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Expert Relativity: Identify the Expert Just Ahead

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ABSTRACT

Experts are often viewed as individuals with a vast storehouse of knowledge beyond the normal participants in a domain. In reality, the expert may have just enough additional knowledge beyond those they interface with to propel their team to success. This research explores the accumulation of knowledge and prior skill set necessary to successfully participate in a business simulation emulating the cash-to-cash cycle of a manufacturing/distribution company. Students participate in simulated organizations where the skill level of novice is designated by freshmen/sophomores/juniors with little to no business education. Experts are designated as seniors/graduate students with business educations that include aspects of the entire cash-to-cash cycle of an organization. Comparisons across simulation games indicate that minor background differences in specific participant ability can make significant differences in simulation standings.

Keywords (Required)

Team Composition, Expert Identification, Novice Learning, Knowledge Acquisition

INTRODUCTION

Corporate success, as measured by market standing and positive cash flow, is an organizational goal. That success is dependent on employees' abilities to adapt and integrate an increasingly complex dissemination of information flowing from systems in which they are not fully familiar. With the rapid change in information systems and technologies, employees must constantly adapt to new applications, functionalities, and workflows (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). Given the continuous adoption of new information technology (IT) by organizations, the IT workforce, and the knowledge workers it supports, an organization is always on a learning curve (Sethi, Barrier, & King, 1999). To cope with the increased array of system features and information sources, individual workers often rely on co-workers to provide snippets of knowledge that allow a more rapid utilization of complex systems. Especially in ERP system implementation, an individual's coworkers are important sources of help in overcoming knowledge barriers constraining use (Sykes, Venkatesh, & Gosain, 2009). While these co-workers may not be considered system "experts", the incremental system knowledge they have may be "just enough" to propel their organization to success. In such a dynamic, information rich, knowledge intensive environment, identifying the expert just ahead can provide a significant advantage to the pursuit of corporate success.

Organizations are constantly monitoring the knowledge needs of their employees and providing opportunities to improve the skills of their workers. However, in many cases, learning to use a new system entails a knowledge transfer process across users with different levels of skills (Sykes, Venkatesh, & Gosain, 2009). Organizations cannot successfully present training opportunities that fully meet the needs of all knowledge workers. Users thus face knowledge barriers to system use even after a system's formal organizational adoption (Fichman & Kemerer, 1999). To alleviate this on-the-job training scenario, large organizations have made use of current system users with significant prior skills in both organizational processes and information system use. These "power users" were identified and trained by the organization in order to facilitate the success of new system implementation (Jones & Price, 2004). With time and special attention, designated experts can be identified and used to improve the skills within an organizational unit. However, prior to the implementation of these types of programs, knowledge workers must find support for overcoming the knowledge barriers existing in their positions by seeking out the more skilled and resourceful employees in order to obtain the knowledge they require.

This study presents an initial step of studying the interactions within an organizationally oriented team. This study presents two perspectives when assessing the organizational team: an organizational learning perspective and a social network perspective. From an organizational learning perspective, individual team members each own a skill set that potentially contributes differently to their organization's success. During the course of the study, individuals learn by participating in the cognitive, experiential, and scanning processes. The two study teams participate in different organizationally complex environments and are considered in an early developmental stage of their organization. The teams' net profit measures their organizational effectiveness. The social network perspective provides a view of the knowledge exchanges that occur within the teams during the course of the study. Individual team members have a knowledge score developed along with a team knowledge score. This score indicates whether the knowledge for organizational success exists with each team. The knowledge scores and the operational efficiency of the team, as measured by their centralization, provide insight into the actual knowledge transfers that occur during participation as an organizational team.

The remainder of this study is outlined as follows. We first review the organizational learning (OL) and social network (SN) perspectives related to the current study. The organizational simulation setup follows along with how aspects of the simulation relate to the OL and SN perspective. Simulation results, individual and team knowledge scores, and team SN scores are reported along with the outcome of the study. A discussion and conclusions based on the outcome of the study complete the article layout.

