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## **A CONCEPTUAL STUDY ON STRUCTURAL COST DRIVERS MODEL AND ITS SERVICE CHARACTERISTICS FOR DESIGNING BUSINESS STRATEGY WITH SPECIAL REFERENCE TO TELECOM INDUSTRY IN INDIA**

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### **INTRODUCTION**

The concept of cost driver acknowledges that there is no single factor (e.g. product volume) that drives cost. Strategic cost management literature proposes two kinds of cost drivers, the structural cost driver and the executional cost driver. Structural cost drivers are concerned with the economics of structure, technology, and the boundaries of the firm (e.g. outsourcing), and executional cost drivers are concerned with continuous improvement such as quality, productivity, speed, and punctuality. The analysis of cost driver determine cost behaviour of firm's value adding activities that provides basis for working out firm's cost position and how it might be improved. This study identifies following main cost categories as executional cost drivers of telecom industry.

- i)** Operating expenditure towards operations and maintenance of the network infrastructure (OPEX)
- ii)** Marketing, Sales and Distribution Costs (MAREX)
- iii)** Employee Cost (EMPEX) and
- iv)** Capital expenditure towards network infrastructure (CAPEX)

The aim of this study is to analyze the impact of cost drivers in strategic management of cost in telecom industry in India. All service costs, and telecommunications costs for that matter, are period costs. Services are different from products in terms of characteristics of services viz. intangibility, inseparability, heterogeneity, and perish-ability. For the analysis of cost drivers, these four major service characteristics are considered as a first set of factors that may influence each of the cost drivers viz. OPEX, MAREX, EMPEX and CAPEX. In addition, variable concerning market conditions viz. competition and increased customer expectations are considered as a second set of factors that may influence the identified four cost drivers.

Structural cost drivers are always considered in the context of trade-offs between configurations of things, e.g. between costs and benefits of a centralized versus a decentralized firm or a modern versus conventional manufacturing paradigm. Structural cost drivers concern the economics of a configuration of things – the configuration of complementarities and, thus, may be considered in a blueprint of business model the firm takes up.

## **2. CONCEPTUAL FRAMEWORK**

### **2.1 COST DRIVER**

The concept of cost driver acknowledges that there is no single factor (e.g. product volume) that drives cost. There are numerous factors and a complex interplay of these factors causes or drives cost influencing the cost behaviour of the firm. According to strategic cost management concept proposed by Shank, J. K. and Govindarajan, V. (1993), in addition to the volume that drives cost, structural choices and executional skills are important in assessing and answering what causes or drives cost. (Shank, J.K., 1989). Strategic cost management assumes two forms in aligning the firm's cost structure with its strategy. One is structural cost management conceived from strategic positioning of the firm and the other is executional cost management for operational effectiveness. Thus giving rise to two kinds of cost drivers, the structural cost driver and the executional cost driver. Structural cost drivers are concerned with the economics of structure, technology, and the boundaries of the firm (e.g. outsourcing), and executional cost drivers are concerned with continuous improvement such as quality, productivity, speed, and punctuality. Structural cost drivers are always considered in the context of trade-offs between configurations of things, e.g. between costs and benefits of a centralized versus a decentralized firm or a modern versus conventional manufacturing paradigm. Structural cost drivers concern the economics of a configuration of things – the configuration of complementarities. For example, an operation outsourcing model has one configuration and managed capacity model has another configuration and each may be, at least in principle, advantageous in different situations. In contrast, each of the executional cost drivers are not related to trade-offs. They are one-dimensional and 'more is always better': better quality, faster cycle times, more productivity, less waste, etc. are always preferred (Mouritsen, J. and Hansen, A., 2006).

### **2.2 EXECUTIONAL COST DRIVERS IN TELECOM INDUSTRY**

Besides cost driver itself, strategic cost management rely on notion of value chain in assessing and answering what causes or drives cost? (Shank, J.K., 1989). The value chain is the linked set of end-to-end value creating activities from sourcing of raw material to delivering finished product to the end user. Value chain, introduced by Porter, M.E. (1985), is the firms' sequence of primary-business activities concerning product design and development, operations, and logistics. In case of typical manufacturing organisations, value chain includes designing, marketing, delivering and supporting its products in that order. Porter's value chain also include support activities such as firm infrastructure, human resource management, technology development and procurement. The value chain for fundamental manufacturing business as a sequence of production, distribution and then consumption, is quite different from service organisation. Service organisations follow another sequence wherein distribution occurs first followed by simultaneous production and consumption of services (Segal-Horn, S., 2003). Value adding activities that drive costs of the mobile networks are

- i)** maintenance of equipment and components (towards preventive maintenance, repairs and replacement of outdated equipments)
- ii)** equipment software licenses (outsourcing etc.)

