt University's Peabody College, our partners include The University of North Carolina at Chapel Hill, Florida State University, the University of Wisconsin-Madison, Georgia State University, the University of California at Riverside, and the Education Development Center.

This paper was presented at NCSU's second national conference, Using Continuous Improvement to Integrating Design, Implementation, and Scale Up. The conference was held on October 7-9, 2015 in Nashville, TN. The authors are:

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Abstract

Accountability policy sanctions have caused districts to adopt new reform strategies and required leaders to find ways to scale up these efforts. However, little attention has been paid to the underlying relationships of leaders and ways that social network churn may undercut these efforts at scaling reform. Our exploratory case study uses social network analysis to examine the level of churn of school and central office leaders in an underperforming system and examines the background and network characteristics of those leaders who leave. We find that leaders who are most central in the expertise network and who serve as brokers in the system were more likely to leave the district during the three-year period, causing significant churn in the underlying system and potentially negative impact on efforts at scale.

Educational policy in the United States has remained focused on eliminating the persistent achievement gap through legislation requiring greater use of research-based evidence and increased accountability at all levels of the system. This has occurred while at the same time a growing national push has caused school and district leaders to systematically collect, interpret, and use data, particularly student test data, for decision-making. Within any system, the interpretation and use of evidence for improvement – and resultant scaling up of new practices systemwide takes place through informal social networks of interaction, as individuals co-construct, make sense and learn as an organization (Argyris & Schön, 1996; Coburn, 2005; Datnow, Hubbard, & Mehan, 2002; Parise & Spillane, 2010). Social interactions around expertise and opportunities for learning and scale can be significantly disrupted when a high percentage of actors leave and enter the system. This activity creates a type of churn often negatively impacting organizational outcomes (Karnstedt, Hennessy, Chan, Basuchowdhuri, Hayes, & Strufe, 2010; Sasovova, Mehra, Borgatti, & Schippers, 2010).

While the majority of educational literature focuses on turnover or the movement out of the system, social network churn is broader, referring to both departure and arrival of actors within a given network (e.g., Finnigan & Daly, 2014; Schools Leaders Network, 2014). Exploring and understanding churn is important, as there are significant "costs" to a system associated with both the exit of individuals (loss of knowledge, social support, organizational memory, training and development costs ability to scale efforts) as well as the entrance of new actors (training, learning both technical and social system) (Sasovova et al., 2010). In general, the limited literature regarding churn argues that an organization's development and improvement is dependent upon the extent to which members make contributions (either actual or potential) to organizational learning, knowledge, and innovation (Arntzen Bechina, 2007;

King, 2009). While there may be some benefits of churn if weaker individuals leave, high levels and constant churn is disruptive to overall organizational success including efforts at scale given the loss of fiscal, human, and social capital.

Although much of the social network churn literature is dominated by empirical work in the field of business or management (e.g., see Buskens & van de Rijt, 2008; Moody, McFarland, & Bender-deMoll, 2005; Sasovova et al., 2010), educational systems are of course not immune to the impact of churn. To date, while we have some sense of the human capital "cost" of churn in education, we have little idea of the social cost. Further, we have limited empirical work on how this churn may actually impact perceptions of organizational learning taking place in systems and the role of those perceptions in churn.

As churn within an organization is a complex phenomenon, in this exploratory case study of a large urban district we focus primarily on one aspect of social network churn—that of the leavers in the system. For this analysis we draw on three years of social network data from district office and site leaders in a large urban school district to examine some of mechanisms that are associated with leaders that leave to better understand the "social cost" of churn. Churn can be particularly crippling to scale up efforts in school districts, particularly within those districts that are under pressure to improve, as both the knowledge that resides in the system and the diffusion of new ideas across the system may be inhibited by the disruption of leavers in the underlying social network. In this study we seek to answer: What is the level of churn within an underperforming system facing accountability policy sanctions? Which district leaders leave during a three-year time period and what are the background (e.g., position, length of time in district, etc.) and network characteristics (e.g., highly central, brokers, key players, etc.) of these

leaders? This work has direct implication for efforts at scale as coherence and consistency of efforts may be detrimentally impacted.

Theoretical Framework

While definitions of churn vary, the most common use of the term of "churn" in education is connected with turnover (Aud, Hussar, Kena, Bianco, Frohlich, Kemp, & Tahan, 2011; NCES, 2006) as well as the "intention" to leave a system (Mitchell et al., 2001). Few social network studies have begun examining the phenomenon of tie churn by looking at the formation of new ties, retention of existing ties, and the lost of preexisting ties at the actor level (Halgin & Borgatti, 2012; Sasovova et al., 2010). Building on previous work, we take a more holistic view of churn at the organizational level to incorporate the phenomenon of departure (lost ties), retention (existing ties), and arrival (newcomers with potential new ties) of individuals to a system, as each may play important roles in terms of cost and potential disruption to scale within an organization. In this regard, we posit that social network churn is concerned with the amount of both leavers and newcomers within a certain time period.

