The Effect of Leadership Turnover on an Intangible Resource: A Virtual Experiment

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Entrepreneurs may start a firm and then leave it. What impact does this leadership turnover have on the firm's intangible resources? Creating an agent-based simulation of a start-up, we examine changing leaders and the development of the intangible resource, the context-for-learning (CFL). Changing leaders negatively affects firm CFL but firms with a high level of CFL recover quicker. Firms that have a new leader with an effective leadership profile also recover quicker. Multiple leadership changes result in a developmental path for CFL that bounces around and ends below the developmental path with the original entrepreneur. For firms with low levels of CFL and an entrepreneur with an ineffective leadership profile, leadership turnover with another entrepreneur with a similar ineffective profile resulted in improved firm CFL levels. Leaders and groups matter. The relative difference between the last leader and the current leader also matters in developing socially constructed resources.

INTRODUCTION

An increasingly important segment of entrepreneurial endeavors is that of entrepreneurial startups in knowledge industries (West, Bamford, & Marsden, 2008). Knowledge industries can be based on advanced scientific research like that found in the biotechnology and nanotechnology industries (Sako, 2003; Palacios, Gil, & Garrigos, 2009). Often founders start these firms with the express purpose to build and then sell the firm to the highest bidder. In this case, the entrepreneur engages not only in building an enterprise that demonstrates a knowledge-based resource, but also in providing that resource upon the transfer to another firm. Two problems face such an entrepreneur (Ucbasaran, Lockett, Wright, & Westhead, 2004). First, how sensitive is the generation of an organizational knowledge resource to the set of people involved in its generation (i.e., what is the effect of personnel turnover in various stages of the enterprise; and what if it is a socially constructed resource or highly dependent upon the people involved)

(Baron & Hannan, 2002)? Secondly, what is the effect on the team when the leader changes (Sharma & Irving, 2005)? Research suggests that leader succession will have successful change efforts that positively affect performance if they move rapidly (Ndofor, Priem, Rathburn, & Dhir, 2009) while other work has shown the importance of the work environment on entrepreneurial learning (Lans, Biemans, Verstegen, & Mulder, 2008). Is that still the case when the departing leader is the founder of a firm and the incoming leader a representative of the purchasing firm?

Because knowledge-based resources are context sensitive, it is very difficult to separate the various effects of context, people, and timing (Blyler & Coff, 2003). This project, by using a computer simulation, examines the changes in the leader and the effect of those changes at different times during the development of a socially constructed resource. Computer simulations addressing entrepreneurs and learning have been used to show the critical nature of learning goals (Noel & Latham, 2006), and to model innovation (Almirall & Casadesus-Masanell, 2010). In virtual experiments, it is possible to hold everything constant with the exception of the experimental intervention. Virtual experiments like traditional experiments shed light on the implications for such changes in the real world.

The computer simulation that we report on is an agent-based model. The structure of the agent-based models, like in structural equation modeling, is the hypothesis that is being examined. It reflects a reduced model of the reality and is a model of the system understanding of independent "individuals" or agents operating on decision rules with set relationships between them (Ng, 2004). To craft the model, we will use as our basis one already used in the management literature. We will add to that model our proposed modeling of leader succession and leader change in acquisitions (or leadership turnover). A summary of the computational model and its strategic resource follows this review. Next, we detail the conceptual and empirical validity- oriented hypotheses (Heath, Hill, & Ciarallo, 2009). We, then, describe the virtual experiments and provide results. Finally, our conclusions and recommendations for further research conclude the paper.

THE BASE SIMULATION

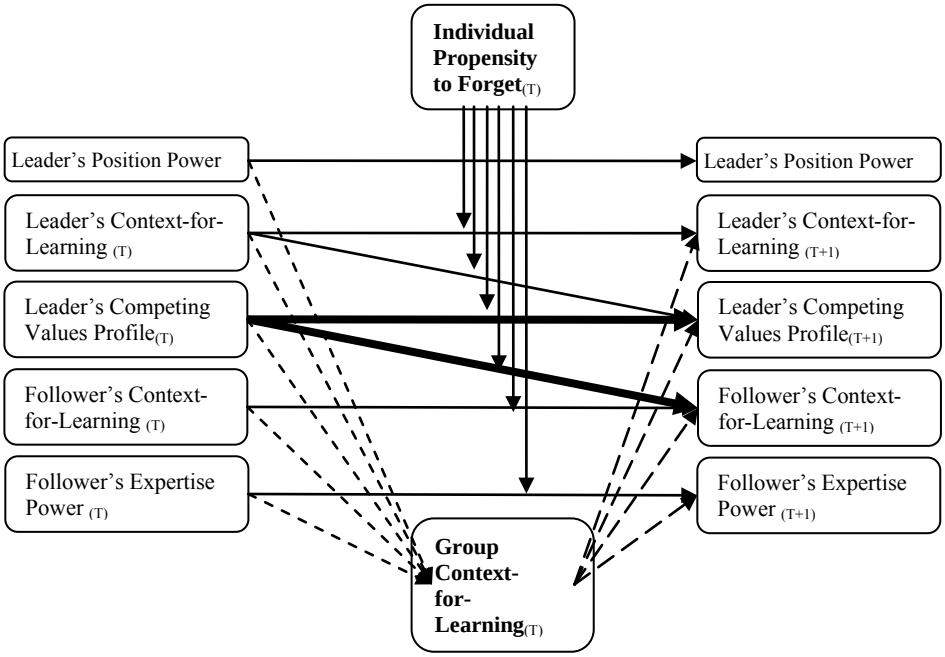
We looked for an agent-gent based model that already included only a small group of people similar to what could be found in a micro-business similar to those engaged in advanced research. We found several agent-based entrepreneurship oriented simulations but their focus was at a market level and the "agent" was the entire organization (Ng, 2004; Zhang, 2003). These simulations were not appropriate. We turned to the management literature and in particular the leadership literature since in a micro-business we have a leader and a small set of followers. While a number of scholars have used agent based modeling (Dal Forno & Merlone, 2006; Dionne & Dionne, 2008; Black, Oliver & Paris, 2008), only one had a preexisting leader and a small set of followers that collectively created an output, Black and colleagues work.