- iii) Customer acquisition (marketing, advertising, etc.)
- iv) Customer provisioning (registration, activation, facilities)
- v) Customer care (CRM, complaint handling)
- vi) Charging and billing
- vii) Space/ rental charges
- viii) Interconnection charges

These cost elements of telecom service providers can be categorized in few broad categories. Gruber, H. (2005) identified four such costs categories viz. Network Operations Costs, Customer Acquisition Costs, Investment Costs, and License fees. At even higher layer these can further be grouped in two broad categories capital expenditure (CAPEX) which includes investment costs and license fees, and operational expenditure (OPEX) constituting network operations costs and customer acquisition costs. Bharti Airtel Limited with its one of the major objective as a cost efficiency prominently mentioned OPEX and CAPEX productivity ratios in its annual report for 2014-15.

According to Theodoros Rokkas, et. al. (2009) the OPEX costs for an integrated operator can be divided in to five general categories. These are described as follows:

1. Network related elements: includes all the necessary costs for network operation, OSS operation, maintenance and repair of the network elements, equipment and software licences, rental of network resources, costs for site rental and electricity.
2. Marketing and sales related elements: costs regarding sales and marketing, customer acquisition and subsidisation.
3. Customer service related elements: costs associated to customer care, charging, billing, call center.
4. IT, support and service development related elements: includes service management, design and development of new services, Business IT, management support, costs regarding the purchase of licenses for content delivery.
5. Interconnection and roaming costs: termination fees for calling or completing a call or a session originated or terminated in another network.

According to Gruber, H. (2005), mobile telecommunications is characterized by substantial economies of scale and scope, and identified four types of cost elements viz. network operation cost, handset subsidies and other subscriber acquisition costs, investment cost and license fees. The main operational costs items for mobile telecommunications are network interconnection costs, maintenance costs, personnel costs and commercial costs. One can distinguish two types of operational costs: costs that the firm can largely control, and costs determined by regulatory authorities and through bargaining. Subsidising handsets to new subscribers is essentially a means for lowering the subscriber's entry costs to the mobile phone market. Other costs are related to the turnover of subscribers, or the 'churn'. The main investment lies with the equipment related to the radio transmission between handset and network: in general, base stations account for more than 50 per cent of the cost of a network. While the cost of the main equipment and operating costs were declining, an opposite movement could be observed in licence fees (Gruber, H., 2005).

Idea Cellular Limited in its annual report for 2014-15 organizes the total operating expenses in seven major heads such as Network Expenses and IT Outsourcing Cost, Roaming and Access Charges, License Fees and Spectrum Usage Charges, Subscriber Acquisition and Servicing Expenditure, Personnel Expenditure, Advertisement and Business Promotion Expenditure, and Other Expenses.

The total cost of telecommunication service as described in Cost Accounting Records (Telecommunication Industry) Rules 2011 consists of direct costs (such as employee cost, sales and marketing cost, administration cost, etc.), network element operating cost and support function or department cost. Network element operating cost is further divided into network direct cost and support function cost.

The analysis of cost driver determine cost behaviour of firm's value adding activities that provides basis for working out firm's cost position and how it might be improved. For the analysis of costs, this study rely on value chain for service organisations introduced by Segal-Horn, S. (2003) as a sequence of distribution followed by simultaneous production and consumption of services. The following main cost categories are identified as executional cost drivers.

- i) Operating expenditure towards operations and maintenance of the network infrastructure (OPEX)
- ii) Marketing, Sales and Distribution Costs (MAREX)
- iii) Employee Cost (EMPEX) and
- iv) Capital expenditure towards network infrastructure (CAPEX)

