The Economics of Communications/Networking Technology

Internet Pricing and Network Design Management

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Overview of Empirical ISP Research

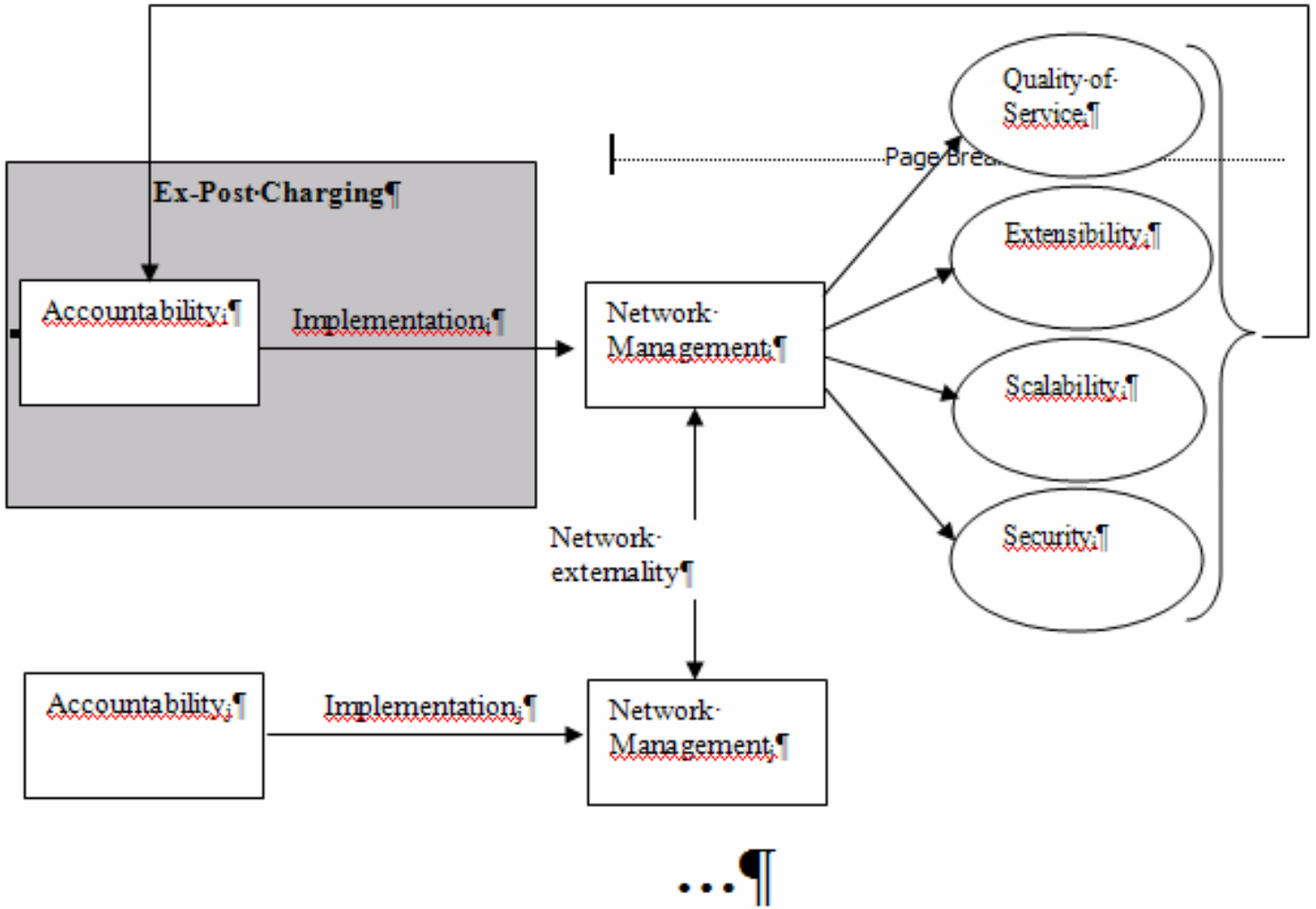
- Project 1: Ex-Post Internet Charging (J. Bailey and S. Raghavan)