ORGANIZATIONAL LEARNING

Organizational Learning (OL) posits that to be competitive in a changing environment, organizations must constantly change their actions in order to achieve their goals of organizational effectiveness. The source of change in organizations resides in the ability of the organization to access knowledge residing in the organization's memory, to access knowledge residing in each individual's memory and to obtain external market information relevant to taking effective actions by the organization. In short, organizational participants must make full use of the cognitive, experiential, and scanning processes that promote rapid learning. The learning process of an organization can also be inhibited or constrained by increasingly complex market environments and the early versus mature developmental stage of the organization.

Learning Processes

The processes by which individuals and organizations learn vary and depend on the activities in which the organization participates as well as the current cognitive abilities of its individuals. Cognitive learning refers to an individual's ability to take in stimuli and integrate that knowledge into actions and decisions. However, cognitive learning is not necessarily reflected in a visible change in behavior (Friedlander, 1983). This lack of behavioral change is due to the fact that individuals may learn, but the learning only adjusts their cognitive maps. This adjustment may reflect their increased recognition that the current courses of action are adequate and therefore need no behavior modification. These cognitive maps refer to the current frame of reference that individuals carry into all situations. Cognitive learning may occur when either a known frame of reference is adjusted or a new frame of reference is learned.

Experiential learning occurs in organizations through the direct actions of their organizational members. These actions can be the result of intentional, systematic efforts (Huber, 1991), or the result of assessing the interactions and decision-making process occurring in the organization. These two views of experiential learning reside specifically in the activities associated with organizational decision-making accomplished by the organizations' members. Experiential learning results from systematic effort that occurs due to the assessment of the actual results obtained from planned efforts against the anticipated results of a completed course of action. Experiential learning that occurs from the assessment of prior interactions and decision-making processes is retrospective in nature. Unanticipated results from a course of action may be reviewed retrospectively in order to assess the actual decision-making process that occurred. Potential modifications of that process may occur due to the result of learning from the review process.

External factors affect organizational success, and planned activities must occur within organizations that allow the modification of behavior to react to adverse environmental conditions. Scanning is the learning process by which organizations procure information about their environment (Huber, 1991). Organizations scan their environments to assess the fit of their organization. Lack of fit between an organization and its environment can indicate either an imminent failure or a future costly transformation (Miller & Friesen, 1980) (Tushman & Romanelli, 1985). Environmental scanning can focus on a multitude of attributes that include but are not limited to: Product competition, marketing awareness, price leadership, and raw material acquisition.

Organizational Development and Market Environment

Two barriers determine the ability of an organization and its individual members to achieve organizationally effective actions. The initial barrier concerns the developmental stage of the organization and its level of maturity. The length of time that the organization has been in operations and the longevity of the organization's members determine the level of organizational knowledge that has accumulated. Organizations that are at the early stage of maturity may possess a relatively large store of organizational knowledge, but that knowledge is fragmented amongst its individual members and potentially unknown to other members. In addition, attempts of an immature organization to systematically accumulate the knowledge of its individuals will be at the beginning of the organization's learning curve. At this stage of development, little experiential learning has occurred within the organization, collective cognitive learning is at the level the individual members have brought to the organization and external scanning processes are still undeveloped.

The second barrier to organizational effectiveness rests with the complexity of the market environment. With increasing complexity, the ability of an organization's members to adequately apply learning processes to achieve organizational effectiveness is reduced. Overload clearly detracts from effective interpretation (Huber, 1991). The cognitive frameworks currently residing in individual members of the organization are more likely to be inadequate with increasingly complex market environments. This situation necessitates the learning of a new frame of reference or cognitive map. Learning new cognitive maps is more difficult and time consuming than modifying an existing cognitive map. A complex environment parallels a more complex product offering for the market. This also implies a higher degree of potential experiential learning that can occur within the organization. Again, more time is required for individual members of the organization to develop the experiential learning necessary to achieve organizational effectiveness. Finally, increasingly complex market environments imply a much larger quantity of stimulus in which the scanning processes of an organization must assimilate and react.

