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# ASSESSING CUSTOMER VALUE OF NET ENABLED FIRMS: TEST OF PANEL DATA

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## ABSTRACT

*This research tests the creation and sustainability of customer value by net enabled enterprises employing customer centric IT systems. Internet based advanced information technologies have moved IT systems beyond the realm of production and operational processes into more customer interfacing functions and these systems have very different dynamics. While empirical research in IS has tested the link of IT capability to superior business value for the firm using accounting based measures, customer perceptions of the value offered by the firm has not been empirically tested yet. We use data from four online home delivery grocery stores to test the creation and sustainability of customer value by these firms. This study uses panel data collected from 304 users of online ordering system across the four home delivery grocers for two consecutive years to test the sustainability effects. Panel data is collected and analyzed to assess customer value created by IT systems after accounting for the other organizational and individual level factors as product quality, service quality (SERVQUAL), and perceived ease of use (PEoU).*

**Keywords:** Customer value, net-enabled organizations, Service quality.

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## Introduction

Organizations are extending their operations and supply chains beyond the production units to include customers as part of the enterprise. Within these extended enterprises, information systems are moving beyond the realm of production and operations into more customer interfacing functions as customer service, ordering, fulfillment, marketing et al. This growth of IT outside the domain of production has changed the dynamics of their use and the value being created by them. Output statistics based on accounting and financial measures are not adequate to capture customer value created by these IT systems and recently researchers have started using qualitative measures to measure the impact of the systems on firms' performance (Mithas et al. 2004). This research assesses the customer value of the net enabled organizations (Straub and Watson 2001) through direct customer surveys, and empirically deduces the sustainability of value by measuring its growth across two years using panel data.

After various research studies early on that suggested the missing link between IT investments and firms' aggregate output statistics naming it the 'Productivity Paradox' (Solow 1987), recent studies have found more positive support the effect of IT on firm productivity (Brynjolfsson and Hitt 1996, Lichtenberg 1995). Using the neo classical paradigm, these studies have used the production firm to assess the value of IT for enhanced productivity in firms' operations. The contribution of IT investments - computer capital, non computer capital, IS staff and expenses – is assessed on the firm's performance, productivity, business profitability, and consumer surplus (Hitt and Brynjolfsson 1996).

Other streams of business value studies have used correlations of IT investments with stock price, profits or other performance measures (Im et al. 2001; Dos Santos et al. 1993). Similarly Bharadwaj et al. (1999) using tobin's q and Barua et al. (1995) using the intermediate level firm variables to assess value created by IT investments. More recently Zhu and Kraemer (2002) have studied the contribution of internet based IT investments on firm performance.

These studies rely primarily on the financial and accounting based measures to assess the value created by the firm. While these objective measures have been found to be vital, the importance of perceptions of customer gains importance because of the fierce competition on the internet channel. As competing firms are "just a click away" (Friedman 1999) creating reliable customer value is an important concern for the firms. The winning firms are able to convince customers of their value proposition and are able to retain them over time. The high cost of recruiting a new online customer, however, which may be 5 to 20 times the gross profit margin per order (Tanskanen et al. 2002), makes it imperative that companies providing online customer ordering create obvious and attractive value for customer. As firms invest millions of dollars in net enabling their enterprise, the assessment of customer value created with these investments is one of the core goal of a net enabled initiative and one that needs to be addressed by IS research (Wheeler 2002). This research is one of the first such

attempts to measure this customer value by directly surveying customers of the firm. The panel data is collected from the same customers of four online home delivery grocers across two years to test the customer value hypothesis.

To our knowledge while business value of IT has been tested in various contexts, no prior work has empirically tested the sustainability of customer perceived value created by the IT systems. Specifically the research question explored by the paper is “Do net enabled firms create positive value for their customers, and does this value sustain over time?”

