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Identifying knowledge agents in a KM strategy: the use of the structural influence index

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Abstract

Knowledge transfer is a complex KM activity that integrates communication technologies with challenging social, cultural, and organizational issues. It is critical to effective KM systems (KMS) and the development of effective transfer strategies enhances competitive advantage. This study incorporated the theory of organizational influence to demonstrate the structural influence index within a network KMS. Using the research process in the pharmaceutical industry as a basis for knowledge transfer events, this study demonstrated the benefits of structural indexing, which identifies knowledge agents, evaluates knowledge sharing among organizational members, and objectively assesses the contribution of knowledge agents. Subgrouping knowledge agents gave insight into knowledge sharing among members and provided a basis for the coordination of knowledge resources in new and unique ways.
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1. Introduction

Knowledge management systems (KMS) may be used to create, gather, organize, and disseminate an organization's knowledge to provide competitive advantage. Organizations may be viewed as knowledge systems having both cognitive and social components [7,22], interconnected with individual member's cognition and social practices. Because organizations are complex systems, KMS encompass multidimensional and intertwined knowledge-based activities, such as: generation, codification, and utilization [13,42].

Knowledge generation involves numerous social, cognitive, and collaborative processes [39] and is an important part of KM. However, the capture, sharing and utilization of internal knowledge is fundamental to the organization's ability to create and sustain competitive advantage [21,53,14] with knowledge utilization a significant value-added activity [19]. If organizational knowledge remains inaccessible or

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non-integrated, then the value of knowledge generation and codification is diminished. Hence, knowledge transfer within the organization is a critical activity.

KM activities, including knowledge transfer, are complex organizational tasks that integrate communication technologies with social, cultural, and organizational issues that can be a major challenge in KMS implementation [3]. Anecdotal evidence from corporations suggests that "people issues" represent the greatest challenge to managing knowledge [46]. One critical area for research involves how to facilitate knowledge transfers between organizational members [4]. Since knowledge transfer is crucial to the development of effective KMS, one challenge is to identify ways to assess the level of knowledge of organizational members and impart strategies that motivate individuals to share it.

This study is based on the theory of organizational influence, which posits that one member's influence or importance in a relationship is affected by other members' dependency on him or her. The network KMS model serves as a theoretical framework to demonstrate a structural influence metric as a tool to develop strategic knowledge profiles as part of an organizational KM transfer strategy. The application of structural influence measures provides two important contributions to a transfer strategy: the identification of relevant knowledge agents and an objective assessment of agent contribution to knowledge events. In broad terms, this study addresses how the "best" knowledge may be identified and made more accessible among organizational units or members to improve knowledge sharing and utilization for greater competitive advantage. An application of the structural influence index is provided using the pharmaceutical R&D process as a relevant example. Plausible data is fabricated to reflect knowledge sharing events occurring among members.

2. Literature review

2.1. Organizational knowledge

The two dimensions of knowledge in organizations are tacit and explicit [43,38]. Tacit knowledge has both cognitive and technical components. The cognitive element is primarily internal and includes an individual's beliefs and viewpoints, whereas the technical one consists of outward skills and ability applied contextually. The knowledge resides in perceptions, behaviors, and skills that are difficult to formalize or codify [49,45]. In contrast, explicit knowledge is easily articulated, formalized, codified, and communicated [16]. Within organizations, the two dimensions are mutually dependent such that tacit knowledge is the framework on which explicit knowledge is understood [44]. Thus, a common background of tacit knowledge must exist among individuals.

The knowledge is as important organizational assets essential to competitive advantage [52]. The effective management of it increases organizational innovativeness and responsiveness [23], increases product quality [40], and shortens time-to-market [41]. Knowledge management is regarded as a process with four basic activities: creating, storing, transferring, and applying. However, the methods used to do this often depend on organizational characteristics as well as the type of knowledge [9]; e.g., case study research has lead researchers to suggest the need for a balance of tacit and explicit knowledge in order to use innovative ideas [32]. Other studies have compared cognitive and community styles of knowledge sharing and found that dialogue and knowledge sharing via social networks (i.e., communities) may be better [51]. Thus, the management of knowledge assets requires an understanding of the organization, its culture, and its resources.