Black and colleagues (Black, Oliver, & Paris, 2008) have developed an agent-based simulation that mimics the social construction of a Context-for-Learning (CFL) across time and prints out a developmental path of the CFL. In the CFL simulation, the environment is a particular workgroup with a specified beginning level of CFL. The goal is to maximize the level of CFL and to do so in the most effective and efficient fashion for the workgroup. The workgroups consists of a leader and followers (See Figure 1). A profile of their perceptions of the factors of the CFL defines the leader, followers, and the collective agent of the group. Influence rules define the relationships among the agents. Learning and forgetting rules define certain additional relationships among agents across time. All agents engage in experiential learning. Followers also learn from directed behaviors by the leaders. Leader behaviors thus directly influence the work group members or followers (Quinn, Faerman, Thompson, & McGrath, 2003). Leaders also learn or forget from their on-the-job experiences in performing leader behaviors. The group's CFL emerges from the particular set of relationships among the agents. CFL Index (CFLI) tracks the development of the group level CFL, which is graphed as the developmental path of the CFL.

In summary, the base simulation, the CFL simulation (Black, Oliver, & Paris, 2008) provides a model (See Figure 1) in which leaders directly influence followers based on the activities they engage in and

indirectly influence followers through the emergent group results. Followers influence each other and leaders only indirectly through the emergent group competency. Both the leaders and the followers influence themselves by either learning or forgetting across time. The emergent group CFL_{Index} is plotted across time through iterations to show a developmental path. The leader prioritizes actions based on his or her existing expertise; the more expert, the more action.

FIGURE 1
DEVELOPMENT OF THE GROUP CONTEXT-FOR-LEARNING
(Adapted from Black et al., 2006)



THE CONCEPTUAL MODEL: ENTREPRENEUR AND SMALL BUSINESS LEADERSHIP TURNOVER

When studying small businesses and the turnover in management of such firms, we need to consider those firms that continue in existence past the departure of their founder. Such firms in essence have turnover in their CEO position (although the firms may or may not be corporations). While some may be in the situation of having family succession (Dyer, 1986; Le Breton-Miller, Miller, & Steier, 2004), others are selling the firm to either another individual or a company (Schollhammer, 1991). Several types of entrepreneurs have been proposed (Starr & Bygrave, 1991; Westhead & Wright, 1998). For the purposes of this study, whether an entrepreneur/founding leader is a serial, portfolio or novice with their accompanying variations in skill sets (Westhead & Wright, 1998) will be accounted for in the area relating to the sets of leadership skills possessed by the leader. What is of most interest is what happens after a leadership turnover due to the acquisition of the small business by either another firm or entrepreneurial succession.

We are not interested in the continuing performance and returns of the acquiring firm (Kumar & May, 2009); but, rather, the continuing performance of the acquired firm. Research shows that leadership has a major impact on performance post-acquisition of the acquired firm (Waldman & Mansour, 2009). Furthermore, in the context of acquisitions, a learning environment is important especially for the

ambidexterity required to exploit existing resources while exploring for new resources and capabilities (Nemanich & Vera, 2009). Earlier, Nemanich and Keller (Nemanich & Keller, 2007) found that transformational leadership helped acquired firm's employees accept the change in leadership and experience job satisfaction. Others have found that having human relation expertise also facilitates successful acquisitions (Croyle & Johnsey, 2007; Seo & Hill, 2005). Certainly, the remaining leaders can find the acquisition process and the integration process stressful (Dotlich, Noel, & Walker, 2005) which in turn can negatively affect the performance of the acquired firm. Yet, these same leaders can also enable their firms to acquire the ambidexterity mentioned above (Graebner, 2004). Thus from the merger and acquisition literature, we find that incoming leaders matter, remaining leaders matter and socially constructed resources, such as cultures that support learning and human resource expertise in mergers and acquisitions, matter.

Often in family businesses, the succession happens over a longer period and the founding leader or a subsequent leader (Le Breton-Miller, Miller, & Steier, 2004) may know the successor. This paper does not focus on that particular type of entrepreneurial turnover but rather on the turnover to an outsider with whom the followers of the firm have no previous experience. For such types of entrepreneurial turnover, research has shown that the probability that a business is sold is correlated with the length of time that the manager of the business has been with that business (Holmes & Schmitz, 1996). In other words, leadership change is correlated with management's tenure. In the first three years of existence, 4% of the founders sell their business (Holmes & Schmitz, 1996, p. 83). This rate increases to 9% at an average of 4.5 years, 20% at an average 7 years, and 21% for businesses older than 22 years (Holmes & Schmitz, 1996, p. 83). Just because there is one change in management does not mean that there will not be subsequent changes (Holmes & Schmitz, 1996). Indeed, the likelihood of management change of managers who are not founding leaders varies by the length of time that the manager has been in place and by the age of the firm (See Table 1). For this paper, we will use the same time spans as earlier research and assume that subsequent changes in management will be as Table 1 indicates.

TABLE 1
CHANCE OF TURNOVER FOR A GIVEN AGE OF A FIRM BY FOUNDING OR NON-FOUNDING LEADERS

Age of Business	Founding Leader	Non-Founding Leader tenure < 3 years	Non-founding Leader tenure ≥ 3 years	% Turnover
If Age of Firm <2	Yes			4%
	No	Yes		16%
If Age of Firm 2<X<3	Yes			4%
	No	Yes		26.8%
If Age of Firm 3<X<6	Yes			9%
	No	Yes		26.8%
	No	No	Yes	8.9%
If Age of Firm 6<X<12	Yes			20%
	No	Yes		18.7%
	No	No	Yes	17.8%
If Age of Firm 12<X<22	Yes			20%
	No	Yes		23%
	No	No	Yes	12%
If Age of Firm 22<X	Yes			21%
	No	Yes		23%
	No	No	Yes	12%

(Adapted From Holmes & Schmitz, 1996)

Between 1995 and 2002, North American annual succession rates for larger businesses ranged between 10% and 17.9% (Lucier, Schuyt, & Spiegel, 2002), which we assert are not that dissimilar to the range of turnover for non-founding leaders in smaller entrepreneurial entities. Given that there is also variation across industries in turnover rates, it seems appropriate to include explicitly this variation. For the five-year period ending 2002, the average industry turnover was 8.8% (Lucier et al, 2002).

An environment that allows employees to learn and grow is a critical part of reducing turnover (Jamrog, 2004), as well as, being critical for entrepreneurship activities (Cope, 2005) and acquisitions (Nemanich & Vera, 2009). The Context-for-Learning (CFL) is such a learning and growing environment (Ghoshel & Bartlett, 1994). The CFL is a strategically important resource to support employee learning and is a dimension of both a strategic resource and a strategic human resource competence since it facilitates learning by organizational members. This understanding of a socially constructed resource and the impact of turnover on its development is increasingly important as firms face worker shortages in management and high-tech skilled labor, or as a firm looking to buy an entrepreneurial startup replaces the entrepreneur.