## **Research Framework**

While initially firms adopted Internet to offer services and products through one or more online channel only, these internet-only firms are losing market share to more traditional firms that employ Internet to supplement their offerings (Teltzrow et al. 2003). Traditional firms as Walmart, Office Depot and Circuit City are adopting internet channels to add value to their offerings by supplementing their physical operations to offer foods and beverages, electronics, apparel and clothing directly to customers (Weill and Vitale 2002) as well as after sales services. While earlier Internet firms as Amazon.com and CDNow.com, offered standardized products (books, CD's, etc.) and services (stock trading, news, etc.); recent organizations are combining the internet with their traditional business models (Weill and Vitale 2002). They use internet to improve the quality of their customer facing operations while increasing the efficiency and cost effectiveness of their operations (Boyer et al. 2002; Boyer and Olson, 2002) The customer value in these firms takes on a totally new dimension as compared with the traditional firms.

### ***Customer Value***

Bagozzi (1992) has proposed that consumers engage in exchanges because of their desire to achieve certain outcome. Customer value thus is usually based on consumer evaluation and is defined as “the consumer’s overall assessment of the utility of a product based on perceptions of what is received and what is given” (Zeithaml 1988, p. 14). Value perceptions are based on logical comparison of what is received in an exchange (i.e. what the consumer gets) in comparison to what the consumer has to give up. Following this tradeoff assessment, if the consumer views a firm as offering high value then consumers are pre disposed to transact with it. For traditional firms including the retail businesses, the gets component is strongly based on product quality, which includes both service quality and the quality of the physical goods being sold (Parasuraman and Grewal 2000). As the perceived quality of service and the physical goods increases, so does the “gets” component of the value equation resulting in higher perceptions of value.

However, most consumer preferences IT-based research has shown that besides product quality, customers of NEOs benefit from the ease of getting product information, search capabilities, ease of transaction, customization and convenience (Zhu and Kraemer 2002). Zhu and Kraemer find net enabled firms create value for the customers through capability to provide

enhanced information through internet, facilitate customer transactions and customization. Barua et al. (2004) reveal the value creation process, in the net enabled organizations, to be due to online informational capabilities (OIC).

Net enabled enterprises change the way customers transact, and create value through alternate means of conducting transactions. Online grocery ordering, for example, has introduced an alternate to physically moving through the store to shop for products, the operations of the firm are extended beyond the retail stores into customers' homes. Customer centered IT systems used by these organizations create value due to increased customization, timeliness, and friendliness. For example for the customers of online groceries the option to easily locate products, to order them without needing to go the store, to select a product from a greater pool of options and to find products in lesser time are some of the benefits of using the online ordering systems. These facilities create superior experience for the customer and hence lead to increased value of the online grocer to the customer. Customers are able to achieve superior service due to more comprehensive and real time information. Search and reminder services, for example, lead to ease of transactions and ordering, and create value that is beyond the product quality. This value perceived by the customers in their transactions with the firm is defined in this paper as the Net Enabled Organization Customer Value (NEOCV).

Thus to summarize while customer value for traditional firms is a factor of the product quality, for net enabled firms additional value is created due to the benefits of the online systems. Thus this research controls for these traditional measures of value and assesses the overall value to the customers when they transact with the online firms.

### ***Creation and Sustenance of Customer value***

Net enabled enterprises, however move information systems employ information systems to customer centric functions as customer service, ordering, fulfillment, and marketing et al. While conventional firms create customer value due to acquaintance, familiarity and tacit knowledge of the customers with firms', physical store, employees, culture, and procedures; net enabled firms may not be able to offer these benefits while deliver value based on location and customer habits. Thus creating value through superior customer service is a challenge. To offer superior value to customers by these firms involves a set of complex mechanisms and adaptations by the firm These adaptations are primarily meant to align their delivery, order fulfillment systems and other internal business and information systems with the customers needs.

The IS research has highlighted various organizational processes that are sine-quo-non for achieving these adaptations to offer superior value. In the application of these technologies to its own context each organization creates its own work processes, flows and functions by structuring the IT into its own environment (Orlikowski 2000). Net enabled organizations

for example might change the order delivery processes to synchronize and gain efficiencies in orders shipped to the same zip code.