Recent research also categorized the organizational management of tacit and explicit knowledge into four styles: dynamic, system-oriented, human-oriented, and passive [10]. Empirical test results have provided evidence that the dynamic KM style is directly related to increased business performance. In contrast to the other three methods, the dynamic style emphasizes KM strategies that include procedures to manage both explicit and tacit organizational knowledge; e.g., the dynamic style has incorporated IT to encourage the transfer of explicit knowledge as well as to augment its flow. The dynamic style also emphasizes the informal sharing of tacit knowledge among individuals to leverage knowledge assets. Management strategies with the greatest impact on organizational performance have required the management of both explicit and tacit knowledge assets on an infrastructure of IT.

Knowledge generation, storage, and diffusion are facilitated by IT, by using such mechanisms as groupware, on-line databases, intranets, data warehouses, and software agents [26,28]. When knowledge assets are leveraged using IT, organizations experience increased performance, greater business value [25] and enhanced dynamic capabilities [50]. Sher and Lee suggested that advanced IT applications facilitate KM, resulting in strategic advantage. Knowledge creation and diffusion is improved as IT enables both storage and sharing of organizational knowledge [24]. Moreover, the strategic placement of IT within organizational knowledge flows is critical for greater performance and increased dynamic capabilities.

KM research has described organizational knowledge flows in terms of the knowledge circulation process, which consists of five components: knowledge creation, accumulation, sharing, utilization, and internalization [35]. As efficiency within each stage increases, knowledge management performance increases and organizations become more knowledge-intensive. The authors claimed that the effectiveness of each step in the process depends on organizational culture, including individual relationships. This supports prior notions that some knowledge is best transferred through experience and less-formal means, such as informal social interaction [34].

IT qualifies as an effective transfer channel; it can be informal and personal as well as formal and impersonal [29]. Informal mechanisms that promote socialization include unscheduled meetings, electronic bulletin boards, and discussion databases. Formal IT channels include video conferencing, training sessions, organizational intranets, and databases. Increasing knowledge transfer may be less dependent on available channels than on motivating individuals.

One major challenge of KM at the individual level is in increasing knowledge transfer or sharing [1]; this is influenced by the extent of interdependency among individuals [36]. The study discussed here focused on the transfer perspective of KM in which individual expertise is the predominant factor in sharing. Both the location of individual knowledge assets or expertise [17] and the extent of knowledge flows among individuals [30] significantly influence KM.

2.2. KMS models

Two models of KMS are identified in the literature: repository and network [2]. The repository model focuses on the creation, storage, and retrieval aspects in the context of person-to-repository or repository-to-person knowledge transfers. In contrast, the network model centers on knowledge access and transfer via direct links between individuals; it involves both social interaction issues (behavioral and cultural) as well as communication channels (technology) between individuals. As a collection of individuals possessing knowledge, the organization has a unique knowledge network for which a structural influence metric is applicable. It is within the network KMS domain that my research attempts to ‘‘measure the knower’’ as discussed by Glazer [20].

Very little empirical work has studied the network KMS. Thus, its characteristics have had to be derived mainly from knowledge theorists and observations. One premise underlying the network KMS is that knowledge exists within the individual who created the knowledge. Hence, knowledge is the *state of knowing* [37] or *personalized information* of an individual. It resides only within the mind of the knower [11]. Knowledge transfer occurs when the knower informs others. Knowledge seekers gather the information from the knower and reassemble it into known or new knowledge. The network KMS model is thus based on the direct linking of knowledge seekers and knowledge sources.

Underlying this study is the premise that knowers in an organization form a knowledge network. This is explicitly demonstrated in organizations that apply network KM strategies in which IT-based systems are developed to support transfer activities. Zhuge describes the cognitive flow among organizational team members as a knowledge intensive sharing process that occurs via a definite media [54]. Using IT in a KM strategy has led to the creation of corporate knowledge directories through knowledge mapping or the building of knowledge networks. Knowledge networks identify relevant knowledge agents and communication technologies enable information flow between the knowledge seeker and the source.

