IMPACT OF INTER ORGANIZATIONAL NETWORKS ON ADOPTION PROCESS OF INFORMATION TECHNOLOGY

Erdem Kirkbesoglu
Baskent University, Baglica Kampusu, Eskisehir Yolu 20. Km, Etimesgut
ANKARA/TURKEY

Gizem Ogutcu
Baskent University, Baglica Kampusu, Eskisehir Yolu 20. Km, Etimesgut
ANKARA/TURKEY

Abstract

The purpose of this study is to generate a conceptual framework that reveals the impact of inter-organizational networks on the adoption process of information technologies. A great majority of the previous research that focuses on the adoption process of information technologies are empirical studies based on inter-organizational factors (for instance; the structure, the strategy or culture of the organization). These are the studies which maximize organizational benefit (performance based) and which give suggestions to the practitioners towards increasing efficiency. Unlike these, in this study, the macro factors (for example strong and weak ties, level of dependency, level of isomorphism among organizations) emerging as a result of the inter-organizational interactions were considered instead of intra-organizational factors. Due to the fact that the most significant field of application for information technologies is the organization, a conceptual assessment was made in this study from the aspect of organizational communities and organization theories. In developing this model, basic statements of various organization theories such as network theory, institutional theory and dependency theory were used. At the end of the study, a number of propositions related to inter organizational interaction that affect adoption and sustained use of innovative technologies in a network context are composed for future studies.

Keywords: *information technology adoption, network theory, dependency, isomorphism.*

1. Introduction

The roles of information technology (IT) on today's organizations have significantly changed over the last decade. Advances in new information technology and changes in the global environment have made it increasingly difficult for organizations to make decisions regarding information technology adoption. Moreover, information systems in a global environment are influenced by different cultures, laws, information technology infrastructure, and the availability and role of skilled personnel (Dasgupta et al., 1999). IT has become the tool used to manage change in business strategies and internal corporate processes by many organizations. Organizations are making significant investments in information technology to align business strategies, enable innovative functional operations and provide extended organizational networks. These organizations have adopted information technology to foster changes in managing customer relationships, manufacturing, procurement, the supply chain and all other key activities and to enhance their competitive capabilities (Chen and Tsou, 2007).

Thus, IT now is one of the major factors improving productivity and performance of the organizations. It is a tool used to manage business strategies and internal corporate processes and it is a nervous system of organizations that determines the organization's competitiveness. So it can create the competitive advantage and innovation for every business. However, Information Technology itself

cannot create the value-added to the organization. It can only make the better products and services via changing the working processes. Moreover, every organization can acquire the same technology and also it is easy to be copied in a short period of time. To sustain the competitive advantages, managers should focuses on contextual factors on the process of IT adoption. It is clear that even though IT has evolved from its traditional to more strategic role within an organization, the adoption process of any new technology can be problematic for many organizations. Several factors appear to accelerate or impede the diffusion of IT in all organizations.

Identifying why and how organizations adopt information technology is crucial for providing a successful adoption process. Several studies have identified different variables that can explain why firms adopt information technology with different intensities and speeds (e.g., Teo and Pian, 2003; Premkumar et al., 1997). A great majority of these studies are composed of the empirical studies based on intra-organizational factors and variables. However, adoption and expansion of information technologies are maintained through the inter-organizational relationships. Both structural properties of the organizations and their interactions with their environment are important. Therefore, in addition to the micro factors based on the structures of organizations, it is necessary that macro perspectives that ground on inter-organizational interactions should be put forth and located on a conceptual ground.

The purpose of this study is to generate a conceptual framework that reveals the impact of inter-organizational networks on the adoption process of information technologies. Since the most important application field of information technologies is organizations, in this study it is aimed at generating a conceptual framework from the aspect of organization communities and organization theories. In developing this model, basic statements of various organization theories such as network theory, institutional theory and dependency theory were used. As a result of the study, testable propositions were formed for future studies.

