An Organizational Exchange Model: Theory and Implementation

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Abstract

Organizational Decision Support Systems (ODSSs) provide the organization with a powerful vehicle to represent to its members the circumstance of the organization through the models embedded in the ODSS. This paper proposes an organizational exchange modeling (OEM) paradigm. The paper discusses the importance of exchange to organizational processes, provides a graphical model to represent exchange features, and relates the proposed model to several other models and frameworks.

Introduction

A major role of an Organizational Decision Support System (ODSS) is to provide a mechanism to share models among the organization's members [9][10] and to support a "... task and activity or decision that affects several organization units... " [9:124] One contemporary strategic issue that ODSSs appear well suited to support is business process reengineering. In addition to using information technology as a business process technology, information technology has a "disruptive" power to advance desired changes through communicating a model of the organization's circumstance [11] that is central to improving performance [12]. However, traditional and contemporary IS models are often criticized as not being sufficient (see for example, [3]).

Organizational Decision Support Systems (ODSSs) can aid in the discovery of more productive organizational forms if an appropriate organizational modeling tool is made available through the ODSS. The purpose of this paper is to: (1) introduce organizational exchange as a model of organization, (2) propose a model of organizational exchange processes, (3) provide the symbols necessary to implement the model, and (4) link the exchange model to existing technology independent models (i.e., DFD and ER). This paper is organized in three sections. The first provides the theoretical background for the model and its components. Implementation issues are covered in the second section. Finally, I discuss the model's benefits, limitations, and extensions.

Organizational exchange

Using exchange processes to describe organizational phenomenon have a rich tradition (For a brief summary see [17]). Levine and White [14] were among the first to call attention the importance of exchange to organizational analysis. Levine and White [14:588] define organizational exchange as "any voluntary activity between two organizations which has consequences, actual or anticipated, for the realization of their respective goals or objectives." More importantly, they [14] go on to suggest that the model applies to interorganizational exchange, as well as intraorganizational exchange. Cook, Emerson, Gillmore, and Yamagishi [6] also reach the conclusion that micro-level dyadic exchange models can be extended to macro-level organizational exchanges. More recently, Williamson's [25][26] transaction cost theories also address the role of exchange in defining organizations and their governance [13].

On benefit of using exchange theory and studying networks of exchanges is that it focuses the analysis on a single construct, the exchange of resources. Moreover, organizational exchange has a significant body of theory and empirical research which suggests the consequences of different patterns of exchange. However, extensions of exchange theory to organization-level analysis is not without its critics [1][17].

Building the model

An approach to model development is to begin with a definition of organization and ask how the definition can be operationalized. Pfeffer [18] and Morgan [16] observe that
the term “organization” has no single definition. While multiple views of organizing may be confounding, for the purposes of developing a model and for the reasons cited above I will adopt one of Pfeffer's [18] definitions that uses exchange and networks of exchanges as a central construct.

Pfeffer [18:271], building on Weick's [23] work, asserts that "..., organizations consist of patterned, repeated interaction among social actors. ... It is possible to represent the patterns of interaction in a network relationship." Advantages of this approach are discussed by Pfeffer [18:273].

Such measures of structure take individual behavior — interactions and transactions — as their fundamental building blocks but are able to get beyond these individual-level behaviors and properties to describe organizations, or parts of organizations, in terms of their relational characteristics. Relational structures can be analyzed as dependent variables and used as independent variables in their own right. This analytical process is not a reification but rather a definition and measurement of organizations in terms of a fundamental property, their interaction structure.

The notion of organizing, organizational exchange and networks of exchange relationships is extensively developed elsewhere (see, for example, [22] [5] [17]). Briefly, the key concepts are:

- Organizations are open systems engaging in recurrent exchanges with external entities to acquire and dispose of resources.
- Only observable and recurrent behaviors define the organization.
- To sustain an exchange, each party must perceive a benefit or "profit".
- Benefits are reduced through transactional "friction" or "losses" (e.g., opportunity costs, time requirements, commissions, fees, brokers, lawyers, etc.).
- Exchanges with the environment create uncertainty, management's key role is to cope with or reduce uncertainty.
- Uncertain and ambiguous conditions provide the opportunity to learning as new cues are perceived and consequences of actions are realized.
- Recurrent exchanges create dependency conditions for one or more participants that results in the exercise of power to influence the outcomes.
- Unfavorable dependency conditions or unsuitable rewards motivate changes in the exchange relations and, consequently, the organization.