Churn involves a substantial amount of costs in terms of training, development, and infrastructure. For example, an estimate for principal preparation programs indicates that the average cost of preparing a new leader ranges from $50,000 to over $100,000 (Mitgang, 2012). In addition to the costs from preparation, there is a wide range of other expenses involved when a leader is replaced including: human resources costs ($20,000 per senior leader); transitional training (ranging from $50,000 to $85,000); onboarding (ranging from $5,500 to $7,500); and professional development (Feinberg & Jeppeson, 2000; Mitgang, 2007, 2012). These studies suggest that turnover of 100 leaders in large school district within three years, as is the case in

this study may add up to millions of dollars. These dollar figures of course do not account for the additional social and human capital costs to the system in terms of lost knowledge, support, and expertise and potential damage to efforts at scaling up reform.

For decades, researchers and policymakers have raised the public's attention to the critical and negative influence of high turnover rates (Béteille, Kalogrides, & Loeb, 2011; Fuller & Young, 2009). Despite these efforts, some researchers have estimated that about 15-33% of leaders across a typical district vacate their positions each year (Béteille et al., 2011; Gates, Guarino, Santibañez, Ghosh-Dastidar, Bugbee Brown, & Chung, 2004; Ringel, Gates, Ghosh-Dastidar, Bugbee Brown, & Chung, 2004). Studies have also indicated that principal turnover can lead to teacher turnover, which more directly impacts student achievement (Béteille et al., 2011; Fuller, Baker, & Young, 2007). In addition, superintendent turnover has been well documented with nearly half of superintendents leaving their positions within three years (Grissom & Andersen, 2012) and nearly two thirds leaving within five years (Byrd, Drews, & Johnson, 2006). While studies of churn have often focused on this top level of leadership or the on the ground level of teachers, we argue that it is critical to examine not just top leaders and not just principals, but the interaction between the two and as such adopting a more systems perspective. Understanding churn and scale up from a systems perspective is important as a growing body of work suggests the nested nature of reform efforts and the importance of diffusion across a system (Daly & Finnigan, 2010).

A few studies in management have attempted to understand some of the factors associated with churn. For example, Soltis and colleagues (2013) found that leaders who are most sought for relationships, but receive less reward and recognition tend to leave the system. In contrast, leaders who seek others and perceive they have the opportunity to learn and develop

are more likely to stay (Friedman & Holtom, 2002; Mossholder, Settoon, & Henagan, 2005). The latter may due in part to the fact that these leaders have access to relational resources they perceive to be useful to their work and thus are less likely to leave the system for a new position in which they would need to re-assess the costs and benefits for such a change. Another organizational study by Mitchell and colleagues (2001) focused on the more relational aspects of churn noting that individual employees' network ties that are embedded in a workplace have a strong influence on whether or not the leader tended to remain or leave a position (Mitchell et al., 2001). Results indicate that the more socially embedded a leader was in the organization, the more likely that individual was to remain in the position; and in contrast, those individuals less socially connected were more likely to leave. However, in these studies the idea of "socially connected" was not defined from a social network perspective and as such was a less precise estimation of connectedness and the type of connections each actor held (central, broker, etc.) To unpack and frame our understanding of churn in our sample of educational leaders, we draw upon the theoretical literature on social capital and social networks within organizations to provide additional perspective on the phenomena.

Social Network Theory. As Lin (2001) suggests, social capital consists of, "The resources embedded in social relations and social structure which can be mobilized when an actor wishes to increase the likelihood of success in purposive action" (p. 24). Social capital is therefore an investment in the social relations in a system through which the resources that exist in social relations between individuals can be accessed, borrowed, or leveraged. This work is foundational for key ideas offered by social network theory.

Our study is informed by prior work on the ways in which the quantity and quality of relationships in a social network influence the process of learning and change (see, for example,

McGrath & Krackhardt, 2003; Stevenson, Bartunek, & Borgatti, 2003). Social network theory provides insight into how social capital stretches across individuals and levels of the educational system as part of the work of organizational learning. Social network theory is concerned with the pattern of ties that exists between actors in a social network (Scott, 2000). This perspective entails a move from a primary focus on the individual to understanding the dynamic supports and constraints of the larger social infrastructure (Borgatti & Foster, 2003; Cross, Borgatti, & Parker, 2002). Social network studies in education (e.g., Coburn & Russell, 2008; Cole & Weinbaum, 2010; Daly, 2010; Frank, Zhao, Penuel, Ellefson, & Porter, 2011; Penuel, Riel, Krause, & Frank, 2009; Spillane, Hunt, & Healey, 2009), as in other fields, focus on how the constellation of relationships facilitate and constrain the flow of "relational resources" (knowledge, practices, etc.), as well as provide insight into how individuals gain access to, are influenced by, and leverage these resources (Degenne & Forsé, 1999). Here we discuss two important aspects of social networks to churn: the overall network structure of the organization and individual positions within the network to understand the flow of relational resources.