However, these adaptations are often complex and hence may not be achieved by firms. This is especially evident from the past research which found that many firms treated IT systems as black-box and assumed their direct impacts without an active intervention on part of the firm. Thus this research empirically tests whether the value created after accounting for product quality is positive or not, and proposes.

*H1: Net enablement of organizations creates positive net enabled organization customer value (NEOCV) for its customers after controlling for the product quality.*

Further according to adaptive structuration theory (AST) the adaptations include a complex interplay of social and cultural elements (DeSanctis and Poole 1994). Within Net enabled organizations, structures as reflected in - reporting hierarchies, organizational knowledge and standard operating procedures - are reproduced, modified or enhanced in the context of internet technologies. In the process firm aligns its IT systems with not just the factors of production, but also with objects, processes, people and technologies that have a value synergy amongst themselves (Barua and Whinston 1998). This helps net enabled organizations develop newer and better ways to provide services, and address customer complaints. Since the process is usually slow and gradual it leads to development of valuable organizational processes that are path dependent and often sustainable source of value. Thus we propose;

*H2: Positive net enabled organization customer value (NEOCV) will persist over time.*

This reliable aspect of value gains significance since the value might be ephemeral in nature and perceived due to the innovative appeal. Thus we measured the customer perceptions at time intervals that were separated by whole one year of their transactions with the net enabled firms.

## Controls

Changes in quality of products, services may cause changes in NEOCV across years. Thus any change in customer value over the two years has to be assessed by controlling for the changes in these factors. Changes in product and service quality that might influence the change in NEOCV across the two years are thus controlled for. Further we also use as controls the individual specific factors. Specifically, two individual level factors perceived ease of use and customer preferences are controlled for to assess the sustainability of value, due to net enablement.

## Methodology

### *Data Collection and Sample*

The overall sample consisted of customers of four different online/home delivery grocers. Same customer was surveyed in year 2003 and 2004 creating a balanced panel design. All four firms preferred not to be identified by name. Collectively firms had annual online/home delivery sales of more than \$300 million in 2003, an aggregate customer base of more than 100,000 customers who purchase at least once per month. All data was collected during the period between September, 2002 and July, 2004, with collection of data at each grocer taking 2 – 3 weeks per instance.

### *Measures*

We used existing scales where possible, but also tried to develop customized scales where appropriate to capture the dynamic and customized nature of the online grocery shopping encounter.

**Product Quality (PrQu):** In our study, the product quality scale focused on measuring a customer's view of the general brand quality of the online-ordered physical product and we use three dimensions of product quality: prestige, versatility, and performance, that have emerged as the most critical across industry categories (Carsky et al. 1998; Garvin 1987).

**Service Quality (SerQu):** To ensure construct and measurement equivalence across the grocers in the sample, we found it to be especially important to use a broad range of items. As such, we devised a scale composed of ten reflective items based on Parasuraman et al. (1985) (i.e., reliability, understanding, responsiveness, competence, security, courtesy, access, tangibles, credibility, and communication). Similar scales have been used by, among others, Hartline and Ferrell (1996), and Kettinger et al. (1995).

**Net Enabled Organization Customer Value (NEOCV):** NEOCV is measured as the perceived value of the firm by the customer. Following Zeithaml (1988) value was operationalized through four item measure to assess the give and get tradeoff made by the customer in their formation of perception about the value they receive from the firm.

**Perceived ease of use (PEoU):** We employ the scale adopted from the Technology Acceptance Model developed by Davis et al. (1989). The scales are adopted from Agarwal and Prasad (1999), with the sole change being the reference to “website” as the technology being addressed.

**Customer Preferences (CusPr):** Consumer Choice theory (Bettman et al. 1998) suggests that customers evaluate their budgets and preferences to reach at an optimal choice. Thus we use the items that measure the affect of price, convenience, accuracy and security on the individuals’ decision to shop with the firm.