Because the network KMS model is based on internal linkages among individuals, the structural influence index derived from organizational influence theory is directly applicable.

3. Structural influence index

Theories of organizational influence use the terms structural power, influence, or importance to refer to the concept of dependency in context-specific relationships. One party has more influence when it has discretion to allocate resources desired by another who has no other resources [48]. Here, *structural influence* or *importance* is defined as ''the knowledge status of a knowledge source in a knowledge network''. When one organizational member relies on the knowledge of another, the first member is dependent on the second member's knowledge status. The theory of organizational influence posits that each member's importance is a function of dependencies on other members, as well as their dependencies on him or her. Salancik proposed that actual influence or status of a network member is a measure of both the direct and indirect dependencies among members; e.g., a member in a knowledge network may appear unimportant because few others depend on him or her for knowledge transfers but that member may actually be more important if the few that seek his or her knowledge are themselves of greater importance or influence. The structural influence metric goes beyond identification of organizational knowers to measuring knowledge status by accounting for both direct and indirect knowledge transfer.

The conceptualization of structural influence in a knowledge network depends on three requirements: direct knowledge transfers within the network, the influence of the other members in the network (indirect transfers), and the intrinsic value of each member. These characteristics have led to several studies assessing the relative importance of specific journals in a discipline: Salancik tested 24 journals using cited references to establish a ranking of organizational research journals [47]. The marketing discipline also used the metric in a comprehensive network analysis of marketing-related journals over a 30 year time period to identify which journals dominated their field [6]. The structural influence metric originating in the sociometric field investigates inter-group relationships or status apart from popularity-type measures [33]. It has been useful for other network contexts, such as group involvement, journal linkages and relationships, and knowledge transfer activities.

3.1. Direct knowledge transfers

Direct dependencies within a small network are easily understood. In a KM scenario, when one network member directly accesses the knowledge of another, there is a dependency. Knowledge transfers are an indication of the influence or relative importance of each member. Organizational influence theory posits that the member least dependent on the other holds more power or influence [18]. However, not all direct dependencies or knowledge transfers are equal. They require different weights.

3.2. Indirect knowledge transfers

Interdependencies among network members must also be assessed to determine member status. Discounting indirect knowledge transfers may cause the influence of any member to be underestimated. For example, Member 1 depends heavily on Member 2 for knowledge, but if Member 2 is strongly dependent on Member 3 then Member 3 is the original knowledge source and indirectly influences Member 1. The complex nature of KM wherein social, collaborative, and cognitive processes are at work to create, share, and enlarge knowledge in organizations suggests that indirect knowledge transfers are necessary to measure member status correctly. KM is ineffective and transfer strategies unproductive if the most knowledgeable and beneficial knowers in the organization are not readily identified.

3.3. Intrinsic value

If a network member is important, independent of the contributions to the network, he or she is said to have intrinsic value. One assumption is that inclusion in a network automatically confers value, otherwise membership is meaningless. Thus, a constant intrinsic value of 1.00 is assigned to each network member to denote inherent value. In this manner, each member is evaluated solely on knowledge transfer events during a given time period and the calculation is not biased by perceptions of member value (e.g., education, seniority, rank, title). This also aids the calculation so that if a member does not participate in knowledge transfer, the overall influence value is the intrinsic value. Thus, 1.00 is the minimum influence or status of any member and there is no upper bound on influence.

3.4. Structural influence calculation

The index of structural influence is based on the work of Hubbell [31]. It incorporates direct and indirect dependencies and intrinsic value to determine the influence of a member. For simplicity, in a network of three members A, B, and C the influence of each can be algebraically expressed as:

$$\begin{aligned} \mathrm{Inf}_A &= \cdots + D_{AB} \times \mathrm{Inf}_B + D_{AC} \times \mathrm{Inf}_C + \mathrm{Int}_A \\ \mathrm{Inf}_B &= D_{BA} \times \mathrm{Inf}_A + \cdots + D_{BC} \times \mathrm{Inf}_C + \mathrm{Int}_B \\ \mathrm{Inf}_C &= D_{CA} \times \mathrm{Inf}_A + D_{CB} \times \mathrm{Inf}_B + \cdots + \mathrm{Int}_C, \end{aligned} \quad (1)$$

where Inf is a measure of the overall influence or knowledge status, D is a measure of knowledge sharing events between members, and Int is the intrinsic value of the member. The dashed lines represent self-dependencies, which are not included in the index calculation. Thus, network members are not credited for internal knowledge that is not transferred.