SOCIAL NETWORKING

The social network (SN) perspective focuses on the relationship ties that exist among individuals within an organization. Prior research has indicated that dense relationship ties provide the cohesion required for coordinated action and leads to innovation success (Obstfeld, 2005). Individuals with more ties have increased access to new and varied information at distant portions of the organization, enabling them to learn and adapt quickly when faced with innovative or uncertain situations that demand different expertise and skill sets (Cross and Cummings, 2004). Thus, SNs that allow a greater flow of information from individual to individual promote a more operationally efficient organization. This occurs since required knowledge should be more readily accessible and therefore would translate to greater organizational effectiveness.

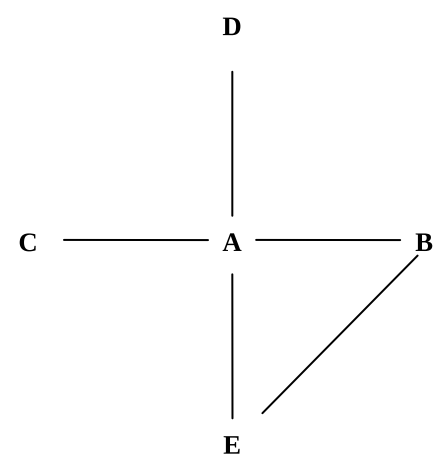

Figure 1

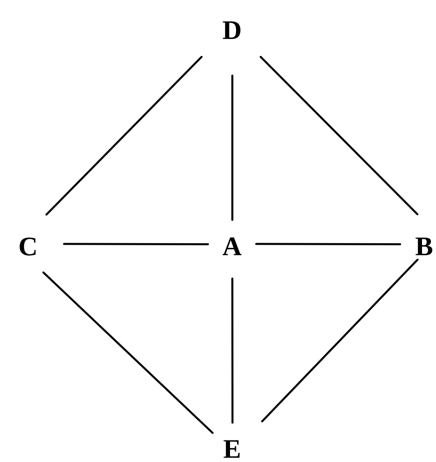

Figure 2

Structurally, a social network consists of a set of nodes, each node representing an actor; and a set of ties, each tie representing a relationship between the actors (Brass, 1995; Scott, 2000). The actors may be individuals, groups or organizations. SN analysis (SNA) focuses on the presence or absence of ties and the nature of the ties, and not the individual actors and their characteristics. SNA can be conducted at the level of the actor or at the level of the network, thus network measures may relate to the actor or to the network.

A central actor has a large number of ties, and is closer to more SN actors. Actors who are central to a network have access to more alternatives and opportunities than other actors, making them less dependent on any other actor, and hence more powerful. They tend to be highly influential, and command prominence and prestige within the organization (Brass, 1995; Hanneman, 2001; Scott, 2000). Degree centrality measures the extent of direct ties that an actor has with other actors in the network. In Figure 1, actor A has a higher degree centrality than actor C. Degree centrality is an actor-level measure.

Centralization refers to the variability in distribution of ties within the network (Brass, 1995; Hanneman, 2001; Scott, 2000). A highly centralized network is one in which a single actor (or small group of actors) have a larger number of ties than other actors within the network. Conversely, a network in which all actors are connected by direct ties would have minimum centralization. The network shown in Figure 1 would be more centralized than the one in Figure 2. Centralization is a network- level measure.

A centralized network structure would be as or even more efficient than a less centralized one in transferring knowledge, particularly when such knowledge is static and quantifiable. A small group of individuals having extensive ties with other actors can efficiently channel quantifiable knowledge to the rest of the unit. However, when the knowledge to be transferred is dynamic, implicit, and dependent on the input of multiple actors, the extensive ties found in a less centralized network facilitates smoother and more efficient knowledge distribution. In an organizational context, when the collective input of members, when each possesses a distinct knowledge base, is required for organizational performance, more evenly distributed ties in a less centralized network facilitates a more encompassing, extensive and smoother transfer of knowledge.