### *Measurement Model*

**Confirmatory factor analysis (CFA):** The measurement properties of the items were tested by a CFA on the 27 items using the full sample (n=304). The CFA suggested good fit. The CFI for the factor model was 0.91 and RMSEA = .08 ( $\chi^2 = 944.47$ ,  $df = 314$ ). All the constructs were found to have good reliabilities (NEOCV = 0.8, SerQu = 0.9, PRQu = 0.8, PEoU = 0.9, and CusPref = 0.7). Further all of the factor loading were found to be significant suggesting good measurement structure of five factors and 27 items. After the testing the factor model we did a test of common method bias to alleviate any threats for the same.

**Test for common method bias:** We employed a confirmatory factor-analytic approach to Harman's one-factor test (McFarlin and Sweeney, 1992; Sanchez and Brock 1996, Podsakoff and Organ 1986). The rationale for this test is that if common method variance poses a serious threat to the analysis and interpretation of the data, a single latent factor would account for all manifest variables (Podsakoff and Organ 1986). A worse fit for the one-factor model would suggest that common method variance does not pose a serious threat (Sanchez and Brock, 1996). The one-factor model yielded a  $\chi^2 = 3050.36$  with 324 degrees of freedom (compared with the  $\chi^2 = 944.47$  and  $df = 314$  for the measurement model). The fit is considerably worse for the unidimensional model than for the measurement model, suggesting that common method bias is not a serious threat in the study.

**Test of reliability of NEOCV (time factor model):** The NEO value was assessed and tested for reliability and stability across time by fitting a latent time factors and observing any change in these over time (this model is referred to as the time factor model). This use is exactly the same as that done by latent growth models (LVGM) which are usually used for more than two time periods (Duncan et al., 1999). As we are interested in analysis of two years of data the time factor model used in this study is focused on the fixed and growth as two factors of change over the years. This is based on approaches originally introduced by Rao (1958) and Tucker (1958), and was extended to allow for the use of current standards in estimation and testing procedures used by computer based structural equation modeling programs (Meredith and Tisak 1990). Essentially, the method provides a means for modeling developmental change as a factor of repeated observations over time; within this approach the period measures form part of the definition of the dependent variable in the analysis (Duncan et al., 1999). Further, continuous covariates can be included in the analysis to test for predictors of change. The



overall fit of the model is evaluated with the time factor as an exogenous variable.

The model was developed using a two latent factor structural equation model. The model was developed to detect the change in the NEO customer value across the two years - 2003 and 2004 – while controlling for changes in other factors that may affect change in NEO customer value. The difference scores (2004 score minus the 2003 score) of these factors – Product quality (PrQu), Service quality (SerQu), Customer Preferences (CusPr) and Perceived Ease of Use (PEoU) – were modeled as the factors that might lead to a change in customer value in 2004. The relation of these change scores to the 2003 firm value was fixed to zero and hence change across two years can only have an impact on the customer value only in year 2004. The change in NEOCV was then measured by modeling an underlying latent time factor with an intercept and slope (see Figure 1). The intercept was modeled as antecedent to NEOCV in both the years (constant effect) while slope affected the NEOCV only in 2004 (change in effect). Thus after accounting for the changes in the control factors the intercept and slope represent the constant and growth aspects of change due to net enablement alone. A positive intercept would mean that there is a positive NEOCV created by these internet firms while a non significant intercept would imply that the firms failed to create positive customer value. Similarly, a non significant slope factor would imply the stability of NEOCV while a negative factor would mean that NEOCV is decreasing over the years and hence is ephemeral and cannot be concluded to be sustainable.

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 Insert Figure 1 about here  
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Measurement equations were fitted for each factor with the items shown in appendix 1 and the following structural equations were tested simultaneously using a moment analysis in EQS:

$$\text{NEOCV}_{03} = \eta_{\beta 0} + E_1 \quad (1)$$

$$\text{NEOCV}_{04} = \eta_{\beta 0} + \eta_{\beta 1} + \text{PrQu}_{04-03} + \text{SerQu}_{04-03} + \text{PEoU}_{04-03} + \text{CUSPR}_{04-03} + E_2 \quad (2)$$

$$\eta_{\beta 0} = M_0 + \zeta_0 \quad (3)$$

$$\eta_{\beta 1} = M_1 + \zeta_1 \quad (4)$$

Where  $\eta_{\beta i}$  ( $i = 0$  to  $1$ ) represents the latent variables for the intercept, and the linear component of the polynomial function;  $\text{NEOCV}_i$  ( $i = '03$  OR  $'04$ ) represents the customer perceived NEO customer value and  $E_i$  ( $i = 1$  or  $2$ ) represents the associated errors.