- Project 2: Empirical Analysis of Security and Pricing among ISPs (J. Bailey and T. Porterfield)

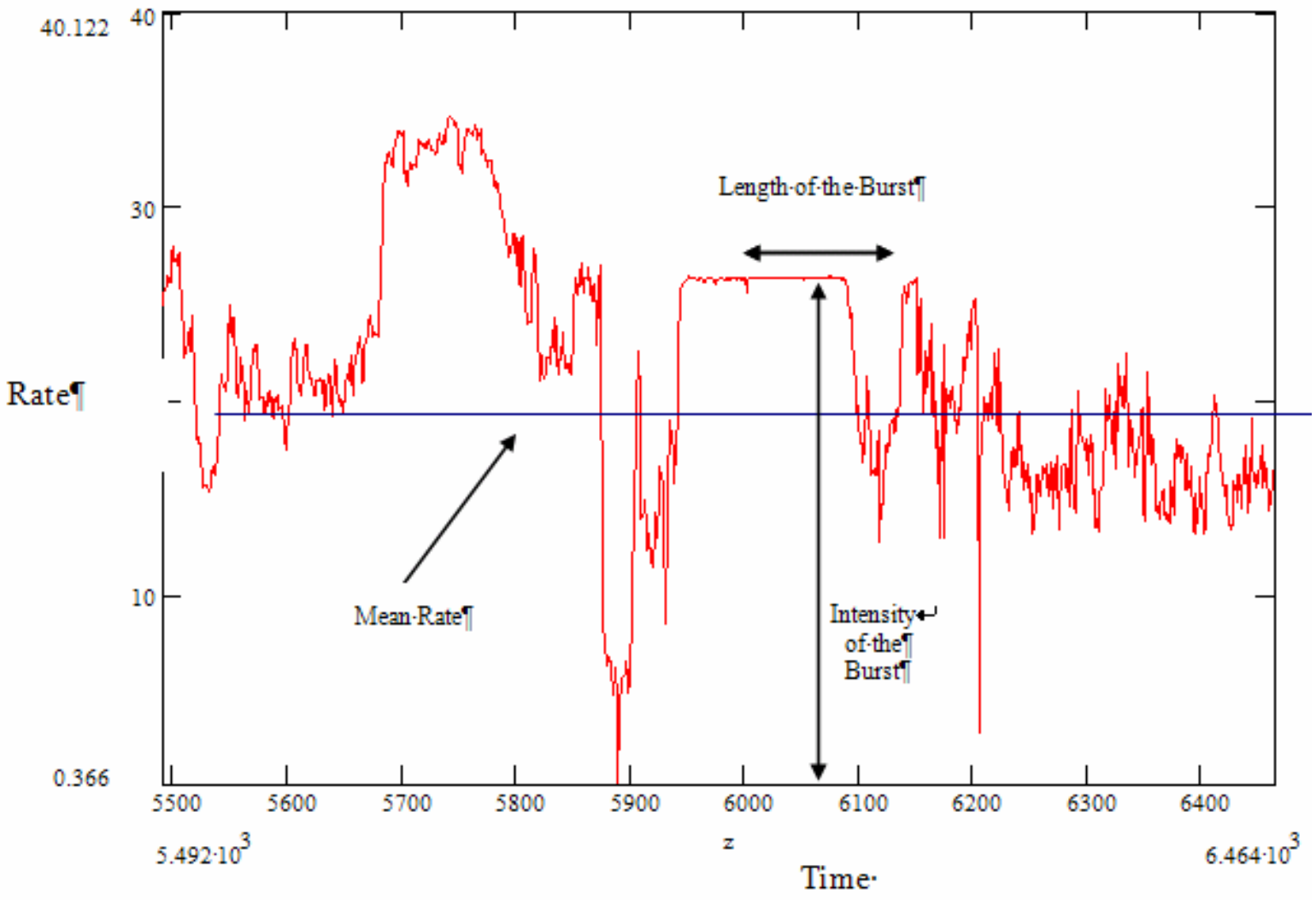
Project 1: Ex-Post Internet Charging (J. Bailey and S. Raghavan)

How can charging for Internet usage promote investments in network management practices that promote better security?