2. Literature Review

Adoption can be defined as a decision to make full use of a new idea as the best course of action available (Rogers, 1995). In other words, adoption involves some form of evaluation of an innovation to determine if it will best satisfy the needs of the prospective adopting organization, as well as the sustained use of the innovation (Hausman and Johnston, 2005). Since information technology began to have an important impact on the way firms are both managed and organized, researchers have investigated the organizational factors behind the degree of adoption of computing, robotic or telecommunications technologies (Bruque and Moyano, 2006: 242). Organizational factors behind information technology adoption may be as important as other elements such as technical factors (Premkumar et al., 1997), although they are usually seen as less significant by practitioners (Fletcher and Wright, 1995).

A great majority of the previous research that focuses on the adoption process of information technologies are empirical studies based on intra-organizational factors because such studies are those which maximize organizational benefit and which are performance based. Particularly, they give suggestions and make recommendations for increasing efficiency in order to avoid from the criticisms of implementers. Therefore, they are mostly related with internal factors such as the structure, strategy or culture of organization. For instance, the previous studies has focused adoption of information technology in small and medium-sized organizations (Bruque and Moyano, 2006; Fink, 1998); a technology leaders who support the technological change (Brancheau and Wetherbe, 1990; Roberts and Liu, 2001); the managers' support for the adoption of information technology (Leonard-Barton and Deschamps, 1988; Soliman and Janz, 2004); information technology as competitive advantage and selection of suitable IT strategies (Powell and Dent-Micallef, 1997; Fletcher and Wright, 1995); cultural dimensions of information technology adoption (Leidner et.al., 2006).

Besides empirical studies, there are quite a lot of conceptual studies.The most used theories are the technology acceptance model (TAM) (Davis, 1989), theory of planned behaviour (TPB) (Ajzen 1991), unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al. 2003), diffusion of innovations (DOI) (Rogers, 1995), and technology, organization and environment (TOE) framework (Tornatzky and Fleischer 1990). Although these conceptual models had a significant contribution in literature, they couldn't provide many explanations regarding the behavioral patterns of organizational communities. The one that emphasizes inter-organizational interaction and the importance of the environment factor among these conceptual models has been TOE. The TOE framework identifies three aspects of an enterprise's context that influence the process by which it adopts and implements a technological innovation: technological context, organizational context, and environmental context.

a. Technological context describes both the internal and external technologies relevant to the firm. Current equipment and practices within organization and the set of available technologies that can be transferred from the organization.

b. Organizational context refers to internal descriptive measures about the organization such as scope, size, and managerial structure.

c. Environmental context is the external context in which an organization conducts its business such as industry, competitors, and government (Tornatzky and Fleischer 1990).

The TOE framework as originally presented, and later adapted in IT adoption studies, provides a useful analytical framework that can be used for studying the adoption and assimilation of different types of IT innovation (Oliviera and Martins, 2011: 112). The TOE framework has a solid theoretical basis, consistent empirical support and the potential of application to IS innovation domains, though specific factors identified within the three contexts may vary across different studies (Oliviera and Martins, 2011: 112). Although TOE emphasizes the internal and external components of the organizations, the environment context as external component includes new and varying factors that influence the IT adoption. There are plenty of studies in literature that develop TOE framework and redefine it (e.g., Chong et al., 2009; Kuan and Chau, 2001). However, none of these studies mentions about the effect of inter-organizational networks. Hence, our purpose in this study is to develop a model that puts forth the effects of inter-organizational networks on the adoption process of information technologies within the scope of environmental context.

3. Conceptual Framework of Adoption

Previous models of organizational adoption are primarily limited to the intra-organizational context where the organizations make an adoption decision and employees subsequently decide whether to use the innovation. Our framework in this study is specifically related to critical inter organizational relationships. We categorize our conceptual framework with network components of adoption process. And three organization theories (network theory, dependency theory and institutional theory) will underlie our conceptual framework and also specific propositions.