VALIDATION HYPOTHESES

The above conceptual models provide a simulation of the system effects that scholars propose regarding entrepreneurial turnover and the potential impact on outcomes. It models the answer to the question, "To what degree do changes in management affect the intangible and socially created resources of firms?" It is important to acknowledge that such a question inherently addresses multiple levels in an organization (Lawrence, 2004). We are looking at individual changes and their impact on (at a minimum) a team-level resource generation, or, for micro-businesses, organizational-level resource generation. Since for startup firms, all individuals can be considered within one reference group (Lawrence, 2006), and given that the agent-based model effort by Black and colleagues (Black, Oliver & Paris, 2008) addresses a small group and across all levels, Black and colleagues' model is an appropriate one to use for an initial investigation.

In that model, the organizational level intangible resource of having a Context–For–Learning emerges from the interactions of the individuals involved. Since this was a small organization of seven employees, it could be considered at a group level. However, we will consider it the entire organization, so organizational level is appropriate. This meets the call for such work (Lawrence, 2004). Furthermore, this type of research provides a set of potential scenarios given changes to the initial model. For our purposes, these scenarios act like descriptions of possible actions and allow us to see the system results of any one particular change. In this instance, the change is the turnover of the entrepreneur for a new leader. We acknowledge that by choosing to use this simulation model, we did not choose to examine the particular situation in which there are remaining leaders from before acquisition that stay into the post-acquisition timeframe.

To highlight differences, two very different leadership behavior profiles will be examined in virtual experiments following Yin's call for examining critical cases (Yin, 2003). From the previous use by Black and associates (Black et al., 2008) and given the independent confirmation of the competing values instrument (Kalliath, Bluedorn, & Gillespie, 1999), we will use profiles of leadership skills from Quinn's competing values framework (Quinn et al, 2003). From that framework, we choose an effective leadership profile (Aggressive Achiever) and an ineffective leadership profile (Drowning Workaholic) (Quinn, et al., 2003). Underlying many of the following hypotheses development is the assumption that those entrepreneurs and their replacements with an effective leadership profile will have better results than those entrepreneurs and their replacements with an ineffective leadership profile (Quinn, et al., 2003).

This paper is interested in examining turnover in leadership as an independent variable. Bruton and colleagues (Bruton, Fried, & Hirisch, 1997) found a strong positive improvement in the performance of a new venture when venture capitalists replaced the CEO. Black & Boal (1997) found a strong correlation

between the Context-For-Learning and performance. Thus, we expect that if the leader of the work group (or, the entrepreneur of a micro business) is replaced there would be a positive improvement in performance (Bruton, Fried, & Hirisch, 1997). There was no specification about the leadership skill sets of either the original leader or the replacements so our first set of hypotheses suggests that any replacement will be better than if the original leader remained.

> *HYPOTHESIS 1A: Ceteris paribus, the replacement of Effective leader by one or more leaders in a serial fashion will result in a continued steeper and higher average developmental path than with no change.*
> *HYPOTHESIS 1B: Ceteris paribus, the replacement of Ineffective leader by one or more leaders in a serial fashion will result in a continued steeper and higher average developmental path than with no change.*

However, other work on leaders indicates that performance can be either positively or negatively affected depending upon other conditions (Glenn-Rowea, Cannella Jr., Rankin, & Gorman, 2005). Glenn-Rowea and associates found that the context of the succession event mattered. We operationalized context as the general orientation of the team. Thus, we expect that when a similarly oriented leader replaces an entrepreneur, as evidenced by having the same competing values leadership behavior profile, the direction of the change will depend upon the skill levels present in the group.

However, Black and associates (Black et al, 2008) found that when determining the impact of a team on a leader, the skill levels present in the group mattered. They found that a leader's growth was constrained by being in charge of a low skilled group and enhanced when in charge of a high skilled group. Thus, initially, we will keep the skill level of the replacement leader the same as the beginning skill level of the original entrepreneur.

Given a High CFL Group, our hypotheses are:

> *HYPOTHESIS 2A: Ceteris paribus, the replacement in a serial fashion of Effective leaders by one or more Effective leaders with a similar beginning CFL level as the original leader, will result in a continued steeper and higher average developmental path than with no change.*
> *HYPOTHESIS 2B: Ceteris paribus, the replacement in a serial fashion of Ineffective leaders by one or more Ineffective leaders with a similar beginning CFL level as the original leader will result in a continued steeper and higher average developmental path than with no change.*

Given a Low CFL group, our hypotheses are:

> *HYPOTHESIS 2C: Ceteris paribus, the replacement in a serial fashion of Effective leaders by one or more Effective leaders with a similar beginning CFL level as the original leader will result in a continued steeper decline and lower average developmental path than with no change.*
> *HYPOTHESIS 2D: Ceteris paribus, the replacement in a serial fashion of Ineffective leaders by one or more Ineffective leaders with a similar beginning CFL level as the original leader will result in a continued steeper decline and lower average developmental path than with no change.*

Next, following the implication from (Black et al, 2008) that levels of skills needed for the focal resource can affect people and thus teams, we allow the skill level of CFL to vary across the entrepreneur and the replacement leader. This allows us to hold the skill of leading or managing constant and look at the impact of having a different level of the focal resource by the leader whether the original entrepreneur or the replacement leader. Again, we will use the extreme representations to allow maximum differences

to emerge. However, our hypotheses will continue to follow the hypothesis pattern from the first set. The change in leader will be positive; that is, it will result in a higher and steeper developmental line than no change.

Given a High CFL Group, our hypotheses are:

> *HYPOTHESIS 2E: Ceteris paribus, the replacement in a serial fashion of Effective leaders by one or more Effective leaders with a different beginning CFL level as the original leader will result in a continued steeper and higher average developmental path than with no change.*
> *HYPOTHESIS 2F: Ceteris paribus, the replacement in a serial fashion of Ineffective leaders by one or more Ineffective leaders with a different beginning CFL level as the original leader will result in a continued steeper and higher average developmental path than with no change.*

Given a Low CFL group our hypotheses are:

> *HYPOTHESIS 2G: Ceteris paribus, the replacement in a serial fashion of Effective leaders by one or more Effective leaders with a different beginning CFL level as the original leader will result in a continued steeper decline and lower average developmental path than with no change.*
> *HYPOTHESIS 2H: Ceteris paribus, the replacement in a serial fashion of Ineffective leaders by one or more Ineffective leaders with a different beginning CFL level as the original leader will result in a continued steeper decline and lower average developmental path than with no change.*

METHODS

Black and associates' model (Black et al, 2008) adjusts values during the run at the level of the individual and recalculates the group level values for each run, thus allowing the group level values to emerge based on the relationship rules among the individuals. This paper adjusts their model to allow for the insertion of the leaders with profiles generated matching the hypothesis conditions and more closely models the periods of time. Figure 1 summarizes the set of agents and the relationships between them. From Figure 1, the reader can see that the model shows a single time step. Each run includes 600 time steps representing ½ month timing between time steps and thus the process indicated in the model reiterates. Each run uses initial inputs that equal values for the Context-for-Learning Profile, Experience Scores, and, for the leader, the Competing-Values-Framework Profile. Each run also outputs those same items along with the focal goal of interest, the Group CFL Index.