Network structure. The concept of network structure is important in understanding resource exchanges between individuals and groups within an organization as they work to scale and diffuse ideas (Cross, Borgatti, & Parker, 2002; Song, Nerur, &Teng, 2007). Social network theorists posit that dense structures facilitate more efficient resource flow as it takes less amount of time and fewer steps for relational resources (e.g., knowledge and information) in these types of structures to move from one actor to another (Burt, 1992; Coleman, 1988, 1990; Granovetter, 1973, 1982; Lin, 2001; Putnam, 1993, 1995). In contrast, a sparse network generates longer or even infinite travel distances for resources to arrive from actor to actor due to fewer ties and more structural holes that disconnect the flow of resources (Burt, 1992). Networks that have a

dense structure generally achieve at a higher levels of performance than those with sparse connections (Reagans & Zuckerman, 2001).

Network scholars posit that relational connections between actors or between groups provide brokerage opportunities that potentially create or augment social capital resources (Burt, 1992). A typical organizational network oftentimes consists of strong and weak connections between actors. It is the weaker connections between actors that represent gaps in the network structure, which generates advantages for connected actors to span their relationships (Burt, 2000; Granovetter, 1973). Those structural holes create brokerage opportunities for actors from different groups to exchange information that is non-redundant because actors within their strongly connected group tend to form a network closure with shared norms and overlapping information (*ibid*). As brokers (those who span structural holes) sit in between a number of weakly connected groups or actors, these actors may have control advantages as they link otherwise disconnected actors/groups and as such have disproportionate influence over the information flow (*ibid*).

The concept of brokers is arguably critical in understanding scaling up efforts as change processes involve a series of learning and exchanges of ideas/knowledge/expertise, and without brokers connecting disconnected others critical relational resources may be unable to bridge gaps and reach the entire system. As such, examining network structures may be useful for educational organizations enacting change as these underlying network structures may be leveraged to better create and diffuse knowledge and innovation (Cross et al., 2002). These resources may be of particular use as districts attempt to innovate and adapt to meet demands in high-stakes educational contexts.

Network position. Individual network position deserves equal attention as it suggests the degree of an actor's influence and popularity in a given network, which is related to the flow of resources across a network (Wasserman & Faust, 1994). Actors who possess a more central network position with more ties tend to have greater influence over the network, as they are able to connect with others for diverse resources. In contrast, peripheral actors tend to be connected with less relational resources and may lack the opportunities to benefit from the resources held by those in more central positions (Borgatti & Everett, 1999; Cross & Parker, 2004). It may also take longer for resources to reach peripheral actors, thus creating a lag time in moving knowledge resources or reform ideas throughout a system (Fernandez& Gould, 1994: Cummings & Cross, 2003).

In addition to central and peripheral network positions, brokers are also critical in resources flow as these brokers are considered a bridge that links one or more disconnected actors (Burt, 1992, 2000). Actors occupying a broker position have greater influence and power over a network both in terms of a connecting role and in their 'power' to filter, coordinate, or distort the resources (e.g., information) that flow throughout the system. Network studies at the organizational level suggest that brokers play key roles in transmitting policy messages to schools and between sub-groups across the district (Ansell, Reckhow, & Kelly, 2009; Daly & Finnigan, 2009; Daly, Liou, Tran, Cornelissen, & Park, 2014; Finnigan & Daly, 2012; Finnigan, Daly, Che, 2013; Honig & Copland, 2008) as they are able to facilitate intra-organizational communication for the diffusion of new ideas, knowledge transfer, cooperative relationships, and innovation (Ghoshal, Korine, & Szulanski, 1994; Song, Nerur, & Teng, 2007; Tsai & Ghoshal, 1998).

The resulting pattern and position of actors based on the pattern of their social ties is important not only to individual resource advantage, but in achieving larger organizational goals (Guzzo & Shea, 1992). Inattention to the influence of relational ties during a significant organizational scale up effort may result in a failed strategy (Cooper & Markus, 1995). While the balance of scholarship in this section suggests that relational ties may facilitate communication and knowledge transfer at all levels of the system in support of scale there has been little attention to the ways in which churn reduces this potential by disrupting the network.

Methods and Data Sources

The large urban district in this study, La Urbana Unified School District employs more than 14,000 individuals across 223 educational facilities. This district serves over 130,000 students from 15 ethnic groups and well over 60 languages in preschool through grade 12. The ethnic breakdown of the district includes approximately 45.7% Hispanic, 23.9% White, 11.8% African American, 5.1% Indo-Chinese, 3.3% Asian, Native American, Pacific Islander, and Multi Racial/Ethnic students. La Urbana employs approximately 7,500 educators and almost 900 pupil services employees (such as bus drivers, grounds, facilities, etc.). The sheer size of the system, as is true with many other large urban systems, influences the formal way that the district is organized. In the summer of 2010, the district was divided into eight "areas" with each comprising up to three high school clusters (elementary and middle schools that feed the high school). These areas are loosely organized by geographic area and are each served by an Area Superintendent who has responsibility over approximately 20 schools. These areas are roughly the size of many small to mid-size districts in the U.S. and as such could be considered "mini" districts. As the primary point of contact, support, and input on evaluation for principals, Area

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Superintendents are formally responsible for connecting the central office to the school sites as well as coordinating articulation between schools within each area.