3.1. Social Network of Organizations. Strong and Weak Ties

Social network theory concerns how actors (e.g., individuals, groups, organizations, etc.) are tied by some sort of social relationship (e.g., advice giving, resource sharing, alliance partnership, etc) (Moliterno and Mahony, 2011). Today's organizations have to be involved in a cooperation network with different actors in order to survive in the complex business environment and ensure sustainability. Assuring the stability of commercial life requires that the relationships within this network should be managed successfully and in coordination for long years. Each organization is embedded within multiple overlapping networks, such that changes in one network impact their functionality and relationship with organizations in other networks to which they are members. Social interactions among the actors have some positive or negative effects on economical behaviour (Uzzi, 1997: 36). This effect of actors on economical processes also provides that they get close to some

different actors and create relational actions for the purpose of gaining some benefits. Actors such as organizations or the representatives of the organization make use of their social interactions during the process of realizing the economical actions.

Granovetter (1985: 504) indicates that behaviors among actors who are the representatives of the organization are embedded into the social networks established based on the relations, which is significant in ensuring trust in social life. That is, actors have some network relations in social life and these networks develop in time based on trust. According to Uzzi (1999: 483) relations based on trust appearing in network mechanisms creates an effect that can hinder opportunist behaviors and abuse of actors. Hence, it is pointed out that a general belief that forming relations with well-known actors where trust expectations arise among networks members results in positive outcomes will occur (Uzzi, 1999: 483). One of the reasons why actors establish a network mechanism by forming social relations among themselves is that actors outside the social network mechanism experience more problems in terms of obtaining knowledge than the others. Uzzi, (1999: 483) puts forth that special knowledge that parties have will spread through the established relationships and brings in skills for the parties engaged in commercial relations. Therefore, social relations established based on mutual trust enable to transfer technical and strategic knowledge that cannot be obtained by market relations. In the event that knowledge that will be necessary for the actors forming social network mechanism to take rational decisions is insufficient or absent, actors react in line with the knowledge coming from the network channel. Thus, the ability of actors will be constrained to decide independent from the network mechanism and embedded social relations will be effective on the decisions taken and actions in conclusion.

Granovetter (1973: 1367) mentions that the relations within inter organizational networks are based on strong and weak ties. At this point strong ties cover the social relations and norms based on trust among individuals. On the other hand, weak ties are the weak and rare market relations that operate without any humanly or social connection among the parties (Granovetter, 1983: 205). While the weak ties include the sources and information that can be obtained outside the actors' own social atmosphere, the strong ones cover the routine sources and knowledge that the actors attain from the other actors.

It is an indicator of a high level of social sharing and confidence among organizations that the ties among organizations in a network mechanism are strong. In networks where strong ties are provided, competition is kept behind. In such networks, the central organizations of the network defined as reputable, big and authoritative are highly trusted. In the event that information circulating in the network is not reliable, central organizations shall be considered as model by the small scaled follower organizations. Thus, adoption of an innovation will be faster.

> *Proposition 1.1. As the number of strong ties among the central and follower organizations increases, the level of IT adoption in the network increases as well.*
>
> *Proposition 1.2. As the number of weak ties among the central and follower organizations increases, the level of IT adoption in the network decreases.*

On the other hand, Granovetter (1983) stresses the importance of weak ties that may be formed with the organizations outside the network. Weak ties would particularly enable fast access to information and adaptation to change (Granovetter, 1983: 202). Granovetter (1973: 1367) states that organizations with a lot of weak ties outside the network will have a great advantage in terms of spreading innovations. Weak ties provide that organizations have access to sources and information outside their own social setting (Granovetter, 1983: 209). The strength of a tie can be stated with concepts as the duration of the ongoing interactions, emotional intensity, intimacy and reciprocal services realized (Granovetter, 1973: 1360). Granovetter (1983: 202) suggests that organizations with

a limited number of weak ties will lack the opportunity to access information in the distant parts of the social system and confine themselves with information in the network. According to Burt (2004), it is not possible to form weak ties outside the network for every actor. Burt (2001; 2004; 2005) uses the concept of structural holes to shed a new light on the concept of social capital. Structural holes theory defines information and control advantage that broker – central - organizations possess in providing the relationship between networks (Burt, 1992). Mediating organizations in organizational life provide the circulation of information in different aspects of the economic system and they affect the structure for their personal benefit. Thanks to this, information transfer between different networks is obtained (Gargiulo and Benassi, 2000: 184). Central organizations get crucial advantages of his bridging function and the position possessed by him provides an advantageous point in the organizational field (Burt, 2004: 356). The realization of structural holes and the provision of linkages between these holes are directly related to actors' experience. For this reason, brokers (such as central organizations) provide information transfer between unrelated networks and mediate between the actors who have no chance of achieving a relationship with other actors by their own. These kinds of central – broker - organizations in the organizational field develop different interpretation and prediction capabilities in order to gain competitive advantage (Burt, 2004: 356). Thus, weak ties formed outside the network will accelerate the entry of the recent innovations transferred into the network. The entry of innovations will accelerate that several organizations in the network make use of these innovations.