SIMULATION SETUP

To investigate the affect minor differences in knowledge can have on organizational effectiveness in relatively ad-hoc teams, two business simulations were played in two different classes at a Midwestern university in the fall of 2009. The business simulations were an Enterprise Resource Planning simulation (ERPsim) constructed by HEC Montreal (Leger et al., 2009). One simulation was conducted with a sophomore level information systems class in which their basic concern was the purchase and selling of a product. This first simulation is referred to as the distribution game. Another simulation was with a senior/graduate level class in which their concern encompassed a broader range of business operations. This second simulation is referred to as the extended game. The net profit of the companies/teams in which the students participated measured organizational effectiveness and company rankings for both games.

Distribution Game

Prior to playing the distribution game, students were given an overview of SAP and the process and nature of the decisions they would be making as a team. They logged into SAP and reviewed the processes and reports necessary to carry out the decisions of product pricing, marketing, and forecasting. For the simulation, students were placed in eleven teams of four individuals per team by requiring them to take seats from front to back as they arrived in the classroom. This randomized the teams based on the manner in which they came into the class, and students arriving together were directed toward different team locations. Help provided was task oriented with how to log onto SAP and how to navigate to commands and reports.

The distribution game was played in a single class period. The game consisted of three 20-day quarters. Quarter 1 began with an initial inventory of six different products for each team. All teams sold the same six products in three different areas of a country. Over the course of the three quarters, teams set product prices, invested in marketing, forecasted material requirements, and released purchase orders to obtain additional inventory. At the end of each quarter, team rankings were displayed and discussed. During the simulation, the learning processes of experiential and scanning were observed based on the number of questions generated as sales were made and inventory dropped.

Extended Game

The second simulation was in a course focused on Enterprise Resource Planning Foundations. After spending six weeks covering the sales, purchasing, and production processes in SAP, an introductory ERPsim game was studied and played. The eight companies consisted of four or five students and were formed using survey data designed to help “balance” the companies. Some preference was given for those students indicating desirable and undesirable teammates. The introductory game was played for four quarters in which six products, 1 kg boxes of Mueslix, were sold to three areas of a country through two different distribution channels. The introductory game provided learning processes that included experiential, cognitive and scanning. This training scenario, along with the broader student experience level, provided the stage for playing the extended game. Team members were kept the same between the introductory game and the extended game. This should have improved each company’s organizational memory, scanning processes and social network.

In the extended game, six alternate products, .5 kg boxes of Mueslix, were available for the companies to sell providing the company discontinued the 1 kg box of the same type. Greater complexity existed since the teams were required to make accounting journal entries and had the ability to request and make payments on loans. Production could be improved by acquiring additional assembly lines and/or reducing setup times. The ability to switch to selling smaller boxes required the companies to change the Bill of Material (BOM). This could only be accomplished if the existing inventory of the 1 kg box of the same type was zero. The extended game consisted of four 30-day quarters and was played in two class periods, one week apart. After quarters one and two, a class period provided time for the teams to review company rankings, discuss future strategy and adjust company assignments.

DATA GATHERED

Subsequent to the game, students completed a survey questionnaire designed to assess aspects of their cognitive learning and the social network operating amongst team members. Network data was obtained using the roster method wherein each team member was provided with a list of other team members. Team members checked the names of other team members they communicated with to obtain simulation information. Their responses created a binary network matrix, with a '1' indicating the presence of a tie and a '0' indicating the absence of a tie between pairs of members within the team. The symmetrized social network was analyzed using UCINET Version 6 (Borgatti et al., 2002). At the team level, centralization scores were computed, and at the team member level, degree centrality scores were obtained.

Knowledge scores of teams and team members were assessed through a collection of individual information centering around three dimensions: Education, SAP process comfort levels and experience. Education was measured using school level and major field of study To obtain SAP process comfort levels, team members were asked to rank their comfort level on a scale of 1 to 7 (7 being the most comfortable and 1 being very uncomfortable) with the sales, purchasing, and production processes. They also ranked their comfort level with the following situations: team environment (Team), unstructured environments with ambiguous directions (UE), learning as you go (L), and working in an environment where a task needs to be completed in a certain amount of time (quickly) (T). They were also asked if they had prior experience with any type of simulation (Sim Exp) and if they had any work experience (Exp). In the distribution game, the expertise measures were gathered after the simulation experience was completed. In the extended game, the expertise measures were gathered prior to the formation of the teams.