In 2010 (the first year of the study) the District's governing board adopted a strategic process, which sets forth the explicit goal of creating a quality school in every neighborhood within five years. Approximately one year after adopting the plan, La Urbana was identified by the State Board of Education (SBE) as requiring corrective actions due to failure of many of its schools to meet Adequate Yearly Performance (AYP) under No Child Left Behind. This designation required the district to undergo a need assessment by a national research, development, and service agency. The report noted the need for the district to focus on data driven decision-making and support communication, particularly within established areas.

Sample

Data were collected at three time points over three years (2010-2013) and included the leaders' demographic information, various social aspects related to their work, and self-reported perceptions of the district's organizational learning climate. The present study aims to explore those leaders who leave the district as a starting point, with comparisons between those leaders who stay and those who leave the district based on the list of the leaders at T1. A total of 257 unique district and site leaders (i.e., superintendent, assistant superintendent, directors, supervisors, and school principals) were included in the study at time point one (T1). Nearly all the leaders (95%) participated in the survey at T1. Among these 257 leaders at T1, about 29% were district leaders and 71% school principals; and 63% were female. These leaders had an average of 11 years of experience serving in administration (SD = 6.5) and five years in their current position (SD = 3.9). Descriptive information for participants in the study is provided in Table 1 and Table 2.

Insert Table 1 and 2 about here

In addition to the general characteristics of these leaders, we further specify the demographic information by dichotomizing these leaders into two groups by their retention status, one group includes those who stay in the district from T1 to T3 (Remain) and the other representing those who leave the district at T2 or T3 (Leave) (see Table 1). We do not see a difference based upon gender for those who remain vs. those who leave but do note that leavers were more likely to be district leaders and less likely to be site leaders compared with those who remained. The leavers were also more likely to be in administration longer, but in their current position a shorter amount of time compared with those who remained.

Procedure

Participating school and district leaders were asked to complete an online-survey over three years at the same time period (Spring). Through the survey, we collected information about individual characteristics (gender, job title, work place, and a number of different years of working experience). We also collected a variety of social network questions but in this study we focus on these leaders' self-assessed frequency of seeking reliable work-related expertise ties (Expertise network) to examine this instrumental or work-related network. We used a bounded approach (Lin, 1999; Scott, 2000) including all the members of the leadership team (district and school administrators) to collect the network data, as this strategy, coupled with high response rates, provides more valid results (Scott, 2000). In developing and validating our social network questions, we drew upon the literature regarding district improvement processes and practices (e.g., Coburn & Russell, 2008; Chrispeels, 2004; Honig, 2006; Supovitz, 2006; Spillane, 2000; Togneri & Anderson, 2003); the evidence use literature (e.g., Marsh, Pane, & Hamilton, 2006);

and previous network studies (c.f., Moolenaar, 2012). We piloted our network questions with practicing administrators in order to better validate the items.

Measures

Dependent variables. As we are interested in understanding leader churn on the part of those who left and to what extent do those who left differ from those who remained, we employ a binary logistic regression with the variable remain (coded as 0) verses leave (coded as 1).

Independent variables. Independent variables were selected to reflect: leaders' network positions as measured by indegree, outdegree, betweenness, and demographics such as work level (district or site) and years of experience in administration and working in the current position.

Respondents were asked to quantitatively assess their expertise relationship with other administrators (district office and school site) within the district. Participants were asked to "…check the interaction frequency of those administrators to whom you turn to for reliable source of expertise related to your work" on a 4-point interaction frequency scale ranging from 1 (within the past two months) to 4 (1-2 times a week). We extracted frequent interactions around expertise for our analysis, defined as every week or two to 1-2 times a week.

Indegree, outdegree, and betweenness. We calculated three network measures related to individual centrality in the expertise network: indegree, outdegree, and betweenness [brokerage] (Borgatti, Jones, & Everett, 1998; Burt, 1983) using the UCINET 6.0 social network software package (Borgatti, Everett, & Freeman, 2002). These network measures allow us to understand the distribution and pattern of individual network connectedness and identify those actors who occupy central and influential network positions. The three types of centrality offer conceptually distinct, although related, perspectives on leaders' network position. Previous

network studies suggest that the use of degree centralities may provide better insight into the understanding of the influence of individual difference on the structure of the individuals' social network where they reside (Burt, 2005; Buskens & van de Rijt, 2008; Kilduff & Krackhardt, 2008). Similarly, individuals may gain, lose, or maintain the same amount of network ties over a period of time. Indegree of a leader refers to the number of incoming ties around expertise a leader receives from other leaders. Outdegree of a leader refers to the number of outgoing ties around expertise a leader sends to other leaders. We also calculated Freeman betweenness centrality (Freeman, 1977), which measures how likely a leader is to possess a broker position in connecting otherwise disconnected leaders in the network (Wasserman & Faust, 1994). The role of broker is critical in understanding the dynamism of such breakage activity as brokers bring potential influence on opening or closing the channel of information flow between actors (Ryall & Sorenson, 2007; Buskens & van de Rijt, 2008).