Other exchange characteristics

In addition to the basic concepts discussed above, two other characteristics of exchange that have received little attention need to be explored. First, most non-trivial exchanges consist of a triad. While much of the exchange theory is focused on dyadic relationships, both at the individual and organizational level, exchange is rarely an isolated dyadic process. Even in an observed dyadic relationships, norms effect behaviors in ways that could lead an observer to think a third person were involved. Second, the exchange of resources involves not only the exchange of information or data, it also includes money, labor, energy, etc. The representation of multiple resources may improve the utility of the model. Discussion of these additional characteristics in the next two sections.

Dyads and triads

Although many exchange models, including the proposed exchange model, consider dyads as the central construct of exchange analysis, the dyadic relationship is usually moderated by a third entity. One essential notion of exchange models is that for exchanges to persist the participants must perceive that they are "profiting" from the exchange. One technique for reducing the "cost" of the exchange or increasing the exchange's "revenue" is to create mutual expectations or norms that minimize the need to renegotiate the exchange conditions for each occurrence. Thibaut and Kelly [27:129] assert that "Once a norm exists, it appears to the pair almost as if a third agent had entered the relationship, a feeling which undoubtedly is reinforced by the fact that in earlier relationships the enforcers of rules often actually were third persons (e.g., the mother in the case of the two brothers)."

Extending this notion to the organization, Weick [23:38] describes an organization and the basic unit of organizational analysis in this way:

Triads are the basic unit of analysis in organization theory. [Emphasis in original.] Three is the crucial number in organization theory. Three can pertain to people, or it can refer to two persons plus one object or one person plus two objects. The reason three is central is that it is the basic unit needed to demonstrate conditionality, a basic concept of organization theory. Organization is a mediated causal relationship between two items [humans and/or objects], in which the relationship is influenced by the state of the third item.

The notion of a dyadic relationship being moderated by a third party is also central to design philosophies of
Churchman [4] posits that for an organization to achieve its goals, the organization requires a triad of individuals including the client (or user), the designer, and the decision maker. Although many organizational activities can be accomplished by a single individual undertaking all three roles, it is the decision maker (i.e., the mediator) role that directly impacts organizational exchange modeling. Decision makers acquire and allocate the resources. In the organizational context, managers act to control the resource exchanges through formal mechanisms such as company policy, to tacit controls learned through on-the-job training, and espousing the organization's values to guide the exchanges.

For the reasons cited above, the proposed model of exchange provides a representation of the third party that mediates the exchange relationship. As a minimum, the source of mediation must be identified to understand the context of the resource exchange.

Resources

Manager's resource allocation practices are central to organizations but often models focus on one specific type of resource. For example, the entity-relationship models and data flow diagrams trace the data structure and processes, respectively. However, as Levine and White [14:588] point out, by expanding the resources to be considered, the observer may discover "organizational interaction that would otherwise be overlooked." The critical question for organizational modelers is "What resources to include?"

Economic theory, for example, considers land, labor, and capital. Levine and White [14] claim that exchange relationships with clients, labor, and other resources are necessary. Functional areas often emphasize a particular resource (e.g., manufacturing emphasizes labor and materials). Tichy, et. al. [21] suggest four exchange resources; affect, influence or power, information, and goods or services. McLeod [15:5] indicates five types of resources — personnel, material, machines (including facilities and energy), money, and information (including data).

With the exception of economic theory, most of the resource typologies are atheoretic. In contrast, Foa and Foa [8] propose and offer empirical support for six types of interpersonal resources. The resources are money, goods, services, information, status, and love. In addition, they [8] propose that resources may be conceptualized in two dimensions. One dimension is concrete versus symbolic; the second is universal versus particular.

Following Foa and Foa's [8] representation, the resources can be placed in two dimensional space (Figure 1). Also, for the purposes of this model, the resources are associated with the vertices of a hexagon. This symbol is the model's basic symbol for an exchange.

![Figure 1: Dimensions Of Resource Exchange (Adapted from Foa and Foa[8])](image)

One advantage of mapping Foa and Foa's [8] resource taxonomy to the exchange symbol is that it suggests to the analyst the multiplicity of exchange contents rather than limiting the investigation to one or a small number of content types. Secondly, transaction cost models (e.g., [25] [26]) suggest that exchanges involving particularistic resources are more problematic than universalistic resources. For example, markets using the exchange of goods for money can rely on formal and impersonal modes of transacting. More personal modes of transaction are required for specific resources such as services. Finally, the concrete-abstract dimension describes the mode of resource transfer. It reminds the analyst of organizational phenomena to consider processes that include physical as well as symbolic exchanges.