The system of simultaneous linear equations is solved by substituting matrices and vectors to arrive at:

$$\mathrm{Inf} = [I - D]^{-1}\mathrm{Int} \quad (2)$$

In this solution, Inf is the vector of overall influence scores for a network of N members; I, an N^2 identity matrix; D, an N^2 dependency matrix; and Int is a vector of intrinsic values.

This derivation of the importance of network members meets all three requirements for measuring structural influence, making it useful for determining each member's knowledge status. The equations show that any member's influence is proportional to the dependency of others on the member (Requirement 1). Solving the simultaneous system of equations algebraically incorporates not only direct dependencies, but also indirect dependencies among network members (Requirement 2). Furthermore, each member is assigned a constant intrinsic value of 1.00 denoting their inclusion in the network (Requirement 3).

3.5. Subgroup influence

An additional advantage of structural indexing is that it lends itself to the estimation of member influence within subgroups. Specific areas of expertise may be partitioned from the network and the contribution of each member of the subgroup measured. This is particularly useful in identifying knowers for more specific, rather than general, knowledge transfer. Moreover, a network member with broad knowledge may be influential over the network as a whole, but less important within a niche-based grouping. An analysis of subgroups or areas of expertise reveals where seemingly less important members exhibit most of their influence. The knowledge network is partitioned into non-overlapping subgroups and individual member influence scores are calculated using:

$$\mathrm{Inf}_{sub} = [I - D]^{-1} \times [D] \times [M] \times [S] \quad (3)$$

where D is the dependency matrix; M, the matrix of membership in a subgroup; and S is the index of intrinsic importance.

4. Application of structural indexing

The pharmaceutical research and development process is now used to demonstrate the benefits of structural indexing in a knowledge sharing strategy. The research and development of a drug are separate procedures which may take as long as 17 years before it is approved for manufacture and marketing. Therefore, shortening time-to-market is a critical IT function [27,12]. Crucial to shortening the product-to-market time is improving information flows among the research and development stages [8]. Since the drug research process is primarily an intellectual activity where knowledge is both required and produced [5], the structural influence metric can identify the knowledge agents via transfer events and objectively determine knowledge status within the R&D process as a whole, as well as within individual areas of expertise. It is not within the scope of this paper to describe the particulars of the stages in drug discovery or development. However, to provide a contextual background the five stages of the research process are summarized:

1. Concept: defining the idea behind the drug to be developed.
2. Screening: looking at thousands of candidate compounds for usefulness.
3. Target identification*:* Studying the effectiveness of potential compounds against the specific disease.
4. Chemical lead: Mapping the compound's structure.
5. Pharmacology: Detailing the study of the compound's reactions in the body.

These represent separate research activities employing numerous knowledge agents. To demonstrate structural indexing, twenty members were identified as part of the research process network, with four directly involved in each of the five specific stages. Data was created in Table 1 to show the number of internal knowledge transfer events among network members during the research process. IT both facilitates knowledge transfer events and captures them; it is an effective medium for the sharing of both explicit and tacit knowledge. Transfer events may be measured or recorded in terms of the number of direct contacts (e.g., e-mail, face-to-face, phone), number and type of formal/informal meetings (e.g., video conferencing, teleconferencing, electronic discussion board), time spent on a project or between members, or number of log-ons to members' published reports or findings. Organizational traits and resources often dictate the mode of knowledge sharing among members or across industries. However, despite the variety and diversity of channels, IT allows the capture of knowledge transfer events.

