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Organization Adoption of Linux: An Institutional Perspective

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ABSTRACT
The rapid adoption of Linux servers by organizations in recent years begs the question of whether the adoption is driven by careful considerations of organizational needs or by bandwagon phenomena. Drawing from the institutional perspective of Tolbert and Zucker (1983), this paper presents a two-stage adoption model for Linux servers and examines systematically the determinants of organizational adoption of Linux servers at each stage. It proposes that, while the adoption of Linux servers is determined by organizational factors both at early and late stages, these factors become relatively poorer predictors as Linux servers becomes more institutionalized. Moreover, as the process of adoption continues, institutional factors become more significant predictors of organizational adoption decisions. This paper contributes to theory building in IS adoption research in general and open source software adoption research in particular.

Keywords
Organizational adoption of innovation, open source software, Linux, institutional theory

INTRODUCTION
Linux is one of the most successful open source projects to date. Since the introduction of the first Linux commercial product in 1993, Linux has had notable success in the server market. While Linux accounted for less than 0.5% of the server operating system market in 1995, its server market share reached 23.1% in 2002 (Gonsalves, 2003). IDC predicts that worldwide market share for Linux server will reach 28% by 2008. In a survey of business users by Forrester, 52% said they are now replacing Windows servers with Linux.

The rapid adoption of Linux servers by organizations begs the question of whether the adoption is driven by careful considerations of organizational needs or by bandwagon phenomena and “me too” mentality (Staw and Epstein, 2000). By advancing a set of testable propositions concerning the organizational and institutional determinants of organizational adoption of Linux servers, this paper answers the call for rigorous, theory guided research on open source software adoption.

ORGANIZATIONAL TECHNOLOGY ADOPTION – AN INSTITUTIONAL PERSPECTIVE
Institutional theory is interested in the causes of institutional isomorphism, a process by which organizations within the same field become increasingly homogeneous over time, adopting uniform structures and practices (DiMaggio and Powell, 1983). According to institutional theorists, organizations engage in isomorphic behaviors with the aim of gaining legitimacy (DiMaggio and Powell, 1983). A legitimate organization is one that is perceived to be pursuing socially acceptable goals in a socially acceptable manner. Insomuch as legitimacy justifies the organization’s role in the social system and helps attract continued support of constituents, it is itself a resource (Ashforth and Gibbs, 1990).

From an institutional perspective, Tolbert and Zucker (1983) suggested that the adoption of innovation by organizations is determined by institutional as well as organizational factors. The relative importance of these factors changes over time as the innovation diffuses among potential adopters. Whereas early adoption of innovation is related to internal organizational requirements and needs, late adopters are more likely to adopt to gain legitimacy (e.g. reputation, image, cultural support, regulatory agency approval, accreditation, etc.). The longitudinal study by Tolbert and Zucker (1983) on the adoption of civil services reform showed that internal organizational factors (i.e. city characteristics) predicted adoption in the initial adoption phase, but they became unimportant as predictors of adoption in the later phase. Similar results have been obtained by other researchers (e.g. Young, Charns and Shortell, 2001) studying organizational adoption of different types of innovations.
The rapid adoption of Linux servers by organizations suggests that institutional forces may be at work. Organizations may have jumped on the Linux bandwagon simply because it has been widely recognized as a legitimate enterprise computing option and has become an established part of the IT infrastructure. Drawing upon the perspective of Tolbert & Zucker (1983), this paper proposes that, while the adoption of Linux servers is influenced by non-institutional factors related to organizational requirements and needs at both early and late stages, these factors become relatively poorer predictors as Linux becomes more institutionalized. Moreover, as the process of adoption continues, institutional factors become more significant predictors of organizational adoption decisions.

**Organizational Factors**

Organizational factors such as size, age, organizational form, and technology context have been identified by prior research (e.g. Damanpour, 1991; DePietro, Wiarda and Fleischer, 1990) as non-institutional antecedents to technology adoption decision and are proposed in this paper as important determinants of Linux server adoption at both early and late adoption stages.

**Size.** Literature in economics (e.g. Cohen and Klepper, 1996) suggests a positive relationship between organization size and innovation rates. Organizational researchers have also argued that larger organizations are more likely to adopt technological innovations because increases in the resources (financial and/or human) of an organization increase experimentation and organizational change (Greve, 1998). For instance, Tolbert and Zucker (1983) found a simple positive relationship between the adoption of civil service reform and city size. Hannan and McDowell (1984) showed that larger banks are more likely to adopt automated teller machines. In a meta-analysis, Damanpour (1989) also found a positive relationship between size and innovation. Therefore,

**Proposition 1:** A large organization will be more likely to adopt Linux servers than a small organization.

**Age.** As demonstrated by many organizational researchers (e.g. Cohen and Levinthal, 1999; Hannan and Freeman, 1984; Levitt and March, 1988; Stinchcombe, 1965), old organizations may succumb to “competency traps” (Levitt and March, 1988), which may result in increased organizational inertia and greater resistance to change. Therefore, older organizations are expected to be less likely to adopt Linux servers than their younger counterparts. Thus,

**Proposition 2:** A new organization will be more likely to adopt Linux servers than an old organization.

**Organizational form.** Burns and Stalker (1961) distinguished between mechanistic and organic organizations and suggested that mechanistic organizations have lower complexity (hence, lower specialization, differentiation, and professionalism), higher formalization and centralization, lower internal and external communication, and higher vertical differentiation than organic ones (Damanpour, 1991). Comparing characteristics of organic organizations with organizational characteristics that positively influence innovation, Damanpour (1991) concluded that the adoption of innovation is easier when organizations have organic rather than mechanistic characteristics. Thus,

**Proposition 3:** An organic organization will be more likely to adopt Linux servers than a mechanistic organization.

**Technology Context.** The extent to which an innovation is compatible an organization’s technology context will affect adoption decisions, because the current technology context constrains the extent and/or the rate of subsequent technological change (Collins, Hage and Hull, 1988). Of the three types of innovations (i.e., incremental, synthetic, and discontinuous) (Tushman and Nadler, 1986), compatibility with existing technology tends to decrease as one moves from incremental to discontinuous changes (DePietro et al., 1990).