The team centralization scores and team member degree centrality scores along with the knowledge measures are presented for the top three teams only. The distribution game measures are in Table 1. The extended game measures are in Table 2. Network structures for the top three teams of the distribution game are depicted in Figures 3. The top three, with an additional two, network structures from the extended game are presented in Figure 4.

DISCUSSION

In an effort to identify the impact of the expert just ahead, the two simulations created different environments in which knowledge was scarce and rapid learning was necessary for success. In the distribution game, the organizations had no prior social network and the knowledge each individual possessed was virtually unknown. Since the participants were mostly freshmen, sophomores and juniors, their prior life, business and team experiences relative to the simulation would be relatively low. With respect to the learning processes; cognitive learning would be strictly an individual skill, experiential learning would be new for the simulation and the scanning skills undeveloped. These organizational teams would be immature on the organizational development scale and the social network would be non-existent at the beginning of the simulation. In this environment, individually held knowledge may be highly valued in terms of organizational success.

For the extended game, the organizational teams had a substantial amount of time in the course to develop their social network prior to the simulation. In terms of the organizational development scale, the organizational teams would be considered more mature than those participants in the distribution game simulation. The knowledge held for each participant should be well known prior to the simulation. The knowledge held by each individual should also be greater since the participants were predominantly seniors and graduate students. With respect to the learning processes; cognitive learning could be a commonly held team skill, experiential learning would be shared due to the prior introductory simulation and the scanning skills in an early stage of development. The discovery and transfer of knowledge from the expert just ahead should be easier for the extended game participants and the learning processes already established for these organizational teams.

Distribution Game

Knowledge discovery from the expert ahead would arise most easily from a decentralized organizational team. The two top-ranked teams (U and L) were the most decentralized (see figure 3) organizations and would be the most able to capitalize on knowledge discovery within their team. The net income for both teams were high and well ahead of the rest of the organizations. The difference in knowledge, and therefore the difference in ranking, between U and L may reside in the greater comfort level Team U had, based on average team score, with the sales and purchasing processes of SAP. The sales and purchasing processes were the predominant processes used in the distribution game. Team R placed a distant third in the simulation, but outdid other teams with lesser

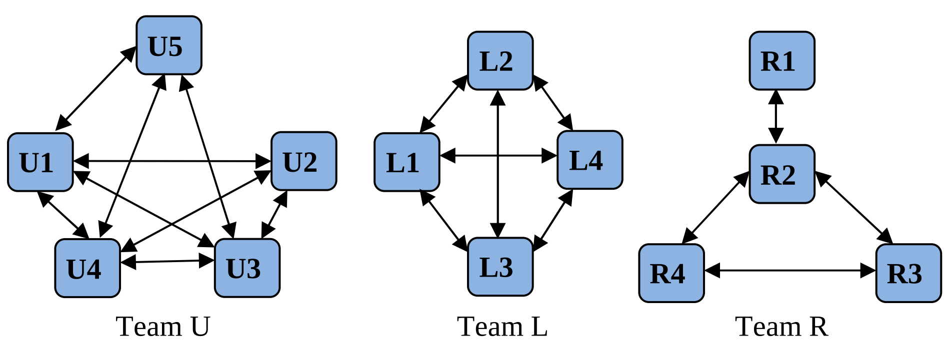

Figure 3 – Selected SN of Distribution Game

centralization. Team R's resident knowledge would appear deeper since more juniors were on this organizational team and there was also prior simulation experience. The additional knowledge of the central participant, R2, being the most inexperienced individual may have allowed the knowledge discovery to occur due to the efforts of the least knowledgeable individual.