### **2.3 FACTORS AFFECTING COST DRIVERS IN TELECOM INDUSTRY**

All service costs are period costs. Services are different from products in terms of characteristics of services viz. intangibility, inseparability, heterogeneity, and perishability. Intangibility as a lack of physical evidence is one of the most important characteristic of services that separate it from products. For example, when we purchase a product such as bicycle or four-wheeler we have a physical product with two wheels or four wheels to demonstrate, on the other hand, when we purchase a service such as holiday package we hardly have anything tangible to demonstrate apart for intangible experience to share. This intangibility of services makes it difficult to describe or communicate services, to measure or define quality, and to understand value added by the organization. Inseparability implies simultaneous production and consumption of services. Services are produced and consumed instantaneously as against the products which are first manufactured, then stored as inventory before being consumed, at different times. Product manufacturing companies can carry inventory of finished products which is absent in service companies because of perishability of services. Services are produced and delivered while customer is present and hence cannot be stored, returned or resold. Services are heterogeneous in a sense that different customers perceive quality of the same service offering differently. Quality of service is partly dependent on personality of service personnel and partly on customers' expectations, thus, making it difficult to guarantee standard service experience (Terzioglu, B. and Chan, E.S., 2013; Miller S., 2011; Segal-Horn, S., 2003). For the analysis of cost drivers, these four major service characteristics are considered as a first

set of factors that may influence each of the cost drivers viz. OPEX, MAREX, EMPEX and CAPEX. In addition, variable concerning market conditions viz. competition and increased customer expectations are considered as a second set of factors that may influence the identified four cost drivers.

### 3. RESEARCH METHODOLOGY

The aim of this study is to analyze the impact of cost drivers in strategic management of cost in telecom industry in India. A grounded theory research comprising literature review, interviews and survey questionnaire is used to identify potential concepts and variables. Literature in the area of cost management in general, and telecom cost management in particular is reviewed. The few semi-structured interviews with key telecom professionals are also conducted. Four cost drivers of telecommunications are identified as executional cost drivers. The first is operating expenditure towards operations and maintenance of the network infrastructure and facilities (OPEX). The second is expenditure towards customer acquisition activities including marketing, sales and distribution (MAREX). The next is expenditure on employee (EMPEX). And the last is capital expenditure incurred in acquiring network infrastructure and facilities (CAPEX). The variables that have impact on these executional cost drivers are identified. The first among these are of set of four major service characteristics that are intangibility, inseparability, perishability and heterogeneity. In addition, competition and increased customer expectations are considered as a second set of variables concerning market conditions. A survey questionnaire to access the impact of identified variables on indentified cost drivers is developed and administered. A response on five point Likert scale regarding impact of each of the above identified variable (e.g. intangibility, perishability, competition, etc.) on each of cost driver (viz. OPEX, MAREX, EMPEX, CAPEX) from 196 telecom professionals from lower, middle and higher management is collected.

The variable wise responses on five point Likert scale are analyzed using exploratory factor analysis in R. Two sets of structural cost drivers from factors (or latent variables) are identified. The first set comprising structural cost drivers viz. ‘organisation design’, ‘organisation positioning’ and ‘organisation performance’ are identified from measuring impact of a set of four service characteristics as that are intangibility, inseparability, perishability and heterogeneity on each of executional cost driver. The second set of observed variable includes impact of competition and increased customer expectations on each of executional cost driver. The other three structural cost drivers identified are ‘mass market services’, ‘differentiated services’, and ‘personalized services’.

The two sets of structural cost drivers (or latent variables) that are identified using exploratory factor analysis are analyzed using confirmatory factor analysis (Structural Equation Modeling – SEM) using ‘lavaan’ package in R.

### 4. DATA CHARACTERISTICS

The 29 responses received online and 167 responses collected through personal visits are combined. There were 19 responses of missing values in at least one of the

questions and the same were removed from the database leaving 177 cases for analysis. There are 69 responses from operations/lower level management, while 94 and 31 are from middle and senior level management respectively. The functional area representation is of 6 numbers of responses from marketing including sales and distribution, 128 from operations, 27 from human resources, and 16 responses from finance. Majority of respondents are having work experience of 11 to 20 years (83 Nos.) followed by 21 to 30 years (39 Nos.) and 3 to 10 years (33 Nos.), and very few are from less than 3 years (8 Nos.) and more than 30 years (14 Nos.) of experience.

## 5. MODEL DEVELOPMENT

The variable wise responses on five point Likert scale are analyzed using exploratory factor analysis (EFA) in R. All variables included are tested for normality using Shapiro-wilk normality test and factors (or latent variables) termed as structural cost drivers are identified from two sets of variable.

### 5.1. EFA OF FIRST SET OF VARIABLES

The first among these two is a set of 16 variables that measures impact of each of four service characteristics – viz. intangibility, inseparability, perishability and heterogeneity on each of the executional cost driver – viz. OPEX, MAREX, EMPEX and CAPEX. The analysis yielded a three-factor solution for factor loadings  $\geq 0.42$ . The first one is organization design. The next is organization positioning. And the last is organisation performance.