The data in Table 1 reflects the assumption that members contribute knowledge mainly within their own stage, although a few also contribute significantly to other stages. The knowledge agents or network members are located on the columns with 'knowledge seekers' or members receiving knowledge on the rows. For example, Member 4 was in contact with Member 1 and 32 knowledge transfer events were recorded. Member 4 made a total of 177 knowledge transfers to others within the network and initiated a total of 333 knowledge events from other network

Table 1
Knowledge transfer events in the five stages of the research process network

Member	Concept				Screening				Target ID				Chemical lead				Pharmacology				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
# 1	0	152	87	123	45	45	80	64	23	41	22	25	15	12	23	24	10	15	12	10	828
# 2	48	0	37	36	10	4	14	7	11	15	10	12	8	10	8	3	1	4	0	1	239
# 3	54	29	0	61	12	4	9	3	8	6	2	4	3	1	0	6	0	2	1	2	209
# 4	32	67	26	0	6	5	10	4	2	1	4	2	0	6	5	1	2	4	0	0	177
# 5	15	4	0	1	0	8	10	12	3	5	1	3	1	2	0	3	1	1	0	0	70
# 6	23	30	15	25	48	0	21	26	4	3	5	2	1	0	1	2	4	0	2	1	213
# 7	26	23	21	15	22	13	0	19	4	5	2	5	2	1	1	2	1	3	0	0	165
# 8	12	13	12	51	42	12	14	0	9	5	11	11	7	3	0	2	3	0	1	0	208
# 9	3	7	12	5	5	7	10	4	0	215	222	185	11	3	2	1	5	2	3	2	704
# 10	2	0	1	4	15	25	16	20	63	0	182	45	52	26	9	22	5	4	6	1	498
# 11	0	2	1	3	0	15	10	8	25	16	0	15	7	6	0	8	2	1	0	2	121
# 12	1	2	0	1	4	5	4	2	54	25	87	0	0	0	1	1	0	2	0	0	189
# 13	3	3	4	2	1	2	1	0	0	1	2	0	0	45	54	37	23	32	5	4	220
# 14	5	7	5	1	5	1	1	1	0	0	0	0	99	0	249	75	21	2	2	5	479
# 15	0	0	2	1	2	0	5	0	1	0	1	0	24	52	0	21	33	4	3	8	157
# 16	2	2	0	1	0	3	1	5	6	0	2	0	14	11	23	0	12	11	1	2	96
# 17	2	4	3	1	0	7	4	2	0	1	2	1	11	13	1	6	0	75	28	5	166
# 18	1	2	5	1	1	1	0	6	0	2	5	1	12	1	2	9	142	0	89	2	282
# 19	0	0	4	1	2	4	1	4	0	4	3	1	1	4	4	4	25	5	0	0	67
# 20	0	1	0	0	0	0	1	1	2	4	3	4	10	11	12	5	13	33	27	0	127
Total	229	348	235	333	220	162	212	188	215	349	566	276	278	207	397	232	303	200	180	45	

members. Zeros on the diagonal indicate the absence of knowledge transfers that apply to knowledge sharing.

4.1. Overall influence

The structural influence metric takes into account not only *how many* knowledge transfer events occur, but also *who* did the sharing. Thus, if Member 1 is the most knowledgeable agent in the network, then the status of any member that transfers knowledge to Member 1 is inevitably increased. S-Plus statistical software was used to solve the system of linear equations based on the knowledge transfers in Table 1. The structural influence estimation for each member is given in Table 2.

In terms of overall knowledge status in the research process, Members 1 and 9 are clearly the most important. They make numerous knowledge transfers (828 and 704, respectively), including knowledge transfers to other members of high importance. The influence measure eliminates self-dependencies or self-knowledge from the calculation so that each member's status depends only on their making and receiving knowledge transfers with others. Thus, knowledge status is not artificially enlarged by a member's own knowledge that they may possess and use, but do not share with others. The measure of overall influence indexes the extent to which the members participate in knowledge transfers and this gives an indication of members whose knowledge is most often accessed.