Extended Game

There existed a large gap in the operational efficiency of the winning team, N, and the remainder of the teams. This is despite the fact that the second place team, O, had a similar centralization score and the third place team had wider range of potential knowledge based on the majors of each team member. Remember, the extended game was much more complex than the distribution game. The complexity of the game may have distracted the team members from the goal of obtaining a positive net profit. With the increased complexity, more of the SAP process comfort levels may have provided a competitive advantage. Team N scored higher on 5 of the 7 measures on average than their second place competitors. Potentially most important is their ability to learn as you go and being able to operate under significant time constraints. With regard to social networking, Team N along with team O were very decentralized (see figure 4). The extensive ties among their team members contributed to their knowledge discovery and top-ranked performance. Teams Q and L have rankings higher than those warranted by their centralization scores. This could perhaps be tentatively attributed to their most central team-members (Q3 and L3) being seniors and having prior work experience. In addition, these teams had a higher proportion of graduate students than other teams. The superior knowledge possessed by the graduate students was perhaps channeled effectively to the entire team by their most central team-members.

CONCLUSION

Although the teams in the extended game had worked together previously, the higher order complexity level of their game appears to have impacted their cognitive, experiential and scanning learning processes and therefore inhibited their decision making. In each simulation, the more decentralized networks appeared to have brought out the knowledge of the expert just ahead even though each organization was close with respect to prior knowledge. Minor differences, especially in the distribution game, provided significant net profit differences in the simulations.

