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Performance effects of multiple control forms in a Lean organization: A quantitative case study in a systems fit approach

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ABSTRACT

The primary objective of this paper is to research and test how control forms function and perform in a Lean organization. In the present quantitative case study, we provide statistical support that Lean is a set of multiple control forms (output, behavioral, and social controls) that complement each other to enhance performance, i.e., it is a control package. Therefore, performance is increased if the average level of control forms is increased, and performance is further increased if the control forms are balanced at the same level representing a complementary effect between them. Moreover, we provide a refinement to the statistical approach in testing systems fit models like ours by supplementing the Euclidian distance with the city-block distance. In this way, we are able to show that the control forms in Lean have a balanced complementary effect on performance, which is distinct from a solely additive effect or no effect. The refined understanding of complementary effect between control forms, the notion of balance, in a Lean organization can be utilized in understanding and testing more general control package theory in other contexts. Our data are archival data spanning multiple years in a dedicated Lean organization. This Scandinavian organization has around 2000 employees and produces small electronic components that are sold to business customers.

1. Introduction

Since the introduction of Lean (Womack et al., 1991) in organizations in Europe and the USA, many companies have adopted the methods in question. In their book, Womack et al. (1991) published statistical results that showed how, according to a series of core business performance measures, Japanese production methods (especially that of Toyota) were superior to production methods in the contemporary American car industry. Toyota's production method has become widely dispersed throughout many parts of the world, including Scandinavia, under the label of Lean. Even though the techniques, methods, and mindsets of Lean have been well documented (Liker, 2004; Liker and Meier, 2006; Bicheno, 2004; Monden, 2010), research on Lean as a control package is scarce.

The main objective of this paper is to research and empirically test whether the performance effects from Lean are related to complementary effects between the control forms in a Lean organization. In this endeavor, we pursue a deeper understanding of complementarities among control forms in Lean by introducing the notion of "balance between control forms," which we find important to enhancing performance. We also use this insight on

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"balance" to derive consequences for the more general control package literature.

Kennedy and Widener (2008) find that Lean is a control package consisting of many variables that constitute an integrated system of multiple control forms. Their case study shows that management accounting research needs to understand the operations management technology, as this implies the use of several control forms in certain ways. Also, Chenhall (2003) stresses that management accounting systems cannot be studied in a vacuum without taking other control forms into consideration. This could cause the same problems as with omitted variables, where the real explanatory factor is left out of the model. This also implies that management accounting should be researched as part of packages that include other control forms. Expanding research to encompass the many variables in a control package, for example a Lean package, emphasizes the need to study the phenomenon using a systems fit approach (Drazin and Van de Ven, 1985).

The widespread use of Lean in companies begs the questions of if and how Lean as a control package enhances performance. Published research on statistical tests of how Lean works as a control package and relates to performance is almost nonexistent. One previous attempt to test the effect of Lean in a systems fit model did not provide any significant results (Selto et al., 1995). With Kennedy and Widener's (2008) qualitative case study, research has developed a step in the right direction towards building theory that answers the question of how Lean works as a control package. However, their study provides no quantitative evidence of performance effects. Moreover, their study identifies a number of intervening and bidirectional relations in the controls of the Lean package, and they consequently argue that the framework they construct is suggestive of a configuration fit. Perceiving Lean through the lens of systems fit begs the additional question of whether performance effects are solely based on complete mutual dependency among control forms or whether improvements to the individual control forms can enhance performance on their own continuously. This includes understanding how the right balance between control forms is constituted, and thus, how off-balance can affect performance.

The study of control packages is not new, as previous empirical papers have studied the application of multiple control forms such as personnel controls, action/behavior controls, output controls, and clan controls, with various labels attached to them (Kren and Kerr, 1993; Eisenhardt, 1985; Kihn, 2007, 2010; Abernethy and Stoelwinder, 1995; Abernethy and Brownell, 1997; Otley and Berry, 1980; Gerdin, 2005; Sandelin, 2008; Chenhall and Langfield-Smith, 1998). However, there is still much to understand about how this works in a modern Lean context. Abernethy and Brownell (1997) call for further research on how organizations rely on combinations of control forms in given settings, and they state that virtually nothing is known about how the effects of any one control are governed by the level of simultaneous reliance on other forms. They conclude that this understanding remains piecemeal until research explores these complex relations. Kihn (2010) adds to this by stating that little research exists on how managers combine accounting information and various other types of information, and it is not clear how managers emphasize multiple forms of controls. Both Kihn (2007) and Kihn (2010) welcome further research on various types of controls. Our study also responds to Abernethy and Brownell's (1997) call by examining how multiple control forms may enhance performance in Lean organizations, and to Malmi and Brown's (2008) request for research on management control systems as a package.

In the general control package literature, it is not found how Lean organizations pick and balance control forms to create complementary performance effects. Nevertheless, Kennedy and Widener (2008) use the general control package literature to address which control forms are used in a Lean organization; however, they do not research in depth what happens to the complementarity effects on performance if control forms are balanced or off-balance. They argue, though, that removing one control form will cause the whole system to roll back to another control system, but they do not look into situations where control forms are present at different levels of implementation. Hence, they do not present an understanding of how performance is affected when there are different balance and off-balance situations between the multiple control forms.

Understanding balance and off-balance in a complementarity perspective in a Lean context also has potential within general control packages theory. In the general control package literature, complementary effects are described, or at least tested, as additive relations between control forms in a profile deviation analysis using a distance measure from an ideal state—or they are tested as interaction effects, which is a pure multiplication that does not necessarily represent or portray how control forms should be balanced. The latter merely states that one control form is dependent on another, and increasing one of them is just as beneficial for performance as increasing the other (i.e., doubling one of them is just as good as doubling the other), even though the off-balance between them is further increased.

Within the theory of equifinality, Sandelin (2008) uses the term "internal consistency between control forms" to describe how control forms can be balanced in different ways and can generate the same outcome/performance, even though the external context is the same for two or more ideal combinations of control forms. However, internal consistency only describes balance for multiple ideal combinations, and does not describe how off-balance can affect the performance stemming from complementary relations amongst multiple control forms.

We perceive the use of multiple control forms in Lean organizations to be quite tightly coupled in a system, as opposed to loosely coupled (Roberts, 2004). Thus, having the right balance is important, as off-balance will thwart the complementary performance effects more in a tightly coupled system than in a loosely coupled system. Off-balance occurs when one or more control forms is deviating from the ideal distance to other control forms. Hence, the level of tightness is important to understand for control packages other than the one in Lean organizations, as it influences how off-balance between control forms can affect performance.