Control variables. We controlled for demographic information that included: work level (district or site) and years of experience (i.e., the number of years in administration and the number of years working in current position). We chose to include these variables as the difference between those who remain and those who leave may be due in part to the length of time a leader has been in a system or in a formal position as a proxy for knowledge and experience.

Data Analysis

We took a four-step process in our analysis. We first presented descriptive statistics of the study variables. Second, we provide a network sociogram to illustrate the expertise network structure of the leaders with a specific focus on distinguishing the Leavers from those Remained in the district. We used the NetDraw social network software (Borgatti, 2002) to generate the

sociograms that contain information such as nodes (individual leaders), ties (connections between leaders for, in this case, the source of expertise), and actor attribute of work level (e.g., district or site leaders) in the social network. The sociogram enables us to explore the initial pattern of the expertise network in terms of actor network position. Third, in further confirming the central and influential role of these leaders, we ran KeyPlayer analysis (Borgatti, 2003) to identify a set of actors who play a key role in connecting other actors, meaning they play important connector roles in the district wide expertise network. The KeyPlayer program identifies "key players" who either occupy core structural positions or who connect large numbers of other actors based on network measures such as in/out-degree centrality or betweenness. We conducted this analysis to determine who the most important "structural" actors were in the expertise network system. In this study, we use fragmentation criterion for the expertise network based on the calculation of actor level betweenness to identify the top number of key actors that may cause the most fragmentation of the network, if removed.

Finally, we employed binary logistic regression analyses to test the relationships between the likelihood of a leader who leaves the district compared to those who remain in his/her position (i.e., indegree, outdegree, and betweenness) in the expertise network controlling for demographics information. As there is a difference in the number of leaders who remain and those who leave, we used a normalized weighting strategy retaining the sum of the weights to be 1. In doing so, we are better able to obtain unbiased estimates and correct significant levels (Clogg & Eliason, 1987; Winship & Radbill, 1994).

In addition, as we aim to explore whether there are relationships between the likelihood of a leaver and his/her network positions as measured by indegree, outdegree, and betweenness, we focus on the quantity of ties a leader has in the expertise network. As such, we considered

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the use of binary logistic regression rather than $p*$ models, which would enable us to predict dyadic relations among pairs of actors, but that was not the intent of this study as the logistic regression provides a more methodologically reasonable approach as suggested in other studies (Grissom & Andersen, 2012; Sasovova, Mehra, Borgatti, & Schippers, 2010). While handling social network data, it is important to address the methodological concern of the assumption of independence of observations. Since the nature of network data is inter-correlated (Borgatti et al., 1998), we analyzed the network measures (i.e., indegree, outdegree, and betweenness) separately in the logistic regression models. Given this strategy, there is less concern about inflating standard errors based on multicollinearity between network measures.

Results

Over the course of three years, the district had approximately a 33% churn rate, indicating that a third of the district and site leaders either left or entered the district during that time period. Of these coming and going leaders, 57% left the district within three years (Leaver) and 44% were new to the district (Newcomer) during the same time period. Importantly, some positions were restructured or left unfilled.

As mentioned above, in this study we focus on the leavers over the course of three years. Those who left the district (Leaver) at T2 or T3 made up 22% of the total district and site leaders. On average, leaders in this district both sought out and received seven other leaders for work-related expertise (see Table 2) with indegree ranging between 0 and 41 ties (SD = 8.3) and outdegree ranging between 0 and 72 ties (SD = 10.1). We note large variation in leaders' expertise-seeking behavior than receiving behavior. In addition, the leaders connected to an

average of less than 1% of two otherwise disconnected leaders in the Expertise network with

betweenness ranging between 0% and 18% (SD = 2.0).

Examining System Leavers

Building off the descriptive statistics around expertise from research, we present the

Expertise network sociograms in Figure 1 to describe the difference in leaders' network positions

for those who remain compared with those who leave. Nodes in Figure 1 are individual leaders

in this district and the lines represent the exchange of information regarding work-related

expertise with arrows representing the direction of nominating or receiving nomination of being

a source of expertise. The nodes are shaped by role (square = central office leader; circle =

school site principal) and clustered into their areas or zones with all of the central office leaders

in the middle and all of the principals and their area superintendents in the clusters.

The nodes are sized by indegree: the larger the node, the more incoming ties a leader

receives from others, meaning that the more the leader is regarded as a source of expertise. As

the figure shows, central office leaders (square nodes) tend to be the most central and influential

actors, as shown by the larger sizes of many of these nodes. Centrality is linked to more

incoming ties, meaning these central office leaders are recognized as a source of expertise by

other leaders across the district compared with principals (circle nodes).

