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ON DEVOPS AND WORKFORCE MORALE

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ABSTRACT

DevOps is a rapidly growing trend in systems analysis and design which blends software development and testing with operations. With DevOps, those who program the software also assist in its deployment and ongoing support. This set of organizational practices is meant to encourage higher-quality software, rapid releases, and reduced downtime. Organizations are increasingly implementing DevOps policies in order to enjoy the associated benefits. However, in many cases the fruits of the implementation are not enjoyed. One possible explanation is a decline in organizational morale. Not all of the changes associated with DevOps may be viewed as positive. Operations engineers lose some control of systems they are responsible for maintaining while software developers' scope of accountability increases. This research holds that factors such as perceived organizational support, job satisfaction, affective commitment, leader consideration, and perceived fairness decline following implementation of DevOps principles. Conclusions and implications for research are supplied.

Keywords

DevOps, Personnel, Morale, Performance, Workforce

INTRODUCTION

Organizations have traditionally divided their information systems capabilities into functional silos. The groups which develop software exist in one silo and the groups which support operations exist in another. Workers' interaction is limited to others who have the same skillsets, goals, and specializations. Each isolated group represents a single piece of the service provisioning process. Although this simplifies management it also leads to groupthink, slower software delivery, and products which may be difficult to support. Furthermore, it leads to conflict. Development teams motivated to update and change their software while operations teams tend toward stability. Some organizations have overcome these conflicts and realized significant value in combining software development with IT operation functions (Dyck et al. 2012). Operations workers become involved in software quality assurance and new feature development while software developers share in responsibility for deploying and managing systems. The resulting concept is called DevOps (Hutterman 2012). In some cases, DevOps has resulted in higher quality software, more streamlined releases, better patch management, and increased agility.

Eager to realize its potential benefits, many firms have taken steps to adopt DevOps. However, not every implementation is successful (Violino 2016). Some organizations have noted declines in productivity, lower quality software, and decreased system uptime following the changes (Roche 2013). These undesirable outcomes may be the result in decreased workforce morale. Changes in job duties and responsibilities are always met with some degree of fear and skepticism. In some cases they permanently reduce employee morale. Coincidentally, DevOps calls for a number of profound changes to work structure and roles (Dyck et al. 2012). For instance, software developers are expected to help support production systems and respond to incidents involving the software they created while operations workers are expected to participate in early phases of the project management lifecycle. Further, workers are incentivized and rewarded by unfamiliar metrics. In addition, delineation of responsibility is blurred. These changes are expected to have a negative impact on perceptions and attitudes within the organization. The present study holds that the implementation of DevOps will cause declines in workforce morale and indirectly lead to underperformance.

This study proposes a research model which explains the relationship between DevOps, employee morale, and performance. The model posits that job changes associated with DevOps will lead to declines in employee morale. Employee morale is manifested in terms of perceived organizational support, job satisfaction, affective commitment, leader consideration, and perceived fairness. In turn, decreased morale leads to reduced employee performance (e.g. decreased productivity, lower quality software, decreased system uptime). A series of corresponding hypotheses are then introduced. The remainder of this manuscript is organized as follows: the following section provides a literature review. The next section is the conceptual development. The proposed research model and hypotheses are shared. The next section describes the proposed methods for testing. The final section provides concluding comments.

LITERATURE REVIEW

This section provides background information on DevOps and on the constructs included in the research model. First, a working definition of DevOps is prescribed. Next, the manifestations of employee morale are introduced. Finally, three facets of employee performance are described.

DevOps is often described as a blend of development and operations functions within the information systems department of an organization. The development function is assumed to be carried out by software developers, programmers, tests, analysts, and quality assurance personnel (Dyck et al. 2012). The operations function is understood to include the people who put software into production and manage production infrastructure. This includes tech personnel such as web administrators, networking experts, database administrators, and systems administrators. DevOps is not software, a set of tools, or a job description. It is a set of policies, practices, and values that streamline the software implementation process (Roche 2013). It addresses organizational culture, automation, measurement, and sharing (Hutterman 2012). If successful, DevOps should improve software quality, reduce lead time, and increase service availability. It should also facilitate communication, eliminate organizational silos, and reduce conflicts.

Typically, DevOps is defined in terms of five dimensions (Lwakatare et al. 2016). These dimensions include the following: collaboration, automation, culture, monitoring, and measurement. (1) Collaboration involves redefining roles and teams in development and operations activities. Developers are expected to learn about and support operations activities such as system resilience, monitoring, administration, and troubleshooting. Development should have the ability to make significant changes to operations. Operations workers are expected to participate in planning, testing, and analyzing software. They should have influence on new software features and control of release of patches. (2) Automation refers to infrastructure and deployment process automation. Tools for maintaining and automating configurations should be adopted. Virtualization should be used as much as possible to commoditize and isolate underlying infrastructure. (3) Culture consists of integration of the development and operations environments. Developers should be expected to carry pagers and take turns handling incidents. Operations staff should take part in post mortems and accept a share of blame following software failures, flaws, and bugs. (4) Monitoring is instrumenting and observing core processes. System performance and reliability parameters should be observed by both groups. (5) Measurement involves the identification of use metrics. Both development and operations should be incentivized and rewarded by the same metrics. Both groups should ultimately be responsible for increasing business value. These dimensions represent significant shifts from the status quo at most organizations. They are generally expected to equate to compelling improvement in performance. However, this study holds that certain attributes of DevOps will lead to declines in employee morale.