The majority of fit indices are be in the acceptable range (CFI = 0.90; Bollen (IFI) = 0.90; RMSEA = 0.07). The results indicate that the mean values of the intercept coefficients ( $\eta_{\beta 0}$ ) is significant across the two years and is positive, while the

slope coefficient ( $\eta_{\beta 1}$ ) was not found significantly different from zero (see Table 1). Thus the NEO customer value was found to be positive and stable without any change (slope = zero) across time (Figure 2). The results thus find support for both the hypothesis (H1 and H2); NEO customer value for organizations implementing extended enterprise systems is positive and does persist over time.

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Insert Figure 2 and Table 1 about here  
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## Conclusions

The paper assessed the reliability of Net enablement organization customer value for customers of online ordering systems at four internet grocers. 304 customers of the grocers purchasing at least once a month were surveyed across two years to generate panel data which was analyzed by fitting a time factor model. We found strong evidence of reliability of business value created by these IT systems for firms' customers. Our results suggest that customers perceive that net enabled organizations create positive and reliable value.

While earlier research has emphasized the use of accounting and financial based measures this research studies the creation of customer perceived value through use of online customer ordering systems. Advanced customer centered technologies create value due to personalization, customization, automatic ordering, reminders and other such features that facilitate customer transactions. Using these features customers of the online grocers save time and effort as they do not have to physically move through the aisles locating the product they are looking for. Similarly saving their order list and having reminder services that inform when their desired products becomes available are other features that create value for the customers of the online groceries. The accounting and financial based measures are unable to tap this intangible value that may not be reflected in the balance sheet and income statements. Instead it is the positive perception in the minds of the customers that are critical and important in today's business environment where customer has more options to choose from then ever before.

We acknowledge that the limitation of the study is the limited time of the data which spans only two years. But the enormity of collecting data using survey methods makes it a rich data set and arguably a rare one. Further, while accounting and financial data are readily available for longer time periods they might be biased as accounting irregularities might continue for a longer time period without being noticed. Customers on the other hand are critically evaluated and perceive the firm's performance and hence their perceptions are more realistic assessment of firm's ability to leverage its IT systems. Further, the

two time periods spanned multiple transactions by these customers and hence had the ample time for them to assess and

experience the firm performance.

To summarize this research has assessed the IT value from the perceptions of firm’s customers. While earlier business value of IT research has studied and accounting and financial based measures, and perceptions of investors in stock market returns, this is the first such attempt to study customer perceptions and we expect the research will fuel future research on the customer perception and experiences in transacting with the firm’s IT systems. Also important implication of research for the top management of net enabled firms is that they should use alternate measures to assess performance of information systems. Due to the limitations in financial and accounting based measures and growing power of customer, this research offers customer value as an alternate measure that can be used by the managers to assess value of their information systems..

**APPENDIX with survey items available upon request from authors**

Table 1: Coefficients, standard deviations and t statistics from the Structural model