Implementation

A extended graphical representation for implementing the organizational exchange model is presented in this section along with two related topics. First, the basic model is described. Second, two templates of organizational processes are suggested to begin the modeling process. Finally, the relationship of this model to the entity-relationship model and the data flow diagram is discussed.

Three symbols define (Figure 2) the model. Exchanges are represented by a hexagon, roles by a rectangle, and resource flows by directed lines. To differentiate this model's symbols from other widely-used models (e.g., entity-relationship models, data flow diagrams), the role and exchange symbols are bisected by a horizontal bar. Directed lines use half arrowheads, above or below the line,
to represent the flow of resources and the exchange's cardinality.

Several other features of the symbols require mention. Figure 2: Exchange Model Symbols

Labels are provided in the exchange symbol to indicate and exchange's name and mediator. The role's name and class are indicated. Since an exchange consists of two unidirectional relationships (i.e., Role_A-to-Role_B and Role_B-to-Role_A), resource flow labels improve the model's semantics. In general, the flow of resources between the roles is the notion of "give" and "take". However, Role A's "Give" is Role B's "Take" and, therefore, the labels are placed on each side of the exchange symbol but are inverted. The more meaningful description from a given role's perspective requires replacing the resource flow labels with more descriptive terms (e.g., offer/accept, buy/sell, etc.) and reading the label closest to the role.

The utility of the model is also enhanced by the differentiation of exchange relationships based upon transaction risks (Figure 3). The risks are indicated by the exchange cardinality. The strength or vulnerability of the exchange network is dependent upon the number of trading partners, the availability of other partners, and the resource's substitutability. Following Williamson's [25] [26] transaction cost analysis, bilateral and supplier monopoly relationships introduce high levels of risk and indicate a need for internal governance. Monopsony relationships favor the organization since the organization controls the resource flow from others since it is the single consumer of the resource. Market relationships are generally the least critical since the organization can arrange an exchange with others.

Although not shown in Figure 3, the model may use unfilled arrowhead symbol to indicate that a role can do without a resource. When substitutes are available or the resource is unimportant to one exchange partner, the other partner is vulnerable unless they also can do without the exchange. Through indications of exchange cardinality, the model reveals resource dependencies and, consequently, power relationships. Process reengineering prescription would suggest outsourcing non-critical dependencies and internalizing high risk transactions.

As a practical matter, the representations shown in Figure 3 may not be used to present the model since it appears cluttered. For display purposes, the analyst may omit most of the labels and use the cardinalities to examine the organization. Applying this model may be improved by beginning with a well-established business model. Selection of template models and an example are discussed next.

Getting Started: Templates and an Example

One persistent issue arising in the use of organizational models is that no adequate models of the domain exist [3]. Three factors may contribute to this circumstance. First, the managerial problem domain is wide and shallow. Second, each firm seeks to create a sustainable competitive advantage that differentiates itself from other firms and, consequently, the organization processes differ from other firms. Third, modelers may be focusing on the wrong unit of analysis.
Exchange models directly address the third observation. The consequences of the other two circumstances may be tempered by adopting a valid and comprehensive organizational framework that serves as a template. Several organizational models are candidates for building a template including the McKinsey 7-S framework, stakeholder analysis, Porter’s five forces model and the value chain.

Among the models, the work of Porter [19] [20] has two advantages. First, he models interorganizational processes with the five-forces model and intraorganizational processes with the value chain model. Second, the models and their consequences have been extensively researched.

The five-forces model (Figure 4) depicts transactions between the organization and five other entities — rivals, buyers, sellers, substitutes, and new entrants. To demonstrate the model’s application, three other interactions of rivals and substitutes are also shown. The basic model consists of seven exchanges between six roles. The representation’s clutter is reduced by using only the exchange label and arrowheads.

Exchanges linking the organization to external entities represent the general case. Other exchanges are specializations of one of the five basic organizational exchanges. For example, the “Buyer-Firm” relationship in the “Bargain” exchange could be specialized by product line or region.