Proposition 2. As the number of weak ties central organizations from outside the network increases, the level of adoption within the network increases as well.

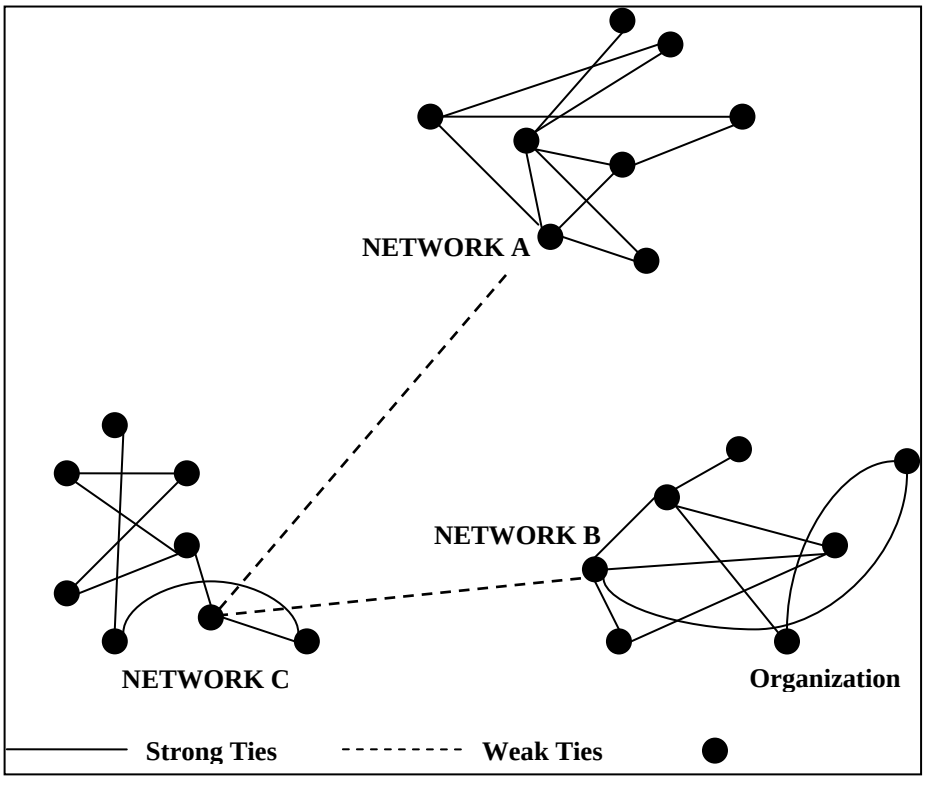

Figure 1: Strong and Weak Ties of Organizations (Burt, 1992)

3.2. Dependency in Social Networks

The basis of studies conducted regarding the dependency relationships among organizations is based on the resource dependency theory (Pfeffer ve Salancik, 1978). Resource dependency theory speaks to competitive processes by which resource scarcities brought about by widespread use of a standard lead to change (Leblebici et al., 1991; Sherer, 2001). According to the resource dependency theory, organizations are not completely self-sufficient. They cannot internally provide all the resources and needs they require. They have to obtain some resources needed from the factors in their environment, which will cause them to interact with the factors in their environment. One of the main problems of organizations is to supply their resource needs from other organizations when resources are scarce. This situation makes it compulsory that resource supply is stable and support from resource providers is obtained. Should an organization experience trouble in providing resources, it will be difficult to maintain its activities. Therefore, it may be required that the organization should fulfill the expectations of the organizations it is interacting with.