Table 2
Structural influence results

Member	Rank	Influence index
# 1	1	8.32
# 9	2	6.00
# 10	3	4.89
# 14	4	4.63
# 2	5	3.45
# 3	6	3.41
# 18	7	3.24
# 6	8	3.06
# 13	9	3.05
# 18	10	2.85
# 4	11	2.75
# 17	12	2.75
# 15	13	2.73
# 7	14	2.68
# 12	15	2.54
# 11	16	2.34
# 20	17	2.10
# 16	18	1.94
# 5	19	1.87
# 19	20	1.56

Since structural indexing accounts for indirect dependencies, the number of knowledge transfers may not directly correlate with a member's knowledge status. For example, Member 18 is actively involved in 282 knowledge transfers; this is the fifth highest in the network but is indexed in the 7th position in terms of overall importance. This suggests that Member 18 did not transfer knowledge to the more influential network members to the same extent as Members 10, 14, 2 and 3. It is also possible that Members 10, 14, 2 and 3 possess some distinctive knowledge. This shows how an objective measure of the influence of a member may be attained. Further partitioning into subgroups shows where each member exerts the most influence.

4.2. Subgroup influence

The knowledge network was partitioned into five subgroups, according to the number of research process stages. It was assumed that each member worked predominantly in one stage, but members also shared knowledge with other stages. One major advantage of the Inf_{sub} equation is that it allows for any subjective grouping, and illustrates how member influence and knowledge sharing distributes within the groupings. Table 1 shows the grouping of each set of four members into the particular research stage. The Inf_{sub} was estimated for each member and is shown in Table 3, which can be interpreted either down the rows or across the columns; e.g., in the Concept stage Member 1 holds the highest rank (1.76) based on knowledge transfer events and is also of highest importance in the screening stage (2.27). The subgroup index indicates that Member 1 is both highly sought out by other members and actively participates in knowledge sharing events.

Subgroup indexing reveals which members have broad knowledge that contributes to multiple stages or are more narrowly focused. For example, Members 17 and 18 are shown to be more niche-based members who contribute predominantly to the pharmacology stage. Member 18 attains the greatest status among this peer group. Members 1 and 14 are not assigned to

Table 3
Member influence within the five research stages

Member	Concept	Screening	Target ID	Chemical lead	Pharmacology	INT	Overall influence
# 1	1.76	2.27*	1.01	1.07	1.21	1.00	8.32
# 2	0.62	0.64*	0.40	0.42	0.37	1.00	3.45
# 3	0.77*	0.63	0.32	0.33	0.36	1.00	3.41
# 4	0.56*	0.48	0.21	0.26	0.25	1.00	2.75
# 5	0.19	0.32*	0.13	0.12	0.11	1.00	1.87
# 6	0.53	0.82*	0.24	0.22	0.26	1.00	3.06
# 7	0.45	0.59*	0.22	0.20	0.21	1.00	2.68
# 8	0.47	0.65*	0.28	0.24	0.21	1.00	2.85
# 9	0.41	0.93	2.28*	0.76	0.63	1.00	6.00
# 10	0.33	0.90	1.15*	0.92	0.60	1.00	4.89
# 11	0.14	0.37*	0.36	0.25	0.22	1.00	2.34
# 12	0.13	0.33	0.71*	0.20	0.17	1.00	2.54
# 13	0.13	0.19	0.09	0.85*	0.79	1.00	3.05
# 14	0.20	0.30	0.13	1.97*	1.03	1.00	4.63
# 15	0.08	0.16	0.07	0.73*	0.70	1.00	2.73
# 16	0.07	0.14	0.08	0.31	0.34*	1.00	1.94
# 17	0.12	0.22	0.09	0.34	0.97*	1.00	2.75
# 18	0.12	0.23	0.11	0.35	1.43*	1.00	3.24
# 19	0.05	0.12	0.05	0.12	0.22*	1.00	1.56
# 20	0.05	0.10	0.09	0.29	0.57*	1.00	2.10

* Area of greatest knowledge contribution of each member.

the pharmacology stage, but they demonstrate a high degree of influence or knowledge contribution to this area. Hence, subgroup indexing gives specific insight into where members exert their influence or knowledge sharing in the research process. It also indicates which members possess the most sought after knowledge in specific areas and who actively participates in knowledge transfers.

5. Discussion

Structural indexing makes numerous contributions to knowledge transfer such as:

- Identifying which members actively share knowledge.
- Showing the degree of knowledge sharing that occurs in the organization.
- Revealing where the most knowledge sharing occurs.
- Identifying high level knowledge sources.
- Determining where each member exerts the most influence in the organization.
- Indicating the extent to which members seek knowledge.