The paper uses a virtual experiment mimicking a small entrepreneurial team comprised of an entrepreneur/leader and seven followers. This size of a new venture is similar to the sizes reported by others (Cooper, Ramachandran, & Schoorman, 1997). Two types of leadership skill profiles tested with two types of homogenous groups. All input data is synthetic data and has been generated to meet the conditions required by the various hypotheses but stochastically varied with the parameters of the experimental condition. The leadership profiles are the effective Aggressive Achiever and the ineffective Drowning Workaholic. The two types of homogenous groups are those that have on average a high Context-for-Learning index value and those that have on average a low CFL index. Table 2 describes the pattern of how the leaders are inserted into or withdrawn from the simulation. The numbers for each round do not add up to 100% because some of the percentages are based on those firms that have already had turnover or which are having it for the first time and the others simply have not had any turnover yet.

While each run is technically a separate virtual experiment, we run each experimental condition 100 times. We then use summaries of the runs for each condition to show the average results. A smoothing algorithm facilitated the ease of viewing and enabled the results of 600 iterations to be in a legible format

for a regular page. The graphs for the conditions for each hypothesis are examined and conclusions drawn. The graphs then reveal what on average occurs when changes as indicated in the table take place.

TABLE 2
CHANCE OF TURNOVER FOR A GIVEN AGE OF A FIRM BY FOUNDING OR NON-FOUNDING LEADERS

# Iterations for Condition	Age of Business	Founding Leader	Non-Founding Leader tenure < 3 years	Non-founding leader tenure ≥ 3 years	***% Turnover*** or % No Turnover Yet
0 →48	If Age of Firm <2	Yes			***4%***
		No	Yes		***16%***
		No	No	No	96%
48 →72	If Age of Firm 2<X<3	Yes			***4%***
		No	Yes		***26.8%***
		No	No	No	92%
72 →144	If Age of Firm 3<X<6	Yes			***9%***
		No	Yes		***26.8%***
		No	No	Yes	***8.9%***
		No	No	No	88%
144→288	If Age of Firm 6<X<12	Yes			***20%***
		No	Yes		***18.7%***
		No	No	Yes	***17.8%***
		No	No	No	84%
288→528	If Age of Firm 12<X<22	Yes			***20%***
		No	Yes		***23%***
		No	No	Yes	***12%***
		No	No	No	82%
528→600	If Age of Firm 22<X	Yes			***21%***
		No	Yes		***23%***
		No	No	Yes	***12%***
		No	No	No	78%

(Adapted from (Holmes & Schmitz, 1996)

RESULTS & DISCUSSION

The output that is examined is the team's developmental path for the socially constructed resource. This resource is the Context-For-Learning. When doing the virtual experiments all input remained the same except for the indicated changes. We next present the results of running the simulation as indicated earlier and, given that each hypothesis has a separate graph, we include discussion elements with each presentation of results to help keep the length of the paper shorter.

The results from the first virtual experiment are displayed in Figure 2. For this first set, -- we displayed the smoothed graph with its standard deviations showing for the results with the changed leader. The bold lines represents the averages, which indicates no leader replacements, and the narrow line inside of the standard deviations, which indicates the results when there are replacements. Our hypothesis, based on venture capitalists replacing entrepreneurs, looked to have the results with replacements to be better than those of the original leader did. For all effective leaders in any type of a group, this was not the case; and Hypothesis 1A was not supported. Since venture capitalists are involved in a very small portion of entrepreneurial efforts, this finding may not be as problematic as it first might seem. What our simulation shows is that on average over time when there is a replacement of a leader with an effective profile of leadership skills, there is a drop in effectiveness and efficiency (i.e. the developmental path is lower and flatter). Notice that the standard deviations slowly increased across time. Indeed, for the first 350 or so iterations, the original leader's developmental path was within the standard deviations for the changed leader's path. For the remainder of the simulation, it ran at the upper edge of the standard deviations.