While the five forces model focuses on external relationships, Porter’s [20] value chain model describes a universal set of internal organizational processes and the interrelationships between processes. Though not depicted in this paper, each component of the value chain represents at least one and, more than likely, more than one exchange relationship. For example, one type of inbound logistics "Acquisition" exchange occurs between purchasing agents and sellers. Operations involves a "Quality Control" exchange between assemblers and inspectors. In some cases the exchanges will be arranged in a network within an element of a value chain. In other cases a value chain may be nested within an element of another value chain. For example, a grocery store is a value chain nested within the parent company’s value chain.

Figure 4: An exchange representation of Porter’s five-forces model
The five forces model and the value chain are general models of organizational processes that can serve as a template for development of a specific model. One advantage of these models is that they are technology independent as is the proposed exchange model. A second advantage is that they can be linked to existing models as described in the next section. A third is that they are supported by extensive research.

**OEM, ER models, and DFDs**

The proposed organizational exchange model (OEM) provides a link or "hook" to two other popular technology-independent models — the entity-relationship (ER) model and the data flow diagram (DFD). The ER model's correspondence is most evident. Exchange roles are entities and exchanges are relationships. The roles do not necessarily, however, map directly into database tables. In general, roles are subtypes of entities. For example, a "Mechanic" role is a subtype of "Employee" or a "Market Research Analyst" is a subclass of "Market Researcher".

Since exchanges represent a bi-directional flow of resources, they can be decomposed into at least two relationships. For example, consider the relationship between students and teachers. The exchange between students and teachers is a many-to-many exchange which can be labeled "Instruction". Instruction consists of at least two relationships between a student and a teacher, "Teach" and "Learn". Also, both the teacher and the student engage in an exchange with the institution that offers the courses and mediates the relationship. The teacher-institution exchange forms an "Academy" and the student-institution exchange creates a "Matriculation" relationship. As part of the normal academy exchange, institutions "Offer" courses that teachers "Teach". Relatedly, students "Register" and institutions "Enroll" students. Among the resources exchanged, the teacher-institution employment relationship that involves an exchange of services for money, the exchange also involves an exchange of status (i.e., teacher of a course offered by the institution).

Processes provide the mechanism to realize an exchange. Data flow diagrams (DFDs) provide a graphical representation scheme to link the exchange's roles and decompose the exchange into subprocesses. McLeod [15.183] points out that the data flow diagram "is perhaps the most natural way to document processes." Considering this observation, it is also not unreasonable to use the DFD to represent flows of other resources (e.g., money, goods, etc.) that are exchanged. For example, each exchange is a context for at least four processes; one for each unidirectional exchange relation and one for the processes that each role undertakes to provide their resources.

The combination of OEMs, ERMs, and DFDs provides the analyst with a powerful set of tools for modeling organizational processes. When supported through an ODSS, the analyst can cross interorganizational and intraorganizational boundaries to improve their understanding of the organization and share that understanding with others.

**Discussion**

Exchange is a relatively universal phenomena. When the exchange becomes recurrent we can recognize it organized activity if it is formally organized or tacit. The proposed model offers the analyst, consultant, or manager a technique for capturing a process that defines organized activity. Since ODSSs support diffusing a shared vision of the organization, ODSSs are the logical mechanism to sustain this modeling activity.

This organizational exchange model (OEM) makes resource dependencies explicit. Representing multiple resource flows in a single model reveals the complexity of various roles. Most importantly, an OEM exposes organizational arrangements that allow effective process reengineering.

The proposed model is not without its theoretical and practical limitations. Foremost among theoretical concerns is the criticism of using exchange to describe intraorganizational exchange. Some researchers argue that organizations distort the exchange process. In a related argument, some researchers question the appropriateness of extending an essentially dyadic process to model larger social systems. Practically, the full model can become cluttered although many of the labels and details can be retained elsewhere without materially affecting the model’s usefulness.

Several extensions to the model are evident. First, the model could be linked to the well-developed network analysis software. Second, qualitative modeling techniques, although not as developed as the social network models, may provide a more powerful tool to study changes in exchange patterns. Third, a more precise technique to integrate ER models, DFDs, and OEMs is needed. Finally, investigation of the relationship of this model to object oriented models is warranted.

In summary, the organizational exchange model defines an organization through a single construct. The model user can represent existing processes to expose strengths and threats or model new processes to expose more powerful organizational arrangements. ODSSs are the logical platform for supporting organizational exchange modelers and their modelbases. Most importantly, ODSSs provide the mechanism to share this knowledge with the organization's members to improve the organization's performance.
References


