

## Chapter XXIII

# Using Partial Least Squares in Digital Government Research

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### INTRODUCTION

Digital government is a complex socio-technical phenomenon, which is affected by technical, managerial, institutional, and environmental factors (Dawes & Pardo, 2002; Fountain, 2001; Gant, 2003; Garson, 2000; Heeks, 2005; Kraemer, King, Dunkle et al., 1989; Landsbergen & Wolken, 2001; Laudon, 1985; Rocheleau, 2003). Recent studies have greatly contributed to developing the necessary knowledge about e-government benefits and success factors (Barrett & Greene, 2000; Dawes, 1996; Gil-García & Pardo, 2005; Heeks, 2003; Holmes, 2001; O’Looney, 2002; Rocheleau, 1999; West, 2005; Zhang et al., 2002). However, an important portion of this research has used a single measure of e-government and relatively simple assumptions about the relationships between information technologies and organizational, institutional, and contextual factors (Gil-García, 2005b).

With important exceptions, previous research has hypothesized mostly models in which all variables are at the same level of importance, limiting understanding about the complex relationships among different categories of factors (e.g., organizational and institutional). In fact, in most of the academic work that has been done so far, all the factors are hypothesized to have a direct relationship to information technology success and few hypotheses have been made about the relationships among the different factors themselves and potential indirect effects of these (see Figure 1).

In addition, many of these studies do not integrate and evaluate multiple measures of e-government, but instead use a single measure and, therefore, need to assume no measurement error.<sup>1</sup> Therefore, a more reliable method of measuring e-government has not been developed and, as a consequence, the comparability of findings among different studies can become problematic. These two conditions are, at least in part, the result of

Figure 1. Mostly direct effects have been hypothesized (Gil-García, 2005b)

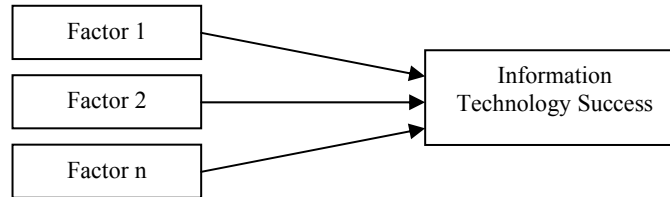


Table 1. Two limitations of linear regression

<b>Assumes no Measurement Error</b>	<ul style="list-style-type: none"> <li>• Normally, constructs are measured using a single indicator</li> <li>• This indicator is assumed to perfectly capture the essence of the theoretical construct</li> <li>• Examples of constructs used in social sciences: social status, organizational capability, adequate institutional environment, job satisfaction, policy effectiveness, etc.</li> </ul>
<b>Assumes No Indirect Effects</b>	<ul style="list-style-type: none"> <li>• Does not systematically test relationships among independent variables</li> <li>• Therefore, indirect effects are not represented</li> <li>• Causes are assumed to be independent from each other</li> </ul>

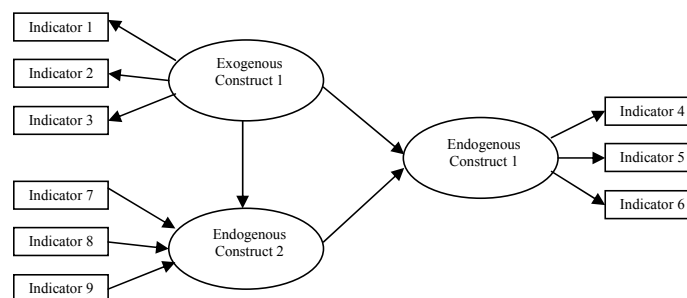
two important limitations related to the statistical method that many of these previous studies have used: linear regression analysis (see Table 1).

This chapter shows how to use partial least squares (PLS) and argues that this could help to incorporate more realistic assumptions and better measurements into digital government research.<sup>2</sup> It does it through a commented example of a digital government research study (Gil-García,

2005b). It is important to clarify that the intention is not to suggest that every research project should use PLS, but to encourage scholars and practitioners to seriously consider this technique as an alternative when designing and carrying out their research.<sup>3</sup> PLS is a structural equation modeling (SEM) technique similar to covariance-based SEM as implemented in LISREL, EQS, or AMOS.<sup>4</sup> Therefore, PLS can simultaneously test the measurement model (relationships between indicators and their corresponding constructs) and the structural model (relationships between constructs) (see Figure 2).

This chapter is organized in six sections, including the foregoing introduction. Section two shows an example of how to present the theoretical model and hypotheses to be tested. Since PLS uses multiple indicators for each variable, section three highlights the importance of including the operationalization of the constructs. Section four offers an example of how to present the findings, including both the measurement and the structural model. Section five suggests potential future trends and section six provides some final comments. Throughout sections two, three, and four, comments about how to use PLS

Figure 2. Testing the measurement and structural models with PLS



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