FIGURE 2
HYPOTHESIS 1A: EFFECTIVE LEADER VERSUS ALL REPLACEMENT LEADERS

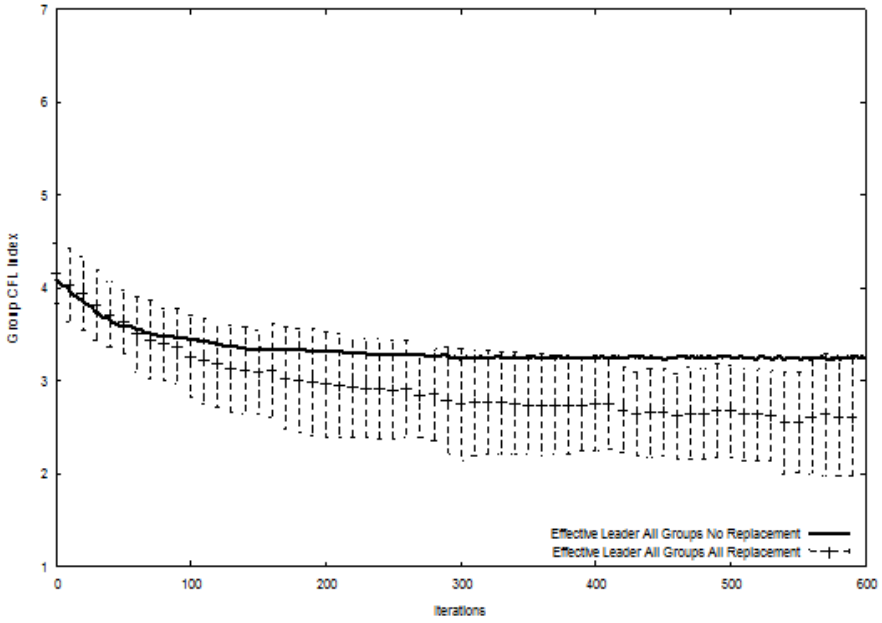
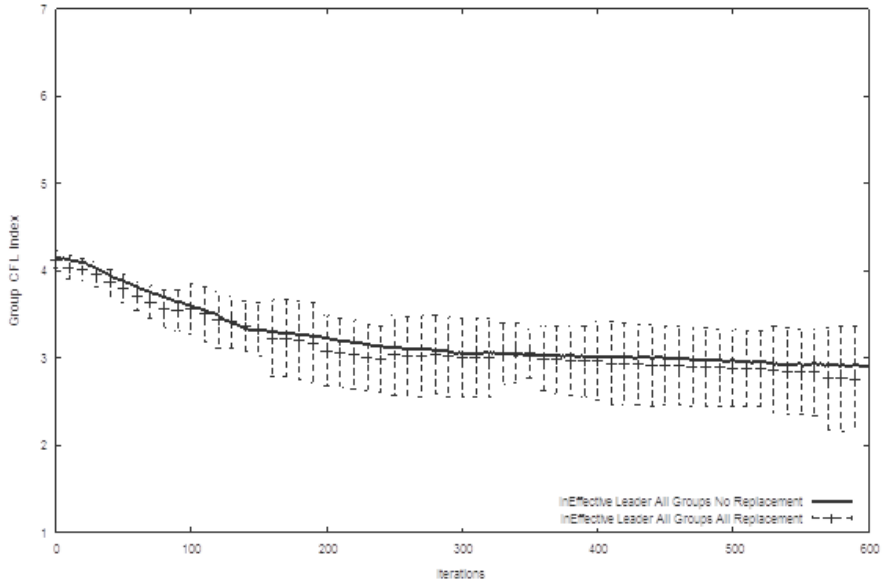
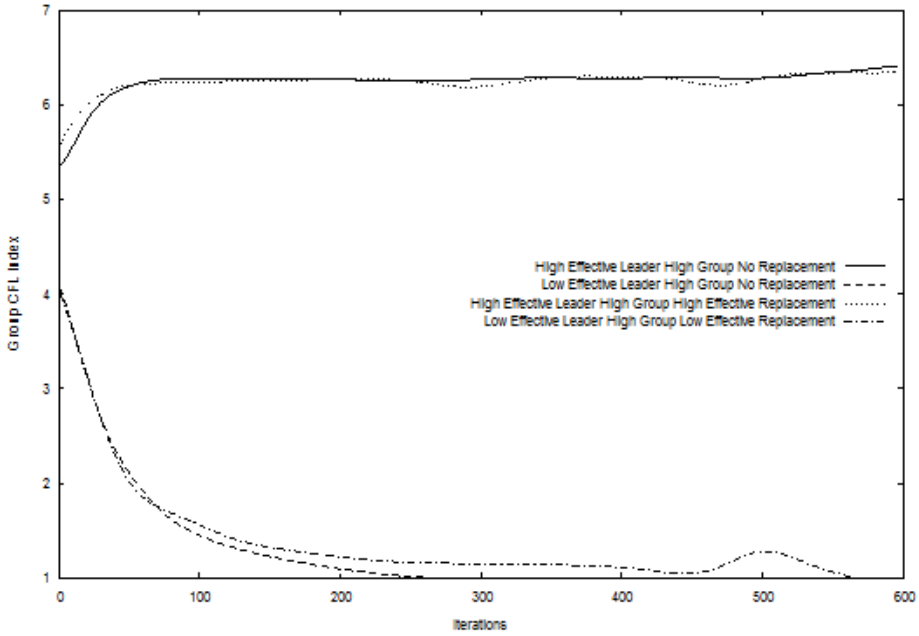


FIGURE 3
HYPOTHESIS 1B: INEFFECTIVE LEADER VERSUS ALL REPLACEMENT LEADERS



Hypothesis 1B mirrored Hypothesis 1A but with ineffective leaders. The same type of graphic display was used again. In Figure 3, we see that again, there was not a steeper and high replacement leader's path but rather for an even longer time period the original leader's path remained not only within the standard deviation of the replacement leader's path but it remained just about in the center of that path until about iteration 570. Hypothesis 1B is also not supported. However, in this instance, the replacement leader's results are neither better nor worse on average than the original ineffective leader being replaced.

FIGURE 4
HYPOTHESIS 2A: EFFECTIVE LEADERS WITH HIGH GROUP REPLACED BY SIMILAR LEADERS



Beginning with Hypothesis 2a, we built upon the work of those who argue that the context matters and, for socially constructed resources, that context is the people at the work site. We again used the results from Bruton and colleagues (Bruton, Fried, & Hirisch, 1997) and set the hypotheses up so that the replacement leader would have the most effective and efficient result but we began to control for the level of the socially constructed resource in the work group. Thus, we looked at the results for those work groups who had an average high level of CFL and separately looked at those with the low levels. We continued to keep the effective and ineffective leader designation, which resulted in two sets of graphs for each hypothesis.

The simulation results for Hypothesis 2a in Figure 4 changes the leaders but keeps them similar to the original leader. In this instance, we allow the leader's level of CFL to vary. Thus we replace an effective leader with another effective leader and in the same group (literally the same group since those beginning figures are used again) but the leader's CFL will either be high or low whichever the original leader's level of CFL, the replacement leader will have the same level. We hypothesized that the results of having replacement leaders would be in more effective and efficient developmental paths. The support for this hypothesis varies. If we look at the first couple of years, then the high effective leader replaced by another high effective leader does have a slightly better result but after about iteration 55, that advantage dissipates and there is no difference between the two results. Now the opposite happens with the effective leader with a low CFL level. In that case, there is really no difference between the replacement low leader and the original leader's results for the first 50 or so iterations but after about iteration 80, the replacement leader's results are better than the original leader. The original leader drives the CFL levels into the basement and the replacement leaders drive it to the basement steps. Hypothesis 2A has very mixed and marginal support.

In Hypothesis 2b, the same high group of followers had ineffective original and replacement leaders. From Figure 5, we see that in neither case did the replacement leader out perform the original leader. The ineffective leader with a high CFL did still have much higher results than did the leader with the low CFL. Remember that again, the same input was used for all runs of the high group so the differences are

strictly due to the leaders and their impact on the group and the group's dynamics over time. Hypothesis 2B was not supported.