The figure also shows those leaders who left – colored in blue – and those leaders who

remained – colored in red. Among the most central leaders (the top 10% of the highest indegree),

approximately 50% were leaders who left the district during the three year period (blue nodes).

Many of these individuals were in the critical position of Area Superintendents, as represented as

a central office square within the area clusters.

Insert Figure 1 about Here

The KeyPlayer results indicate that several key leaders who are regarded as a reliable source of expertise (noted with a K) are also the ones that left the district during the study time period (colored blue). For example, all but one of the area superintendents were both key players and left the district though some were not as central in the expertise network as others. On the other hand several less central leaders from central office were also identified as key players and left the district during this time. Figure 1 helps to illustrate not only the level of churn on the part of Leaver in the system (i.e., central office versus school site), but also the tendency that those leaders who left were both central (often playing broker roles) and as such influential, causing disruption in the overall network and likely impacting scale up.

To understand more about the people who left the system we examined the relationship between different background characteristics and network attributes and leaving (Table 3). All models were significant explaining 15% to 19% of the variance in predicting the likelihood of being a leaver as opposed to someone who remains ($p< .001$). Multicollinearity test for the models indicates that there is no variable in the models that is measuring the same relationship as is measured by another variable(s). The variance inflation factors (VIFs) of predicting variables range from 1.03 to 1.29, meaning that each of the independent variables contributes uniquely and independently to the variance in predicting the outcome variable.

Insert Table 3 about Here

Demographics variables and leavers. The regression results across the three models indicate that, leaders who work at the central office were more likely to leave than school site leaders over the study period. In other words, the likelihood of a district leader leaving the district is on average one time higher than those of a site leader over the study period. In addition, all three models indicate that leaders with more years of experience as an administrator

and fewer years of experience in their current position were more likely to leave the district. This indicates that those leavers who might have moved to different positions across the district over the three years ended up leaving the district.

Network positions and leavers. The results show some important differences with regard to network position of the leaders. First, as seen in model 1, those with higher expertise indegree are more likely to leave the district. In other words, leaders who are sought more by other leaders for expertise are almost two times more likely to leave the district than those with less sought expertise. The second model suggests no statistically significant association between a leader's expertise seeking behaviors (i.e., expertise outdegree) and the likelihood of leaving the district. That is, whether or not leaders actively seek expertise from others does not affect the likelihood of leaving the district. Finally, confirming the key player result above, model 3 suggests that being a broker in the expertise network (i.e., expertise betweenness) is positively associated with the likelihood of leaving the district. Those leaders who are better able to bridge expertise between the two disconnected leaders are more likely than those with less brokering capacity to leave the district.

In sum, leaders who worked at the district office, had more years of experience as an administrator, worked in their current position for a shorter period of time, were more often sought for expertise, and played a brokering role in bridging sources of expertise, were more likely to leave the district.

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Discussion

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These data suggest the challenges districts face in scaling up reform efforts as the "experts" in the system who are sought out for their knowledge or bridge to others are more likely to be the ones to leave. This longitudinal analysis using social network concepts and

methods shows us how tenuous the linkages to knowledge and expertise are in the system that is experiencing churn. It also suggests we need to expand our notions of capital to include not just the fiscal issues associated with scale and churn, but those related to human and social capital.

Previous studies in education have attempted to understand some of the social factors associated with churn, for example, suggesting that leaders who are highly sought out but do not receive reward and recognition tend to leave the system (Soltis et al.,2013). Although these "experts" are sought for knowledge and skills they bring to the organization, it is possible that this heavy reliance on these leaders is what pushes them out of the system perhaps due to stress or burn out. Burn out may be exacerbated by the high levels of stress in these underperforming systems who seem to face a barrage of sanctions (Finnigan & Daly, 2012; Finnigan, Daly, & Stewart, 2012). Creating opportunities for greater work-related recognition in underperforming systems as well as supporting high levels of trust and support may support the diffusion and uptake of complex ideas and practices, providing a bit of inoculation to the potentially poisoning effects of churn. Our work suggests focusing on the social capital costs within a system and loss of organizational memory, which may be important for efforts at scale.

We found that leaders who were highly embedded in an instrumental work related relationship in terms of indegree expertise, were more likely to leave in this school district, which runs counter to the more general work-related that find that less socially connected individuals tend to leave (Mitchell et al., 2001). It is possible that this speaks directly to the context of an underperforming system – or an organization in crisis. Our data may indicate that these leaders became "overwhelmed" with the sheer number of incoming relationships, which likely distracts from the core work of leaders, particularly one that was under pressure to improve.

An overreliance on a few actors for relational resources may inhibit the distribution of expertise in the system and in a sense "restricts" or narrows the availability of "expertise" to those few individuals—in a sense reducing the amount of diverse perspectives in the system. Importantly, the "sources of expertise" were not equally dispersed across a system, rather reliable sources of expertise tended to be located in a few individuals, many of whom were at the central office. As such, the district may consider in providing additional opportunities for leadership development that intentionally diffuses expertise across a system. In doing so, the district may enhance capacity and alignment to reform efforts and achieve scale across the system. Better effort toward distributing expertise throughout the system may ease the pressure on those that are viewed as "experts" and provide opportunities to diversify the expertise available o the system. Diffusing knowledge and expertise may also have the benefit of building capacity and coherence across the organization in order to support more coherent scaling of efforts.