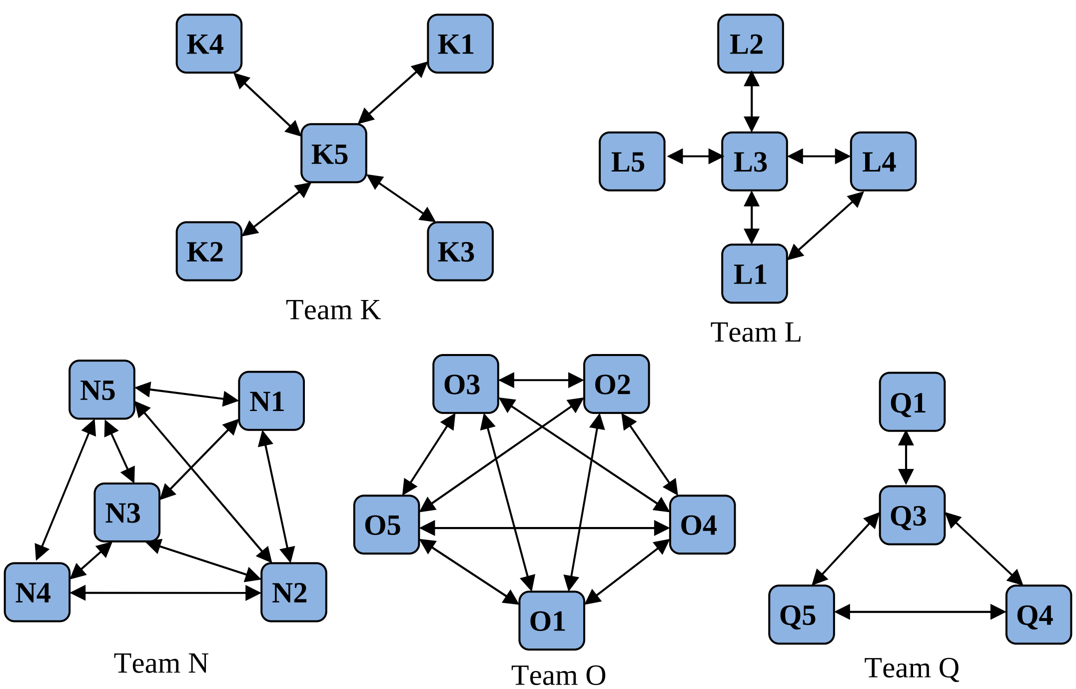

Figure 4 – Selected SN of Extended Game

				Network		**Knowledge**										
						Education		**SAP Process Comfort Levels**							**Experience**	
Team	Rank	Net Income*	Team Members	Network Centralization (%)	Degree Centrality (%)	School Level	Major	Sales	Pur.	Prod	Team	UE & AD	L	T	Sim Exp	Work Exp
U	1	274	U1	2.78	100	J	Mgmt	5	7	4	7	6	7	7	No	Some
			U3		100	So	Design	5	3	3	6	6	3	7	No	None
			U4		100	J	Acct	5	5	5	5	4	4	5	No	Some
			U2		75	-	Acct	5	1	2	4	5	7	7	No	Some
			U5		75	So	Mgmt	6	6	6	6	6	6	6	No	Some
					Team U Averages			5.2	4.4	4.0	5.6	5.4	5.4	6.4		
L	2	233	L1	0.00	100	So	Mktg	5	4	5	7	6	7	6	No	Some
			L2		100	J	Admn	4	4	4	7	4	7	7	No	None
			L3		100	F	Acct	6	5	6	6	5	7	7	No	Some
			L4		100	S	Educ.	4	3	3	7	7	7	7	No	Some
					Team L Averages			4.7	4.0	4.5	6.8	5.5	7.0	6.8		
R	3	98	R2	66.67	100	So	Acct	4	4	4	7	6	7	7	Yes	Some
			R3		67	J	Acct	3	3	3	7	4	5	7	No	Some
			R4		67	J	Admn	4	5	4	7	5	5	5	No	None
			R1		33	J	Mgmt	2	2	2	5	2	2	4	Yes	Some
					Team R Averages			3.3	3.5	3.3	6.5	4.3	4.8	5.8		
M	4	68		11.11												
Q*	5	37		-												
O*	6	28		-												
V	7	21		11.11												
P	8	19		11.11												
N*	9	-50		-												
T	10	-63		11.11												
S	11	-88		100.00												

* Indicates teams for which reliable network measures could not be obtained due to absenteeism

Lower ranked team scores are available upon request from the authors and have been removed due to space constraints

Table 1 – Distribution Game

				Network		**Knowledge**										
						Education		**SAP Process Comfort Levels**							**Experience**	
Team	Rank	Net Income*	Team Members	Network Centralization (%)	Degree Centrality	School Level	Major	Sales	Pur	Prod	Team	UE & AD	L	T	Sim Exp	Exp
N	1	1,266	N2	2.78	100	Gr.	Phy. Educ.	6	5	6	5	5	4	6	No	None
			N3		100	S	IS	5	5	5	5	4	6	6	Yes	Some
			N5		100	-	-	-	-	-	-	-	-	-	-	-
			N1		75	S	IS	6	6	5	7	7	7	7	Yes	Some
			N4		75	S	IS	4	4	4	5	3	5	5	No	Some
					Team N Averages			5.3	5.0	5.0	5.5	4.8	5.5	6.0		
O	2	-80	O1	0.00	100	S	Admin	6	5	6	5	5	4	5	No	None
			O2		100	S	IS	4	3	4	2	3	3	3	No	None
			O3		100	J	Admin/Fin	5	5	4	6	5	5	5	No	Some
			O4		100	S	Admin/Fin	5	5	5	7	6	6	6	No	Some
			O5		100	Gr.	Admin	7	6	6	7	6	6	0	No	None
					Team O Averages			5.4	4.8	5.0	5.4	5.0	4.8	3.8		
Q	3	-421	Q3	66.67	100	S	Admin	4	4	4	6	5	5	5	No	Some
			Q4		67	Gr.	Mgmt	5	5	5	4	4	5	5	No	None
			Q1		33	Gr.	IS	4	4	4	6	1	5	5	No	None
			Q5		67	S	Admin	4	4	4	5	0	6	6	No	None
					Team Q Averages			4.3	4.3	4.25	5.25	2.5	5.3	5.3		
M	4	-484		0.00	Lower ranked team scores are available upon request from the authors and have been removed due to space constraints											
K	5	-1,530		100.00												
R	6	-1,834		14.58												
L	7	-1,971		56.25												
P	8	-2,537		18.75												

Table 2 - Extended Game

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