FIGURE 5
HYPOTHESIS 2B: INEFFECTIVE LEADER WITH HIGH GROUP REPLACED BY SIMILAR LEADERS

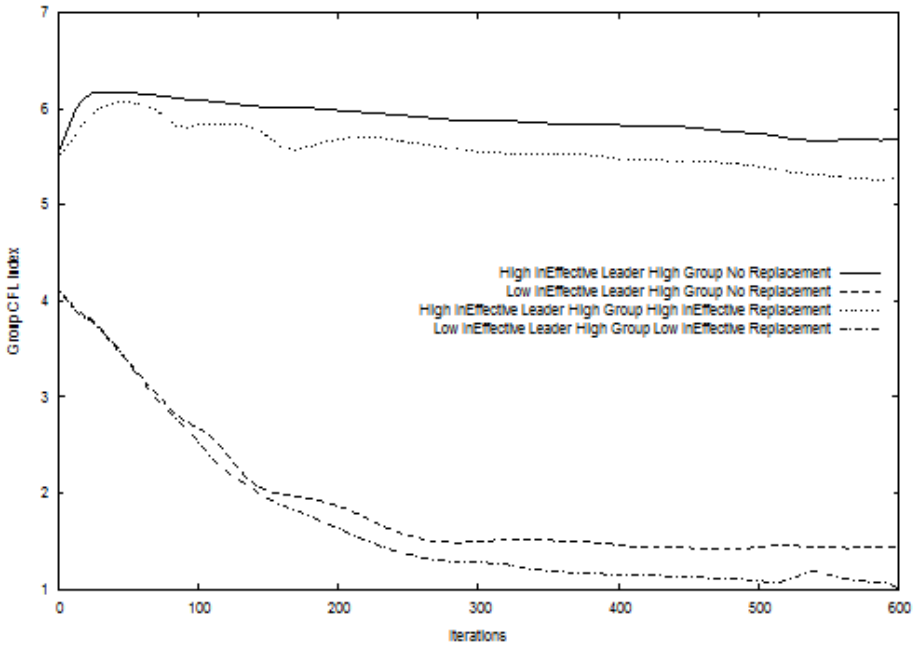
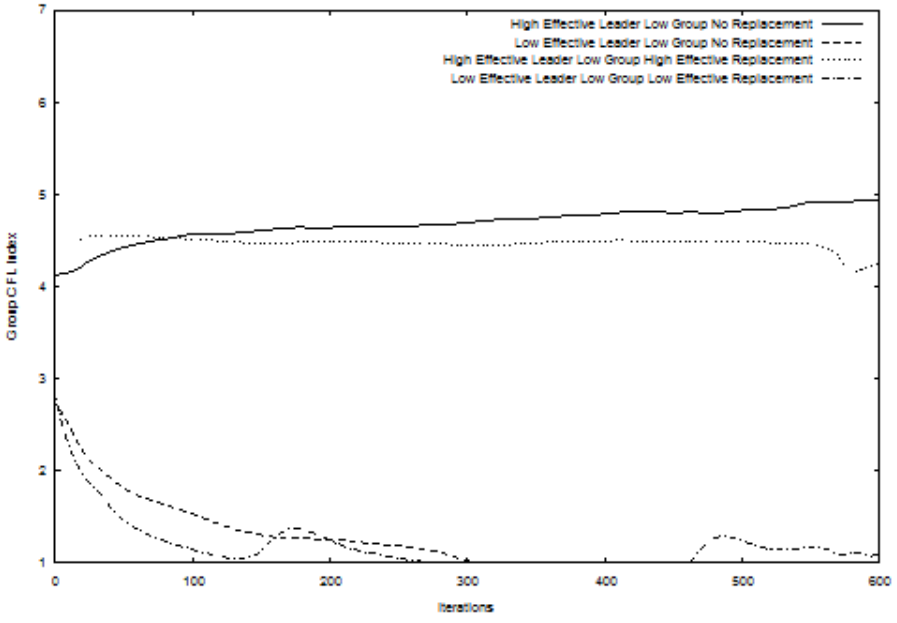


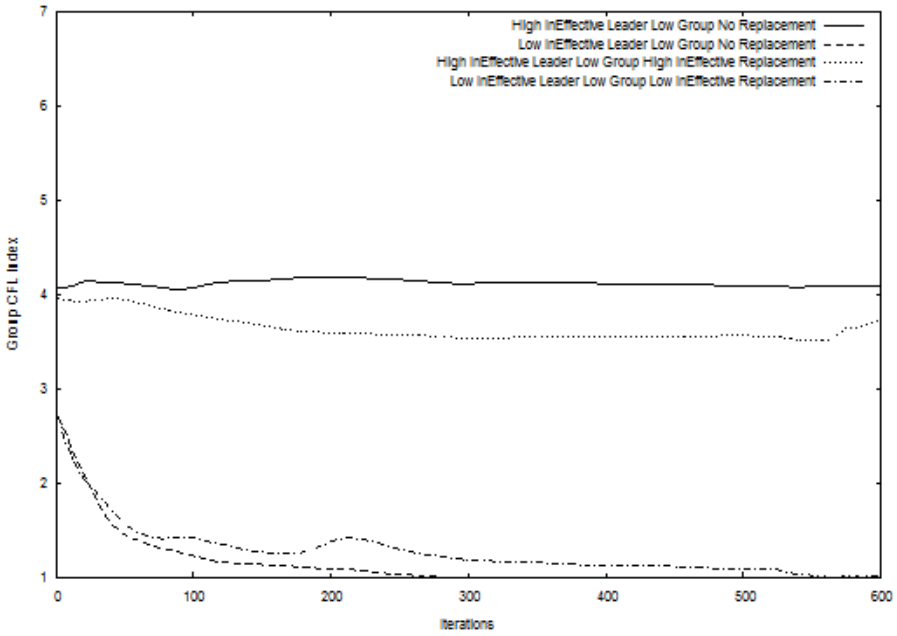
FIGURE 6
HYPOTHESIS 2C: EFFECTIVE LEADER WITH LOW GROUP REPLACED BY SIMILAR LEADERS



Hypotheses 2A and 2B are now repeated with a group with a low average CFL value. We again begin with the effective leader. Figure 6 again shows that the developmental paths of the leader with a high CFL or a low CFL are very different. Again, like with the high group, the high leader when replaced with another high effective leader again has the results as hypothesized for the first 100 iterations. After that however, rather than there being no difference, retaining the original leader has better results than the typical pattern of leadership change as indicated in the literature. On the other hand, the original leader is better than the replacement leaders. The results bounce around after about 250 iterations but that bouncing is in and out of the basement (i.e. they really don't have any level of CFL or perhaps even a negatively oriented context) Hypothesis 2C is not supported.