Brokers also played a key role in maintaining the structure of relationships as they possess the capacity to bridge disconnected people in the system. However, in this study leaders who occupied broker positions were particularly vulnerable to leaving the system. The loss of brokers in a system has three potential impacts: First, these individuals "span" structural holes, meaning they support connections between otherwise disconnected actors; second, these brokers are important as they move instrumental resources such as expertise across a system; and third, as these brokers tended to be in key administrative positions (Area Superintendents), they were directly responsible for moving resources most related to the overall district improvement plan.

The loss of these leaders, key players in a structural sense, can be seen as a loss of institutional knowledge in the system and our results show a direct impact on potential

fragmentation of the system. This is particularly damaging to scale up initiatives as these brokers help "weave" together an otherwise disconnected set of reliable sources of expertise related to the district's overall initiative. This ultimately may mean that resources like expertise will have a more difficult time moving throughout the system as the removal of those key brokers will potentially lead to a disruption of a network. Network fragmentation that results from a lack of brokers may inhibit the system's ability to effectively move knowledge and information to all members as well as create smaller cohesive subgroups that are not generating new ideas and approaches resulting in systemic inertia (Hannan & Freeman, 1984). Well connected channels for the flow of expertise may be more efficient in distributing, (re)allocating, and generating resources necessary for improvement. More densely connected system may better facilitate coherence and cohesiveness in exchanging ideas, which potentially supports the developed and maintenance of interpersonal relationships as well as leveling the playing field with regard to access to information.

Implications and Conclusion

Using social network analysis and logistic regression models we examined factors associated with churn on the part of leavers based on three years of data collected from a large urban system. The findings suggest that leaders who worked longer in the district but in their current position for a shorter period of time, who were most sought for reliable expertise related to their work, and those who occupied "key" brokering positions in connecting that expertise across the district were most likely to leave. Taken together the results suggest that well beyond human capital costs there may be significant "social capital" costs when leaders leave a system. The moving in and out of the system creates a type of "revolving door" of leaders, which not only disrupts ties, but potentially hinders organizational improvement and scale by disconnecting

rather than strengthening the knowledge within the system. As such it is critical that district leaders begin to focus on ways to provide systemic support to leaders in the district to develop and mobilize and distribute the knowledge that resides in the system. In this case, paying attention to the support structures and practices for Area Superintendents would have been beneficial. In addition, finding ways to strengthen the role of the "brokers" in the system through opportunities for people to connect that might not usually connect could have a positive impact on the strength of ties.

There are a number of limitations of this exploratory study that bear mention. The first is that this paper privileged the examination of those that left the system and less analysis of the newcomers, which is an important part of the churn story. Future work should look at both leavers and newcomers to better understand movement in and out of the system. Secondly, our analysis only looks at a subset of a large urban school district central office actors (those director level and above) and as such likely underestimates the actual churn in the system. This suggests the importance of future studies that take a larger and more varied sample. Finally, in the end as this is more of a study about the "quantity" of ties and the resulting network position, it lacks qualitative data about the "quality" of the interactions across actors. Future work that combines rich qualitative data related to the topic is of critical importance.

Understanding the role of churn has never been more important, particularly as we consider issues related to scaling up reform. Given the relatively consistent rate of churn combined with the graying of the education work force and a significant amount of retirements on the horizon churn will be increasingly important not just in large urban settings, but across the nation in all settings. Much of the previous work focuses on the human and fiscal costs associated with churn particularly on turnover, but do not pay as close attention to the social side

of network churn as school and district leaders undertake reforms in response to accountability pressures. Our exploratory work suggests that the costs of churn extend well into the social and perceptual arenas, likely inhibiting efforts to bring about change districtwide.

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Tables

Table 1: Sample Characteristics of All Leaders at T1

	All leaders	Remain	Leave
Gender			
Female	164 (63.1%)	128 (63.1%)	36 (63.2%)
Male	96 (36.9%)	75 (36.9%)	21 (36.8%)
Role			
District leader	75 (28.8%)	48 (23.6%)	27 (47.4%)
Site leader	185 (71.2%)	155 (76.4%)	30 (52.6%)
Years in administration			
≤ 8 years	87 (33.5%)	72 (36.7%)	15 (26.0%)
8-12 years	85 (32.7%)	67 (34.2%)	18 (31.5%)
≥ 13 years	81 (31.2%)	57 (29.1%)	24 (42.5%)
Years at current position			
≤ 2 years	85 (32.7%)	62 (31.2%)	23 (46.0%)
3-6 years	77 (29.6%)	60 (30.2%)	17 (34.0%)
≥ 7 years	94 (36.2%)	77 (38.7%)	17 (34.0%)

Note: N = 257. Numbers reported in cells are frequency and percentages in parenthesis.