As part of an overall KM strategy, organizations view the measurement of knowledge sharing as an important activity. McKinsey & Company measures the level of internal knowledge sharing by tracking the number and frequency with which a consultant's publications are utilized. This information then becomes important input into promotion considerations. Since knowledge transfer events are probably unique to a network or industry and dependent on available IT, a knowledge sharing strategy must define what constitutes a knowledge transfer event.

Organizations realize the benefits of knowledge sharing to competitive advantage and organizational performance. Ruggles states that the top-two activities executives specify as critical to KM are mapping sources of internal expertise and creating networks of knowledge workers. The creation of corporate directories or yellow pages is one KM outcome in organizations that map intellectual resources. Hoffmann-LaRoche includes a yellow page directory of relevant people as part of its drug approval process knowledge map. However, the most useful knowledge map identifies not only the relevant knowledge sources, but also the best knowledge sources. Optimal leveraging of internal knowledge occurs when the best knowledge sources transfer knowledge. Structural indexing provides clues to identify those most knowledgeable *and* most willing to share knowledge. The measure gives an impartial assessment of knowledge resources that can help optimize knowledge transfer. The influence index can also be part of a formal reward mechanism to motivate cooperation in leveraging organizational knowledge.

Knowledge sharing strategies can also be directly linked with the organization's value-added activities to further leverage internal knowledge. Structural indexing can help an organization prioritize knowledge assets and focus knowledge transfers to create greater leverage for its efforts. Strategic areas of knowledge can be isolated and a ''critical learning mass'' formed to build a knowledge base around a strategically important position. The alignment of a knowledge base with a competitive position may allow an organization to both compete and excel in an industry.

An advantage of the structural influence measure is that it does not overlook seemingly unimportant members, nor does it overrate those that may be socially popular. Subjective evaluations may deem a particular member unimportant for any number of reasons, such as undesirable social traits. Structural indexing can help clarify the relative importance of individual members and their involvement in knowledge sharing. Conversely, any member's importance is not unduly overrated as it would be if based on subjective assessments.

The grouping of network members into specific knowledge areas adds even greater strategic advantages in identifying and leveraging knowledge assets. Subgroup identification and indexing add value to KM mapping and may result in greater knowledge transfer. The flexibility of subgroup partitioning is an advantage for organizations interested in optimizing knowledge sharing.

As with any research, limitations exist. This study is limited in that it applies sociometric analysis in a network environment to a relatively new area (knowledge transfer) in which theory is undeveloped. Furthermore, the data serves as an illustration of how structural indexing may be applied using the pharmaceutical research process as a model. Valuable insights will result when structural indexing is applied and studied as an actual element of an organizational knowledge transfer strategy. Also, structural indexing does not guarantee that a high status member represents the ''best'' knowledge in the organization or in a specific area. If knowledge agents are unwilling to share or participate in transfer events, then competitive advantage is hindered.

This research is also limited by the assumptions that underlie the study. First, areas in Table 1 that indicate a lack of knowledge sharing among members denotes total non-sharing, which may not be the case: knowledge transfer may occur but not be captured. Second, each knowledge transfer has been given equal weight in determining member influence. This may not be a good assumption.

6. Conclusion

Drucker [15] states that leveraging organizational knowledge is not only important, but may be the only source of comparative advantage. The application of organizational influence theory to KMS is both unique and useful. It contributes to a growing body of literature in the development of KM theory and provides a functional tool that can be refined and implemented in organizational KM strategies. Structural indexing provides more complete information for knowledge maps and corporate knowledge directories. It allows organizations to combine and coordinate knowledge resources and capabilities in new and distinctive ways.

The development of KM strategies for knowledge transfer is a dynamic and complex undertaking. A principal belief within organizations is that the ability to compete based on knowledge depends primarily on people, rather than processes or technology. Strategies that guide the sharing of internal knowledge represent great challenges, as major cultural disruptions are bound to occur. Knowledge transfer strategies are at the heart of a significant and broad issue, which is the creation of a knowledge-sharing culture in the organization.

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