Employee morale is defined as a function of multiple intrinsic factors (Organ et al. 1995). Intrinsic factors are subject to the interpretation of the employee. For instance, an intrinsic factor may be a perception or an attitude regarding a facet of the organization. Morale is often manifested in terms of five constructs: job satisfaction, perceived fairness, perceived organizational support, affective commitment, and leader consideration. These constructs have been in use in the organizational behavior discipline for many years. Extensive records of their uses and limitations are available. Definitions of these constructs are provided in Table 1 (below).

Construct	Source	Description
Job Satisfaction	(Tett et al. 1993)	The degree of affective attachment to a particular job at a given organization.
Perceived Fairness	(Brockner et al. 1986)	The degree of satisfaction in an exchange relationship between an employee and extensions of the organization.
Perceived Organizational Support	(Eisenberger et al. 1986)	The degree to which employees believe that the organization values their contribution and cares about their well-being.
Affective Commitment	(Meyer et al. 1993)	An employee's emotional attachment to and involvement in an organization.
Leader Consideration	(House 1971)	The degree to which the leader is perceived to foster a supportive environment of support, warmth, friendliness, and helpfulness.

Table 1. Manifestations of Morale

Employee performance is most often described as an outcome of multiple intrinsic and extrinsic factors. Performance has two dimensions: qualitative performance and quantitative performance. Qualitative performance is often associated with attributes such as organizational citizenship behavior. Compliance with organizational rules, helping, and being a good sport are considered facets of qualitative performance. Quantitative performance is often discussed in terms of work outcomes. These include productivity and quality of work. Although the qualitative measures are important, this study focuses on the quantitative impacts in order to explain counter-intuitive outcomes, such as lower productivity, of DevOps implementations. Although any number of metrics could be used, this research focuses on three of the most broadly stated and simple measures which closely apply to DevOps principles. Further, they are often used as metrics to assess improvements following transitions to DevOps. This is meant to increase the relevance and generalizability of the research model.

Construct	Source	Description
Productivity	(Herbsleb et al. 2001)	The speed at which system designs are developed into code and brought into production.
Software Quality	(Kitchenham et al. 1996)	The number of errors which require patching following release.
System Uptime	(Lamanna et al. 2003)	The percent of uptime a production system is available.

Table 2. Manifestations of Performance

CONCEPTUAL DEVELOPMENT

The adoption of DevOps principles requires a significant shift in organizational structure, change of job functions, expansion of responsibilities, and shift to new evaluation parameters. These changes are expected to have profound impact on the morale of workers affected by the change. The changes are not expected to have a net positive impact on morale. Rather, they are expected to decreased morale for an extended period of time. Changes such as those described in the tenants of DevOps are expected to create role-related stress and insecurity, which has been shown to decrease various aspects of employee morale (Leigh et al. 1988). Saair and Judge (2004) connected expansions in work responsibility with decreases in job satisfaction. DevOps expands and changes the roles of development and IT operation support so that they are responsible for larger segments of the delivery process. Eisenberger and colleagues found that perceived organizational support and affective commitment decrease when work changes are interpreted as negative (Eisenberger et al. 1990). Further Daly and Geyer (1994) observed that perceived fairness declines when employee performance measures are made less specific to one's primary work functions. Because DevOps requires retooling of employee performance metrics from specific standards to generalized standards, perceived fairness is expected to decline. The first hypothesis formalizes this linkage:

H₁: Organizational adoption of DevOps principles will result in a decrease in manifestations of employee morale.

Although the purpose of DevOps is to improve effectiveness and efficiency at developing and deploying software, there are many documented cases in which it actually leads to declines in these areas (Violino 2016). Thus, this study predicts that adoption of DevOps principles will lead to sustained decreases in performance because employee morale is damaged. This proposition is based on a long chain of evidence which holds that decreases in attitude lead to decreases in the quantitative measures of performance (Brayfield et al. 1955). Specifically, Petty and colleagues (1984) performed a meta-analysis of the relationship between individual job satisfaction and job performance. The relationship was reconfirmed in by Rosen and colleagues (2006). Affective commitment, perceived organizational support, and job performance were found to be related in a 1993 study of commitment (Shore et al. 1993). At an individual level, perceived fairness was found to influence individual work performance (Rashid et al. 2003). Regarding the manifestations of performance, measures of productivity and work quality are long accepted indicators of quantitative performance (Katz et al. 1950). Thus, the second hypothesis is well supported:

H₂: Decreases in employee morale will lead to quantitative decreases in individual performance.