Ex-Post Internet Charging Framework



Internet Trace Analysis



Ex-Post Internet Charging

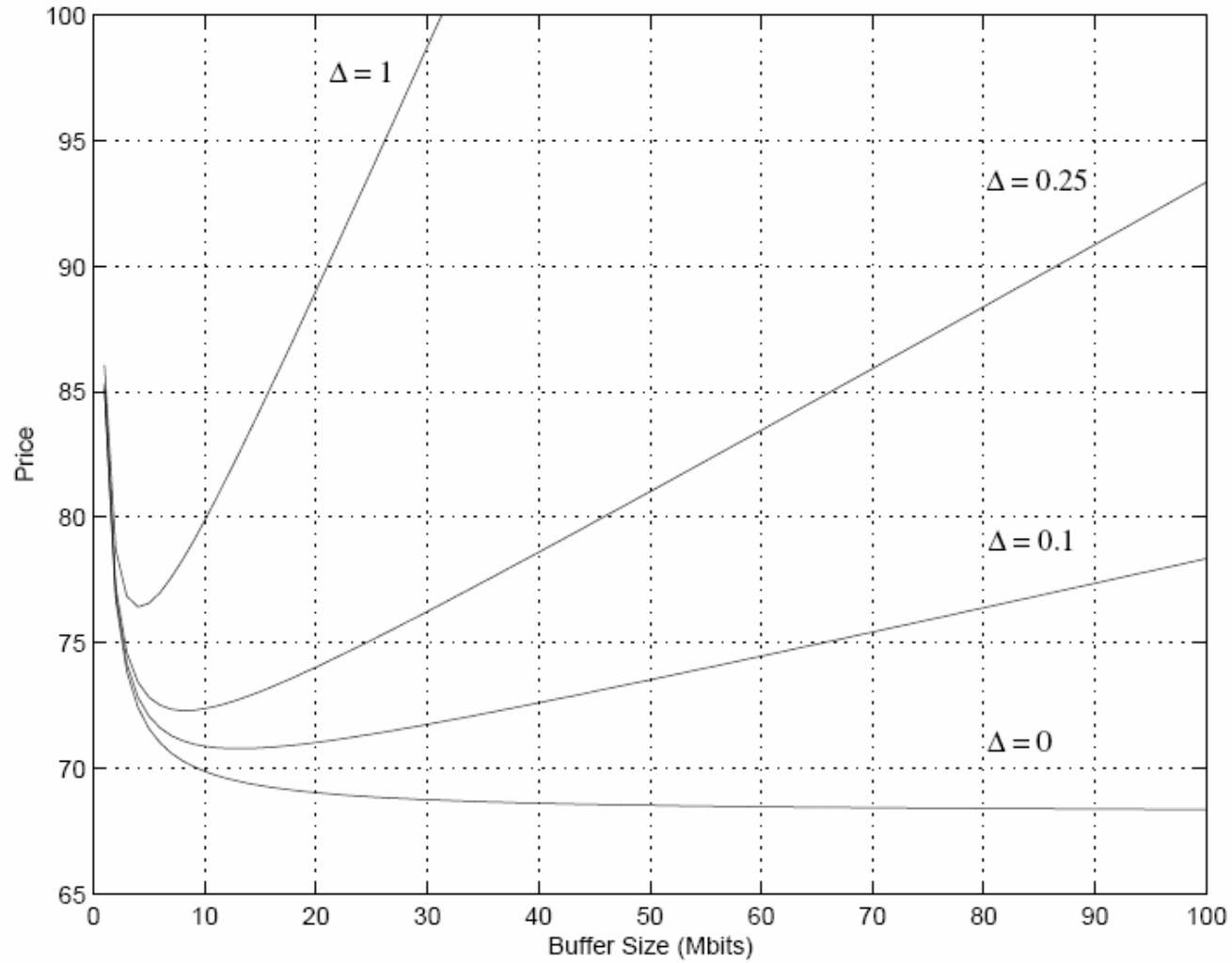
Price function:

$$P = a * (\Delta * B + C)$$

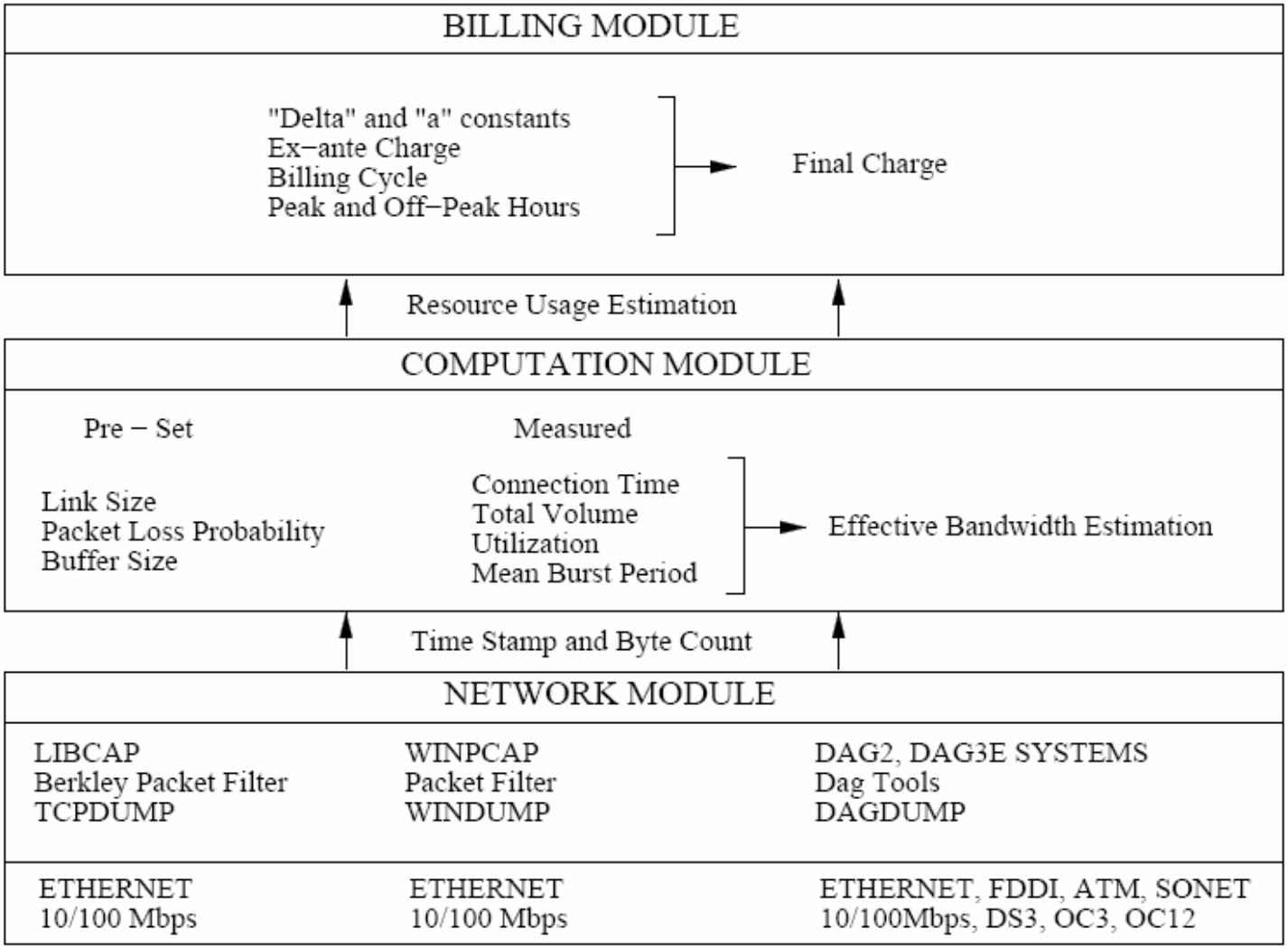
where:

$$\Delta = \frac{|C_H - C_L|}{B_H - B_L}$$

Effect of Delta on Price



Ex-Post Internet Charging Architecture



Project 2: Empirical Analysis of Pricing and Security among ISPs (J. Bailey and T. Porterfield)

How does pricing and (security) technology adoption lead to subsequent firm performance?

Research Setting and Data

Dataset 1: TheList.com

- Longitudinal (2002 through present)
- Measurement of External Service Offerings
- Dynamic (entry and exit)

Dataset 2: Computer Intelligence (Harte-Hanks)

- Longitudinal (2002 through 2004)
- Measurement of Internal Infrastructure
- Dynamic (technology adoption)

Model and Analysis – Dataset #1

Logit Survival Model

$$ALIVE\_2004 = \beta_0 + \beta_1 CODES\_2002 + \beta_2 EXPERIENCE\_2002 + \sum_{i=1}^{n} \gamma_i TECHNOLOGY\_2002_i$$

Mean comparison

March 2002		March 2004	
1883		0	Exiting
924		924	Surviving
		1197	Entering
2807		2121	Total

Technology and Services

Variable	*Technology*	*Variable*	*Technology*	*Variable*	*Technology*
ISDN	"ISDN"	SHELL	"SHELL ACCOUNT"	CONSULT	"CONSULTING"
DSL	"DSL"	SQL	"SQL"	VPN	"VPN"
T1	"T1"	PASSWD	"PASSWORD"	ASP	"ASP"
T3	"T3"	SPAM	"SPAM"	RAUDIO	"REAL AUDIO"
SSL	"SSL"	FILTER	"FILTER"	TOLLFRE	"TOLL FREE PHONE SUPPORT"
WIRELES	"WIRELESS"	COMMER	"COMMERCE"	TFOUR	"24 HOUR SUPPORT"
CABLE	"CABLE"	DBASE	"DATABASE"	MXHOST	"WEB SITE HOSTING" or "WEB HOSTING"
SAT	"SATELLITE"	CGI	"CGI"	MXCOLOC	"COLOCATION" or "CO-LOCATION"
REG	"REGISTRATION"	PGRAM	"PROGRAMMING	MXSEC	"SECURITY" or "SECURE"
PRIVACY	"PRIVACY"	COLD	"COLD FUSION"	MXWEBDV	"WEB SITE DEVELOPMENT" or "WEB DEVELOPMENT"
FIREWAL	"FIREWALL"	NETWRK	"NETWORK"	MXWEBDS	"WEB SITE DESIGN" or "WEB DESIGN"

Results: Early Mover Advantage

		Exiting	Survivor	Survivor	Entrant
Resource	Survival	March 2002	March 2002	March 2004	March 2004
Spam	1.311* (0.638)	0.3%	0.8%	2.1%*	6.3%*
DSL	0.431** (0.090)	41.8%	50.0%*	53.4%	56.6%
Experience	0.157** (0.032)	1.73 yrs.	1.97 yrs.*	3.94 yrs.*	1.3 yrs*