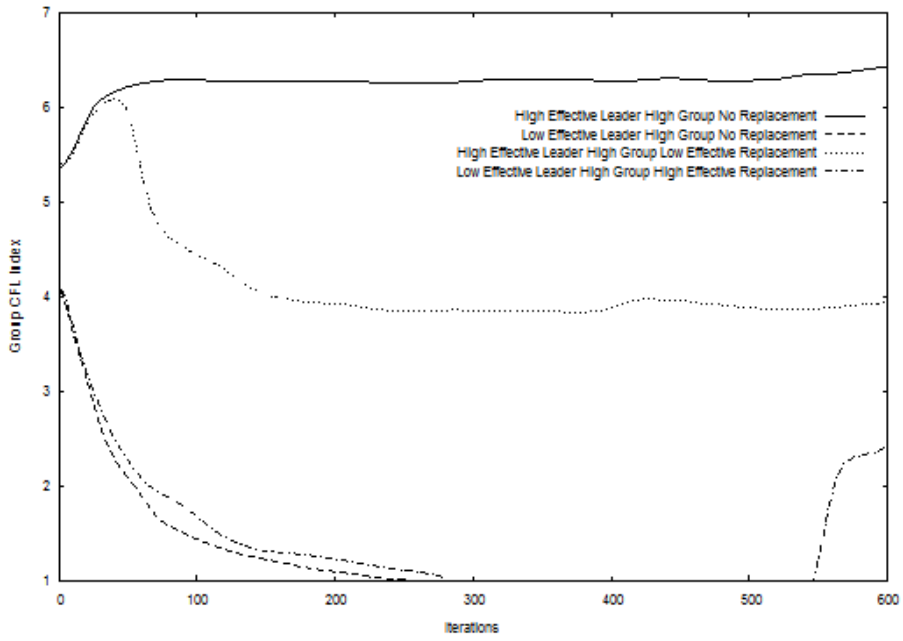
Hypothesis 2D called for replacement ineffective leaders to outperform original ineffective leaders when they had work groups with an average CFL that was low. From Figure 7, we can see that only occurred when the Ineffective leader had a low CFL. When there is an ineffective leader whose personal CFL is low and who has a work group with a low CFL, the replacement ineffective leader with the low CFL has marginally better results than the original leader. Thus, Hypothesis 2D has mixed support.

FIGURE 7
HYPOTHESIS 2D: INEFFECTIVE LEADER WITH LOW GROUP REPLACED BY SIMILAR LEADERS



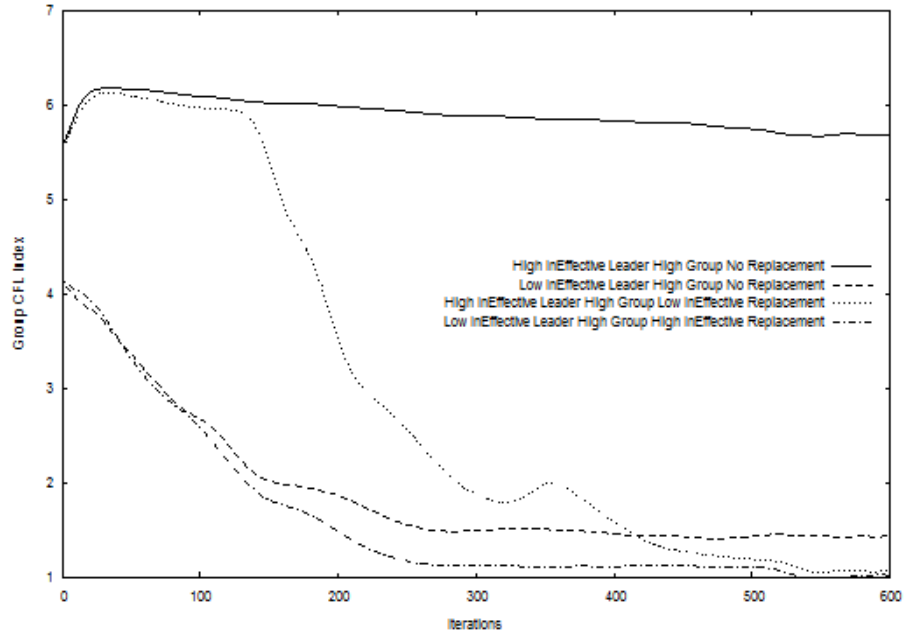
Beginning with Hypothesis 2E, instead of replacing the original leader with another leader exactly like them in profile or CFL, we vary the CFL levels. Thus, in Figure 8, Hypothesis 2E replaces an effective leader with a high CFL with an effective leader with a low CFL and vice versa. Even so, the hypothesis suggests that the results for all replacements are to be better than for the original leader. It comes as no surprise that there are mixed results. When the low effective leader replaces a high effective leader, we reject the hypothesis; however, when the high effective leader replaces a low effective leader there is marginal improvement. Hypothesis 2E has mixed results. An interesting result here is when a low effective leader replaced by a high effective leader, the results drastically dropped. This result kicks in with the very first "sell" or replacement at iteration 48 but levels off by about iteration 150.

FIGURE 8
HYPOTHESIS 2E: EFFECTIVE LEADERS WITH HIGH GROUP REPLACED BY DIFFERENT LEADERS



The next hypothesis, 2F, looked at the ineffective leaders and the high group. It, too, called for the replacement leaders to have results better than the original leaders. From Figure 9, we can see than no results associated with replacement leaders were better than the results from the original low-level ineffective leaders. Hypothesis 2F was not supported.

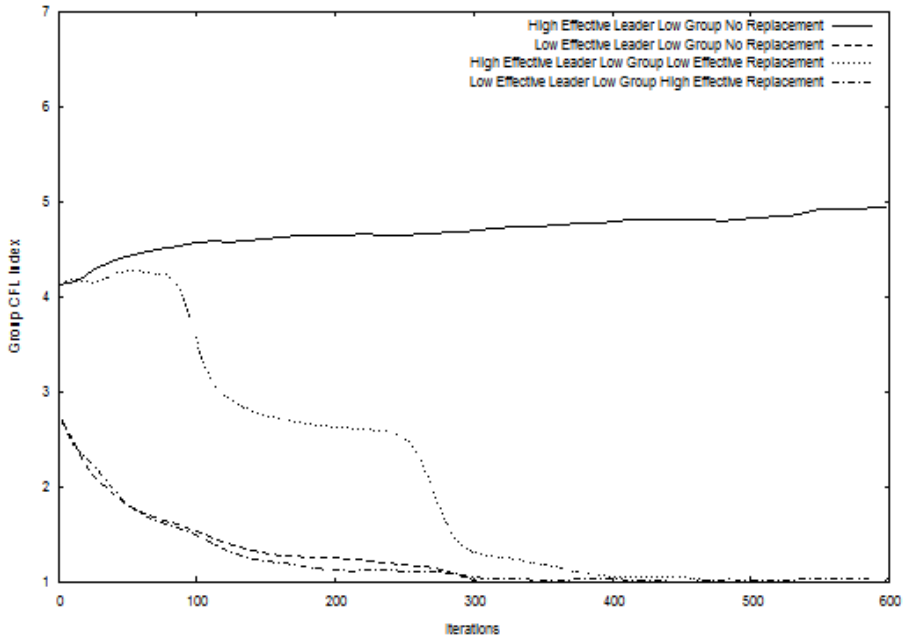
FIGURE 9
HYPOTHESIS 2F: INEFFECTIVE LEADER WITH HIGH GROUP REPLACED BY DIFFERENT LEADERS



Hypotheses 2G and 2H looked at the effective and ineffective leaders with work groups with low CFL. In Figure 10, we look at the replacement of the high effective leader in the low group with a low effective leader and see that that replacement pattern has a series of downward progressing steps. When we replace the low effective leader with a high effective leader, the replacement leader again has marginally higher results in the long run with indeterminate results in the short run. Thus, Hypothesis 2G is not supported.