The research model is depicted in Figure 1 (below). It shows the results of DevOps implementation on employee morale and performance. Each of the relationships is negative. The relationship between DevOps and each manifestation of morale is included as part of the first hypothesis, while the relationship between each of the tenants of morale and performance are represented by the first hypothesis.

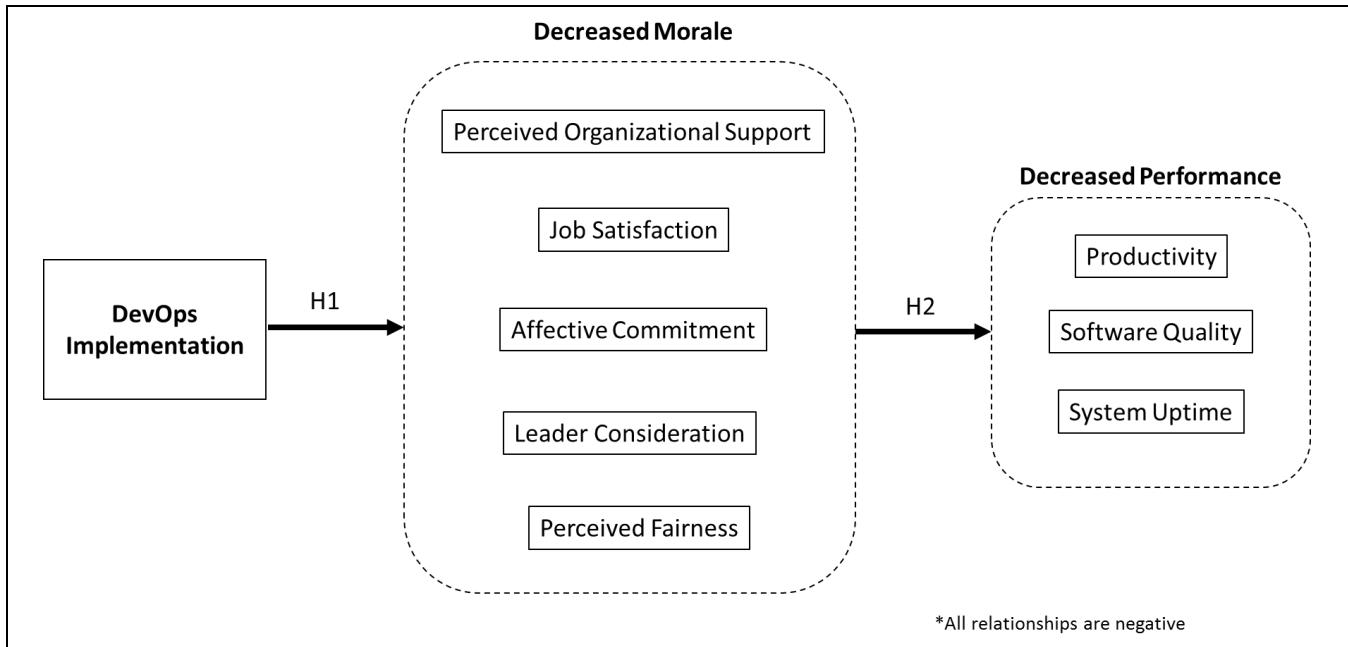


Figure 1. Research Model

METHODOLOGY

Surveys will be conducted on a population of IT professionals in order to evaluate the relationship between the predictors and the dependent variables. It will be necessary to operationalize a survey instrument and evaluate employee sentiment before and after a DevOps implementation. Perceived organizational support will be operationalized using 8 scale items from Eisenberger et al., (2002). Job satisfaction will be operationalized using 6 items from Brayfield and Rothe (1951). Affective commitment will be operationalized using 6 scale items from Meyer Et Al., (1993). Leader consideration will be operationalized using 3 scales items extracted by Lambert Et Al., (2012) from the Leader Behavior Description Questionnaire. Perceived Fairness will be measured using 2 scale items extracted by Konovsky and Cropanzano (1991) from a longer scale developed by Tyler (1989). DevOps will be operationalized using a binary value to indicate if the associate responses are pre or post-implementation. Measures of productivity, software quality, and system uptime are expected to be collected by the organization and available in report format.

CONCLUSIONS

DevOps has been described as a new solution to old problems. However, this research holds that DevOps rekindles old organizational problems. Adoption of DevOps practices is expected to introduce stressors which hurt employee morale and hinder performance. Although most organizational changes lead to short-term stress and uncertainty DevOps is expected to cause sustained anxiety because it runs counter to many basic principles of good management. The implications of the results of this research potentially affect both academia and practice by expanding the body of knowledge and by gaining insight on the impact of DevOps implementations. The proposed hypotheses will be tested in the near future so that empirical evidence is available to test the claims made in this research and shed important light on a prevailing management trend.

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