Table 2: Descriptive Statistics of All T1 Leaders

	All leaders	Remain	Leave
Years of experience			
Years in administration	11.3 (6.5)	10.8 (6.1)	13.2 (7.7)
Years at current position	5.1 (3.9)	5.4 (4.0)	3.8 (3.4)
Network position			
Expertise indegree	7.0 (8.3)	6.3 (7.1)	9.7 (11.3)
Expertise outdegree	7.0 (10.1)	6.4 (7.9)	9.5 (15.4)
Expertise betweenness (%)	0.7 (2.0)	0.5 (1.0)	1.5 (3.7)

Note: N = 257. Numbers reported in cells are mean and standard deviation in parenthesis

Table 3: Logistic Regression Models on the Likelihood of Being a Leaver

	Model 1			Model 2			Model 3		
	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)
Constant	-0.42	.38	0.65	-0.13	.37	0.88	1.08	.46	2.93
Work level (site)	-1.05	.25	0.35***	-0.87	.25	0.42***	-0.98	.26	0.38***
Years in administration	0.49	.14	1.63**	0.49	.14	1.64***	0.46	.14	1.58**
Years at current position	-0.32	.15	0.73*	-0.47	.14	0.63**	-0.47	.14	0.63**
Network position									
Expertise indegree	1.86	.54	6.40**						
Expertise outdegree				0.51	.36	1.66			
Expertise betweenness							0.56	.27	1.76*
NagelkerkeR^2		.19			.15			.15	
Model χ^2		55.42***			42.83***			45.12***	

Note: N = 257 based on T1. Maximum likelihood estimation is used as the regression method in the models.Leave status coded as 1 for those who left and 0 for those who remained.
*p<.05, **p<.01, ***p < .001.

Figures

Figure 1: Expertise Network of Leaders over Time
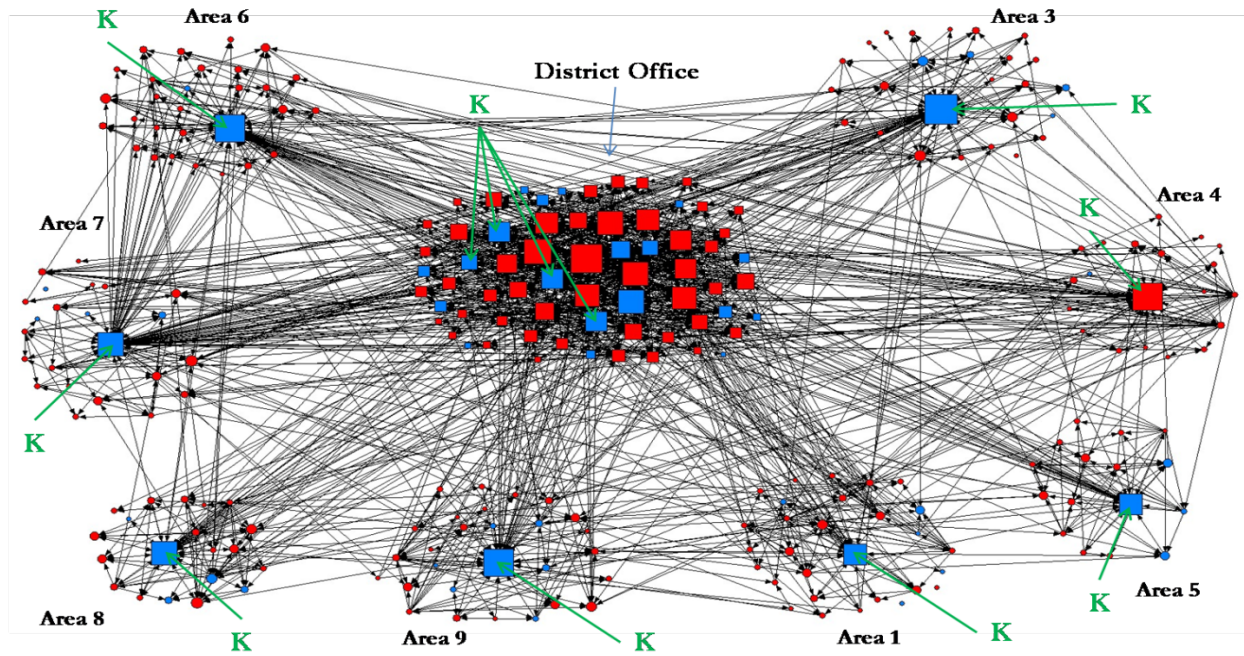
Note: N=257. This network sociogram represents the pattern of seeking and being regarded as reliable source of expertise on a weekly basis. Nodes are sized by indegree; shaped by position (square=district leader, circle=site principals); colored by churn status (red=Remained, blue=Left); and positioned by work area. Letter 'K' represents the key brokers identified by KeyPlayer finder (Borgatti, 2003).