Hypothesis 2H is the last hypothesis. This experimental condition has the low group with ineffective leaders. The high ineffective leader being replaced with the low ineffective leader has no real effect on results until late in the run (about iteration 550) when the replacement leader's results drop dramatically. The replacement of the low ineffective leader with a high ineffective leader has marginal effective results during the first 200 or so iterations but about iteration 220, there is dramatic improvement, which over the course of about 100 iterations results in a line that matches that of the original high ineffective leader. There is mixed support for Hypothesis 2H.

FIGURE 10
HYPOTHESIS 2G: EFFECTIVE LEADER WITH LOW GROUP REPLACED BY DIFFERENT LEADERS



CONCLUSION

Each of these virtual experiments used the theoretically created agent-based model, and substituted the indicated leader profile mimicking the sale of a small entrepreneurial firm and the replacement of the entrepreneur with someone new. In each instance, changes occurred. Overall, most change was not positive resulting in higher and steeper developmental paths but usually negative resulting in lower developmental paths. Surprisingly, when ineffective leaders changed there was less change than when effective leaders changed. This is somewhat counterintuitive given the recent work by Shaw and his associates (Shaw, Erickson, & Harvey, 2011) which found that leaders with just a couple of extreme characteristics could be considered destructive yet here were some with a number of extremes, which were actually more effective. Certainly, this condition bears closer investigation in the future.

When these changes were looked at more closely and the level of Context-For-Learning of the leader was taken into account as suggested by subsequent hypotheses, more drastic results were found. One major result is that the level of the socially constructed resource held by the leader makes a major

difference in the developmental path even given the exact same personnel in the workgroups! For example, Hypothesis 2A shows that in a high CFL work group, the effective leader had a high plateau while the ineffective leader's plateau ran along the bottom of the scale. The high leaders' groups plateaued earlier (less than 100 iterations) while it took about twice as long for the low leaders' groups to plateau. These two major differences had nothing to do with the hypothesis but do dramatically show why the results from the first hypotheses needed further examination.

Furthermore, it is interesting to note that if we just looked at the first round of substitutions as would have been implied by Bruton and associates in their looking at venture capitalists and replacing of entrepreneurs, there were those positive results in a few cases. From Hypotheses 2A-2D, we can see that having leaders with high levels of a critical socially constructed resources is key to obtaining and maintaining higher levels of this resource within the organization. If there is an initial high CFL leader (whether effective or ineffective), it sets the whole team up for less critical secession needs. Furthermore, that succession to other high CFL leaders will maintain high organizational levels of CFL. This is true even if the leader is ineffective in managing and has poor leadership skills (the ineffective profile does not disrupt this high-level plateau by much.) However, if either the organization begins with a leader with low levels of CFL or transitions to one (Hypotheses 2E-H), then there will be a decline in the organizational level across time.

In all instances, it was evident that the better the second leader for both the socially constructed resource and leadership skill levels, the better the developmental path of the Context-For-Learning. This has face validity in that the wrong leader can inadvertently destroy or set back the intellectual or knowledge resources of an acquired entrepreneurial entity, outside of any changes due to changes in organizational structures. However, these experiments also show that the purchase of a firm can also result in its enhancement. The trigger here is the relative skills of the new leader vis-à-vis the initial entrepreneur/leader.

While we had mixed results in replacing our original entrepreneur leader with effective leaders, we did have some interesting findings. What is striking about this set of virtual experiments is the very strong effects that the group had on the outcome, along with the strong effect of retention of the original leader. Some system effects are in play here that merit a closer look in future research. Does the actual timing of the "sale" matter in the development of the Context-For-Learning and thus by implication in other socially constructed resources? By teasing out the path for each sale, and when it occurred, we may be able to find patterns.

Another interesting result across hypotheses graphs also indicates an area worthy of further investigation. In almost all cases, when there was an ineffective leader, there is at least a very slight negative slope to the developmental path, even when the leader has a high level of the socially constructed resource. Thus, poor management skills will degrade your critical intangible resources across time if actions are not taken. This degradation is less than that found when there are low levels of the socially constructed resource present in the leader but it is there. When the group has a low CFL level and the leader has a low CFL level, then those low management skills mean that the leader "facilitates" the ruin of that resource (the line merges into the bottom of the graph). The most dramatic of these losses appears when a low CFL leader replaces a high CFL leader. While this may not be the case when a venture capitalist replaces an entrepreneur, it may indeed be the case with other types of leader successions. It is also interesting that when there is a low group, it will take a couple of replacements with a high CFL leader after an initial low CFL to get the group up to even a mid level of CFL.

This work highlights the usefulness of using computer simulations or computational modeling in investigating socially constructed resources, small businesses, and other cross level examinations. For example, what is the effect of turnover of work group members on small knowledge based organizations? How quickly do socially constructed resources grow or decline with turnover? Furthermore, the results of the simulation may be better understood if we have separate average lines for the sold firms with their leadership turnover for each iteration. This would enable us to determine if there was a pattern to early iteration sales and leadership turnover versus late iteration sales and leadership turnover.

This project like any other has its associated strengths and weaknesses. A strength of the virtual experiment was the ability to hold the group constant with the exception of the leader and leader turnover. A weakness is in the reliance upon computer programs, which while theoretically sound, have yet to be completely field validated. Thus, we expect that these virtual experiments illustrate something that theoretically could happen and not that it will happen.

We conclude this paper by noting that next steps include the gathering of data from knowledge workers and the examination of the growth of their "knowledge" pool to see if it mirrors the growth in the Context-for-Learning. Face validity aside, it is important to take theoretical models back to the field repeatedly for additional validation exercises. Exciting times are ahead and we look forward to the further examination into the effects of leadership turnover on strategically important and intangible resources.

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