Structural Coefficient [Change in]	$\beta$	Std Error	t- statistic
H1 Intercept	0.95	0.07	70.86**
H2 Slope	0.55	.06	-1.14
Product Quality (PrQu)	0.28	0.10	3.00**
Service Quality (SerQu)	0.33	0.09	3.70**
Perceived Ease of Use (PEoU)	-0.14	0.08	- 1.95
Customer Preferences (CusPref)	-.10	0.09	-1.03

significant at \* 5% level and \*\* 1 % level



Figure 2: Intercept and Slope of latent factor to measure growth in NEOCV

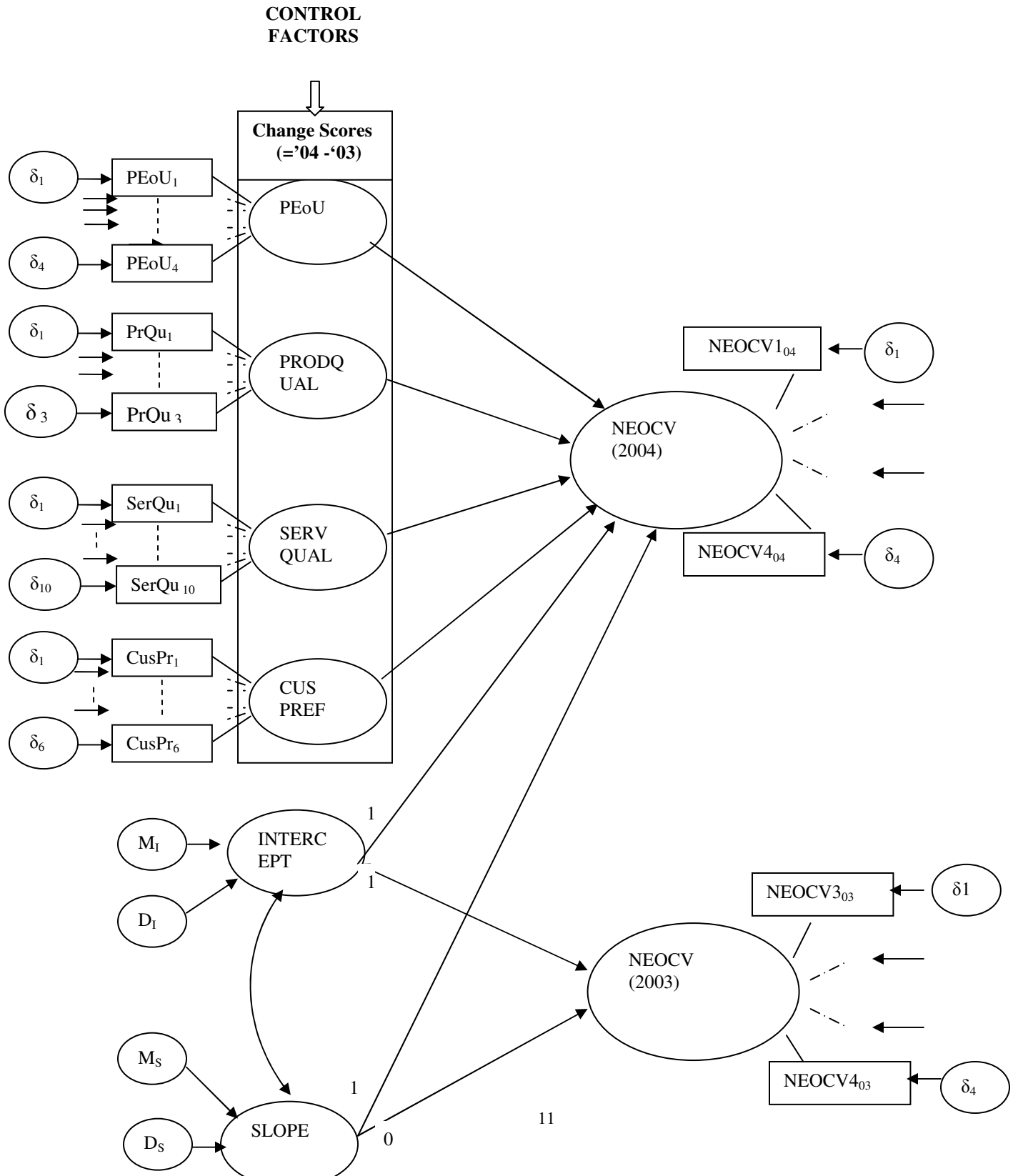


Figure 1: Structural Model with latent time factor (as intercept and slope) and control factors

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