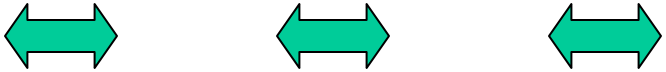
+ p<0.1; * p<0.05; ** p<0.01

Results: Early Mover Disadvantage

		Exiting	Survivor	Survivor	Entrant
Resource	Survival	March 2002	March 2002	March 2004	March 2004
Wireless	-0.262+ (0.138)	14.2%	10.2%*	12.8%	27.0%*
Toll Free	-0.296 (0.212)	10.6%	4.7%*	13.5%*	59.3%*
24 Hour	-0.422+ (0.222)	10.4%	4.0%*	10.8%*	54.7%*
Colocation	-0.217+ (0.131)	18.9%	14.0%*	19.8%*	43.8%*

+ p<0.1; * p<0.05; ** p<0.01

Results: Deadweight Resources



		Exiting	Survivor	Survivor	Entrant
Resource	Survival	March 2002	March 2002	March 2004	March 2004
VPN	-0.52+ (0.28)	4.2%	2.2%*	2.9%	2.9%
Password	-0.89+ (0.46)	2.3%	0.8%*	0.8%	0.3%

+ p<0.1; * p<0.05; ** p<0.01

Preliminary Conclusions

- Security adoption is low and appears to be less important than other technology offerings

- Dynamics of technology adoption is important
  - Costs and benefits related to timing
  - Shedding technologies is difficult

- Ratcheting effect of technology adoption
  - Technology usage increases over time
  - Difficult to shed a technology once it is acquired

Model and Analysis – Dataset #2

Methodology

- Mean comparisons (2002 to 2004)
- OLS regression (2004 Data)

$$FIRM\_PERFORMANCE = \beta_0 + \sum_{i=1}^{n} \gamma_i FIRM\_MEASURES\_2004_i +$$
$$\sum_{i=1}^{n} \gamma_i IT\_TECHNOLOGY\_2004_i + \sum_{i=1}^{n} \gamma_i COMM\_TECHNOLOGY\_2004_i$$

Firm Measures

Variable	*Description*	*Variable*	*Description*
SCOPE	Area Codes Served	EXPERIENCE	Years in market
TRAFFIC	Volume through site	IT_EMPLOYEES	Number of IT employees
EMPLE	Number of employees	PROGRAMMERS	Number of programmers

IT Infrastructure Measures

Variable	*Description*	*Variable*	*Description*
DPPURCH	Central or local DP purchasing	PCPURCH	Central or local PC purchasing
TOTSTORAGE	Total storage capacity	TOTWKS	Total workstations
TOTMAIN	Total mainframe computers	TOTDESK	Total desktop computers
TOTMIDRANGE	Total midrange computers	TOTLANHUB	Total lan hubs
TOTLAN	Total local area networks	TOTROUTER	Total lan routers
TOTSERVER	Total servers	INETACCESS	Internet access type
DRECOVERY	Disaster recovery planning	GIGAETHER	Gigabyte ethernet status

Communication Infrastructure Measures

Variable	*Description*	*Variable*	*Description*
TELESYSPURCH	Central or local voice purchasing	LONGDISPURCH	Central or local long distance purchasing
TOTTEXT	Total phone extensions	LDEXP	Monthly long distance expenses
REMOTES	Total remote data communications sites	TOTTRUNK	Total installed trunks
TOTDDD	Total direct dial lines	TOT800	Total 800 lines
TOTISDN	Total ISDN lines	TOTT1	Total T1 lines
TOTT3	Total T3 lines	TOTXDSL	Total XDSL lines
TOTDATA	Total data lines	MAXDATACOM	Maximum data line speed
SONET_STATUS	Status of SONET	VIP_STATUS	Status of voice over IP
WANSVCS_STATUS	Status of WAN services		

Next Steps

- Continue to understand the importance of security adoption to firm performance

- Understand the relationship of pricing to security

- Analyze the importance of the competitive environment in the adoption of pricing and security