Dedrick & West (2004) have noted a polarization between firms that primarily used Unix-based applications (the so-called “Unix shops”) and those that are primarily Windows-based (the so-called “Microsoft shops”). Although the switch to Linux from either Unix or Windows environment involves considerable back-office migration and the training of technical personnel, the transition to Linux is incremental for “Unix shops” where skills are easily transferable whereas the transition is discontinuous for “Microsoft shops” that lack such skill (DePietro et al., 1990; Tushman and Nadler, 1986). As such, “Unix-shops” are more likely to adopt Linux than are “Microsoft shops”. Thus,

**Proposition 4:** An organization that is primarily Unix-based will be more likely to adopt Linux servers than one that is primarily Windows-based.
Institutional Factors

As discussed previously, later adoption of Linux will be driven by various institutional factors, over and beyond the effects of organizational factors. DiMaggio & Powell (1983) have highlighted three mechanisms through which institutional isomorphic change occurs: Coercive isomorphism, mimetic isomorphism, and normative isomorphism. The institutional factors predicting Linux adoption at a later stage are thus derived from the three mechanisms.

Coercive isomorphism is a result of “both formal and informal pressures exerted on organizations by other organizations upon which they are dependent and by cultural expectations in the society within which organizations function” (DiMaggio and Powell, 1983, p. 67). It exists when an organization adopts certain values and norms because of pressures (which may be felt as force, persuasion, or expectations) from other organizations or society in general (DiMaggio and Powell, 1983). Insomuch as organizations are expected to conform to practices that are considered important within an industry, their decisions to adopt Linux servers may be influenced by the industry’s general attitude towards Linux servers (e.g. endorsement, recommendation). Thus,

**Proposition 5**: At a later adoption stage, an organization will be more likely to adopt Linux servers if its industry endorses (or recommends) Linux servers.

Mimetic isomorphism, or “follow the leader”, is driven by the organizations’ desire to reduce uncertainty and gain legitimacy by modeling themselves after organizations in their field that they perceive to be more legitimate (Nicolaou, 1999). Since legitimacy is often inferred from traits like large size and success, organizations may seek to imitate the practices of larger and more successful organizations, which are usually leaders of the industry. The uncertainties associated with the costs and benefits of Linux adoption as well as with the ongoing Linux legal battle with SOC Group provide a context for imitation -- when industry leaders adopt Linux servers, other organizations in the industry are likely to follow suit. Thus:

**Proposition 6**: At a later adoption stage, an organization will be more likely to adopt Linux servers if industry leaders have adopted Linux servers.

Normative isomorphism is associated with professionalization. Formal education/training and the growth of professional networks lead to the legitimation and diffusion of normative models (DiMaggio and Powell, 1983). Established practitioners exchange information about appropriate practices through conferences, workshops, educational programs and professional publications (Nicolaou, 1999). In the context of Linux adoption, the professional affiliation of an organization’s CIO, that is, whether the CIO of an organization is affiliated with an open source organization (e.g. Open Source Initiative) may affect the organization’s likelihood to adopt Linux servers. Thus,

**Proposition 7**: At a later adoption stage, an organization will be more likely to adopt Linux servers if its CIO is affiliated with open source organizations.

Finally, prior research (e.g. Tolbert and Zucker, 1983; Young et al., 2001) has shown that, as the process of adoption continues, organizational factors become increasingly less relevant to the adoption process. By contrast, institutional factors become more significant predictors of organizational adoption decisions. Thus,

**Proposition 8**: As the process of adoption continues, organizational factors (i.e. organization size, age, form, and technology context) become increasingly less important in predicting Linux server adoption. At a later adoption stage, institutional factors (i.e. industry endorsement, adoption by industry leaders, and CIO affiliation) will be more important in predicting Linux server adoption than non-institutional factors.

CONTRIBUTION OF THE STUDY

While the open source movement has captured the attention of many IS practitioners, rigorous, theory guided academic research on this subject has only started emerging. This paper contributes to research in this area by advancing testable propositions concerning the determinants of organizational adoption of Linux servers, the most successful products of the best known open source project to date.

Additionally, IS researchers have only recently started to use institutional theory as a lens to understand organizational adoption of information technology. Teo, Wei, and Benbasat (2003) proposed and found that mimetic pressures, coercive pressures, and normative pressures had significant impact on organizational intention to adopt financial electronic data interchange. Swanson and Ramiller (2004) distinguished between mindful innovation (where innovative action is grounded in organizational specifics) and mindless innovation (where innovative actions betray an absence of attention to organizational specifics) and proposed that the patterns of mindfulness and mindlessness innovations are influenced by the
nature of the innovations, organizational characteristics, and normative force. Despite their attention to institutional factors, neither study has addressed the differential effects of organizational and institutional determinants at different stages of the adoption process. Presenting a staged adoption model of Linux servers that integrates organizational and institutional factors, this paper contributes to theory building in IS innovation adoption literature.

Finally, although institutional theorists argue that late adopters base their actions on legitimacy rather than technical rationality, most of the supporting evidence has been indirect, providing more support for the absence of technical or organizational determinants of adoption than for the presence of institutional processes (Staw and Epstein, 2000). This paper contributes to the institution literature by specifying the effects of institutional mechanisms on organizational adoption of Linux servers.

REFERENCES