Pfeffer and Salancik (1978) mentioned that dependency relationship appears in two conditions. (1) To what extent the required resource is important in order for the organization to survive? (2) Are there any other organizations that possess the required resource? If an organization is highly dependent on another, the latter one is in a stronger position in that relationship. Thus, the central organizations that are strong in the dependency relationship want that innovation they have is adopted by the follower organizations. Because central organizations want to ensure continuity of dependency relationship. The follower organization that transfers an information technology would have to be dependent to the central organization for a while.

> *Proposition 3. As the dependency between the follower and central organization in/or a network increases, the level of adoption in the network increases as well.*

3.3. Isomorphic Inclination in Organizational Networks

Institutional literature emphasizes that organizational structure and processes tend to become isomorphic with the accepted norms for organizations of particular types (DiMaggio and Powell, 1983). According to the institutional theory, the structures and processes of organizations are shaped as a result of their compliance in the institutional environment they exist in (Ozen, 2007: 240). The institutional environment is a built environment which include the rational structures, norms, rules, beliefs and legends formed outside and over the organizations (Ozen, 2007: 241). According to DiMaggio and Powell (1991: 67-74), organizations adopt the structures and implementations suggested by the common laws and become isomorphic.

The theory claims that firms become more similar due to isomorphic pressures and pressures for legitimacy. Because organizational decisions are not driven purely by rational goals of efficiency, but also by social and cultural factors and concerns for legitimacy. Such an environment is named as the institutional environment. In order for the organizations to survive, being technically efficient is not enough but they need to validate themselves by adopting the institutions in this environment. As a result, since organizations living in the same "organizational area" must adapt to the similar institutions regardless of their specific rational requirements, they become structurally isomorphic (Meyer and Rowan, 1977; Scott and Meyer, 1991). This means that firms in the same field tend to become homologous over time, as competitive and customer pressures motivate them to copy industry leaders. For example, rather than making a purely internally driven decision to adopt e-commerce, firms are likely to be induced to adopt and use e-commerce by external isomorphic pressures from competitors, trading partners, customers, and government. Mimetic, coercive, and normative institutional pressures existing in an institutionalized environment may influence organizations' predisposition toward an IT-based interorganizational system (Teo et al. 2003).

Several positions, policies, procedures, programs in modern organizations and opinions of the important groups of the society are validated by public opinion and laws (Meyer and Rowan, 1977). These elements of the formal structure are expressive indicators of strong institutional rules that serve like rationalized myths (Ozen, 2007). Meyer and Rowan (1977) argue that they should adopt these rationalized innovations that functions as a myth. By this way, organizations adopt these innovations not because of increasing their own technical efficiencies but because it is externally "legitimate". In order to demonstrate to the external environment that they are doing to this, they consider external or ceremonial assessment criteria (certificates, documents, awards… etc.) (Meyer and Rowan,1977). In conclusion, organizations become isomorphic with the organizations around them by copying them. Hence, rationalized institutional rules and institutional myths will create the most fundamental impact facilitating the spread of innovation in a network. The source of these effects will be the significant organizations in the state, professional organizations and the organizations in the institutional field.

> *Proposition 4. As the rationalized institutional rules and institutional myths in a network towards innovation become widespread, the level of adoption increases.*

In the light of our testable propositions, conceptual model can be summarized in Figure 2.

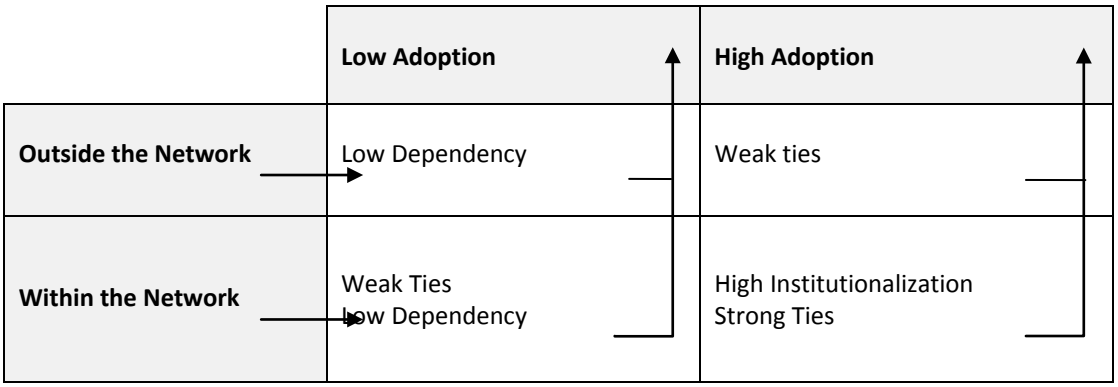

Figure 2: Conceptual Model of IT Adoption for Inter Organizational Networks

4. Conclusion

In this study, we developed a conceptual framework that reveals the contribution of inter-organizational networks in the process of adoption of information technologies. The empirical and theoretical studies regarding the adoption of information technologies mostly focus on factors inside the organization. Most adoption researchers have mainly focused on evaluating a few variables that impact the adoption of specific technologies by a single organization or consumer, mostly disregarding a holistic consideration of factors that might shape cooperative adoption, especially in a network context. Thus, strong and weak ties, dependency relations and isomorphic inclination which are escape researchers' notice as a topic of organizational networks investigated in this study. This study reveals the fact that not only the efficiency based technical environment but also the institutional environment and the dependency relationships should be analyzed by the implementers. Therefore, it will be beneficial that IT adoption is measured with both micro variables and macro interactions.

References

Ajzen, I. 1991. "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50, pp 179-211.

Brancheau, J. C. and Wetherbe, J. C. 1990. "The Adoption of Spreadsheet Software: Testing Innovation Diffusion Theory in the Context of End-User Computing". *Information Systems Research*, Vol. 1. pp. 115-143.

Bruque, S. and Moyano, J. 2007. "Organisational determinants of information technology adoption and implementation in SMEs: The case of family and cooperative firms". *Technovation* 27. p. 241–253.

Burt, R. 1992. *Structural holes.* Chicago: University of Chicago Press.

Burt, S.R. 2001. *Structural Holes versus Network Closure as Social Capital*. University of Chicago and Institute European d'Administration d'Affaires. No: 773-702-0848.

Burt, S.R. 2004. "Structural Holes and Good Ideas", *American Journal of Sociology*. 110 (2): 349-399.

Burt, S.R. 2005. *Brokerage & Closure*. New York, Oxford University Press.

Chen, J.S. & Tsou, H.T. 2007. "Information technology adoption for service innovation practices and competitive advantage: the case of financial firms" *Information Research*, 12(3) paper 314

Chong, A.Y.L., Ooi, K.B., Lin, B.S. and Raman, M. 2009. "Factors affecting the adoption level of c-commerce: An empirical study", *Journal of Computer Information Systems*, Vol. 50, No. 2, pp 13-22.

Dasgupta, S., Devraj A., Anthony I. and Shanthi G, 1999, 'Determinants of Information Technology Adoption: An Extension of Existing Models to Firms in a Developing Country', *Journal of Global Information Management* (July–September), 30–40.

Davis, F.D. 1989. "Perceived usefulness, perceived ease of use, and user acceptance of information technology", "MIS Quarterly", Vol. 13, No. 3, pp 319-340.

DiMaggio, P. J. and Powell, W. 1983. "The iron cage revisited institutional isomorphism and collective rationality in organizational fields", *American Sociological Review*, Vol. 48, 147-60.

Edward B. R. and Wenyun K. L. 2001. "Ally or acquire? How technology leaders decide". *MIT Sloan Management Review*. 43, 1, 26–34.

Fletcher, K. and Wright, C., 1995. "Organizational, strategic and technical barriers to successful implementation of Database Marketing". International. *Journal of Information Management* 15, 115–126.

Gargiulo, M. ve Benassi, M. 2000. "Traped in your own net? Network cohesion, structural holes and the adaptation of social capital". *Organization Science*, 11 (2): 183-196.

Granovetter, M. 1973. "Strength of Weak Ties". *American Journal of Sociology*, 78: 1360-1380.

Granovetter, M. 1983. "The strength of weak ties: A network theory revisited". *Sociological Theory*, 1: 201-233.

Granovetter, M. 1985. "Economic Action and Social Structure: The Problem of Embeddedness". *American Journal of Sociology*, 91(3): 481-510.

Hausman, A. and Johnston, W.J. 2005. "Cooperative adoption of complex systems: a comprehensive model within and across networks". *Journal of Business & Industrial Marketing*. Vol:20/4/5. p. 200–210.

Kuan, K.K.Y. and Chau, P.Y.K. 2001. "A perception-based model for edi adoption in small businesses using a technology-organization-environment framework", *Information & Management*, Vol. 38, No. 8, pp 507-521.

Leblebici, H., Salancik, G., Copay, A., & King, T. 1991. Institutional change and the transformation of interorganizational fields: An organizational history of the U.S. radio broadcasting industry. Administrative Science Quarterly, 36: 333-363.

Leidner, Dorothy E. and Kayworth, Timothy. 2006. "A Review of Culture in Information Systems Research: Toward a Theory of Information Technology Culture Conflict", *MIS Quarterly*, (30: 2).

Leonard-Barton, D. and Deschamps, I. 1988. "Managerial influence in the implementation of new technology". *Management Science*, Vol. 34, pp. 1252-1265.

Meyer, J. W. and Rowan, B. 1977. "Institutional organizations: formal structure as myth and ceremony", *American Journal of Sociology*, Vol. 83, 340-63.

Moliterno, T.P. and Mahony, D.M. 2011. "Network Theory of Organization: A Multilevel Approach". *Journal of Management*. 37: 443-467.

Oliveira, T and Martins, M, F. 2011. "Literature Review of Information Technology Adoption Models at Firm Level". *The Electronic Journal Information Systems Evaluation*. Vol. 14 Issue 1, pp.110-121.

Ozen, Ş. 2007. New Institutional Theory. A. S. Sargut ve Ş. Özen (edt) *Organization Theories* . Ankara: Imge, 237-331.

Pfeffer, J. and Salancik, G. 1978. *The external control of organizations: A resource dependence perspective*, New York, Harper & Row

Powell, T.C., Dent-Micallef, A., 1997. "Information technology as competitive advantage: the role of human, business and technology resources". *Strategic Management Journal*. Vol. 18, 375–405.

Premkumar, G., Ramamurthy, K., Crum, M., 1997. "Determinants of EDI adoption in the transportation industry". *European Journal of Information Systems.* Vol: 6, 107–121.

Rogers, E. 1995*, Diffusion of Innovations*, 4th ed., The Free Press, New York, NY.

Scott, W. Richard, and John W. Meyer. 1991. The Organization of Societal Sectors: Propositions and Early Evidence. Pp. 108-142 in *The New Institutionalism in Organizational Analysis*, edited by Walter W. Powell and Paul J. DiMaggio. Chicago: University of Chicago Press.

Sherer, P. D. 2001. Reconciling best-practice andfirmdifference perspectives in strategic IR/HRM research. Paper presented at the annual meeting of the Industrial Relations Research Association, New Orleans.

Soliman, K.S., Janz, B.D., 2004. "An exploratory study to identify the critical factors affecting the decision to establish Internet-based interorganizational information systems". *Information and Management*. 41, 697–706.

Teo, H. H. Wei, K. K. and Benbasat, I. 2003. "Predicting Intention to Adopt Interorganizational Linkages: An Institutional Perspective". *Management Information Systems Quarterly*. Vol. 27, No. 1. pp. 19-49.

Teo, T.S.H. and Pian, Y., 2003. "A contingency perspective on Internet adoption and competitive advantage". *European Journal of Information Systems.* Vol: 12, 78–92.

Tornatzky, L. and Fleischer, M. 1990. *The process of technology innovation*, Lexington, MA, Lexington Books.

Uzzi, B. 1997. "Social structure and competition in interfirm networks: The paradox of embeddedness". *Administrative Science Quarterly*, 42: 35-67.

Uzzi, B. 1999. "Social relations and networks in the making of financial capital". *American Sociological Review*. Vol: 64 481-505.

Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. 2003. "User acceptance of information technology: Toward a unified view", *MIS Quarterly*, Vol. 27, No. 3, pp. 425-478.