The first factor i.e. **organisation design** is concerned with long-term commitment of resource and hence has loadings from all four cost elements (OPEX, MAREX, EMPEX and CAPEX) that are reported to increase due to intangibility and inseparability characteristics of services. In service industries output is an intangible experience that may be produced, transferred and consumed at the same time (Segal-Horn, S., 2003.). One of those problems, faced by many but not all service providers, is the problem of coordinating marketing and operations (Chapter 19, Handbook of Marketing). This is reflected in increase in all the four executional cost drivers due to intangibility and inseparability characteristics of services.

There are 4 items that loads the second factor, **organisation positioning**. The components of all the cost elements viz. OPEX, MAREX, EMPEX and CAPEX that increases as a result of heterogeneity of services loads this factor. Quality of service is partly dependent on personality of service personnel and partly on customers' expectations, thus, making it difficult to guarantee standard service experience (Segal-Horn, S., 2003.). This is visible from loading of the this factor with increase in OPEX, MAREX, EMPEX and CAPEX due to heterogeneity.

The third factor has loading from 4 items representing **organisation performance** as one of the structural cost driver. Product manufacturing firms can carry inventory of finished products which is absent in service firms because of perishability of services. Capacity utilization is crucial for service firms. These concerns are visible with the loading on increase in all components of cost elements viz. OPEX, MAREX, EMPEX and CAPEX due to perishability aspect of telecom services. Capacity decisions also impact costs and profitability. There are basic compromise s between creating

additional capacity to better serve customers and increasing costs (Chapter 19, Handbook of Marketing).

### 5.2. EFA OF SECOND SET OF VARIABLES

In the second set of observed variable includes impact of competition and increased customer expectations. Another three latent variables viz. mass market, differentiation, personalization are identified for factor loadings  $\geq 0.42$ .

The variable wise responses for second set of data on five point Likert scale are analyzed using factor analysis in R. All variables included are tested for normality using Shapiro-wilk normality test and factors (or latent variables) are identified.

Managing the corporate brand and making core service relevant and valuable is yet another challenge especially for companies that have had a background of technical legacy and now facing a new commercial environment which is becoming more and more market-oriented or customer-oriented (Young, L. and Burgess, B. eds., 2010). The first factor, i.e. **Differentiated Services**, comprises loadings from increase in CAPEX as a result of both competition and customer expectations. In addition, increase in MAREX due to increase in customer expectation and increase in OPEX due to increase in competition loads this factor.

The second factor is related to the other end of service types which is '**Personalised Services**'. The elements that load this factor is reflected in loading of this factors by increase EMPEX with both competition and customer expectation.

The third factor is '**Mass Market Services**' which foresee loading from increase in OPEX with competition and can be attributed to exploitation of economies of scale and demand uncertainty due to availability of substitutes such as OTT services in telecommunication market.

In sum, six structural cost drivers of telecom service in two sets of three latent variables are identified. The first set includes organization design, organization positioning and organisation performance while the second set include mass market services, differentiated services, personalized services.

### 5.3. STRUCTURAL MODEL

Structural cost drivers concern the economics of a configuration of things – the configuration of complementarities and, thus, contribute to design of business model. Among the six identified structural cost drivers, the first set includes organization design, organization positioning and organisation performance which are related to business model the firm takes up. Business model is a broader concept that, in addition to describing firm's transaction within and across its boundaries, addresses issues beyond the traditional boundaries of the firm. Business models enable organisation design at enterprise level and assist in identifying untapped opportunities from within the organisation (Zott, C. and Amit, R., 2008).

The processes for service business can be classified as professional services, service shops and mass services with the decreasing order of customization and customer contact {Oxford}. The second set of structural cost drivers includes mass market services, differentiated services, and personalized services are concerned with this classification of service processes. This represents market segment the firm intends to serve, or type of services the firm wishes to provide, with the chosen business model.

Wirtz, B.W., Pistoia, A., Ullrich, S. and Göttel, V. (2016) proposed to consider business model from dynamic perspective so as the business model to evolve in response to internal as well as external changes. Thus, enabling organisations generate competitive advantage by considering customer and market components, in addition to the value adding activities of the organisation.

Structural cost drivers are always considered in the context of trade-offs between configurations of things, e.g. between costs and benefits of a centralized versus a decentralized firm or a modern versus conventional manufacturing, or service, paradigm. The two sets of latent variables, i.e. identified structural cost drivers, are analyzed using confirmatory factor analysis (Structural Equation Modeling – SEM) using ‘lavaan’ package in R. Figure 1 shows the model testing results for interrelations between the two sets of structural drivers.

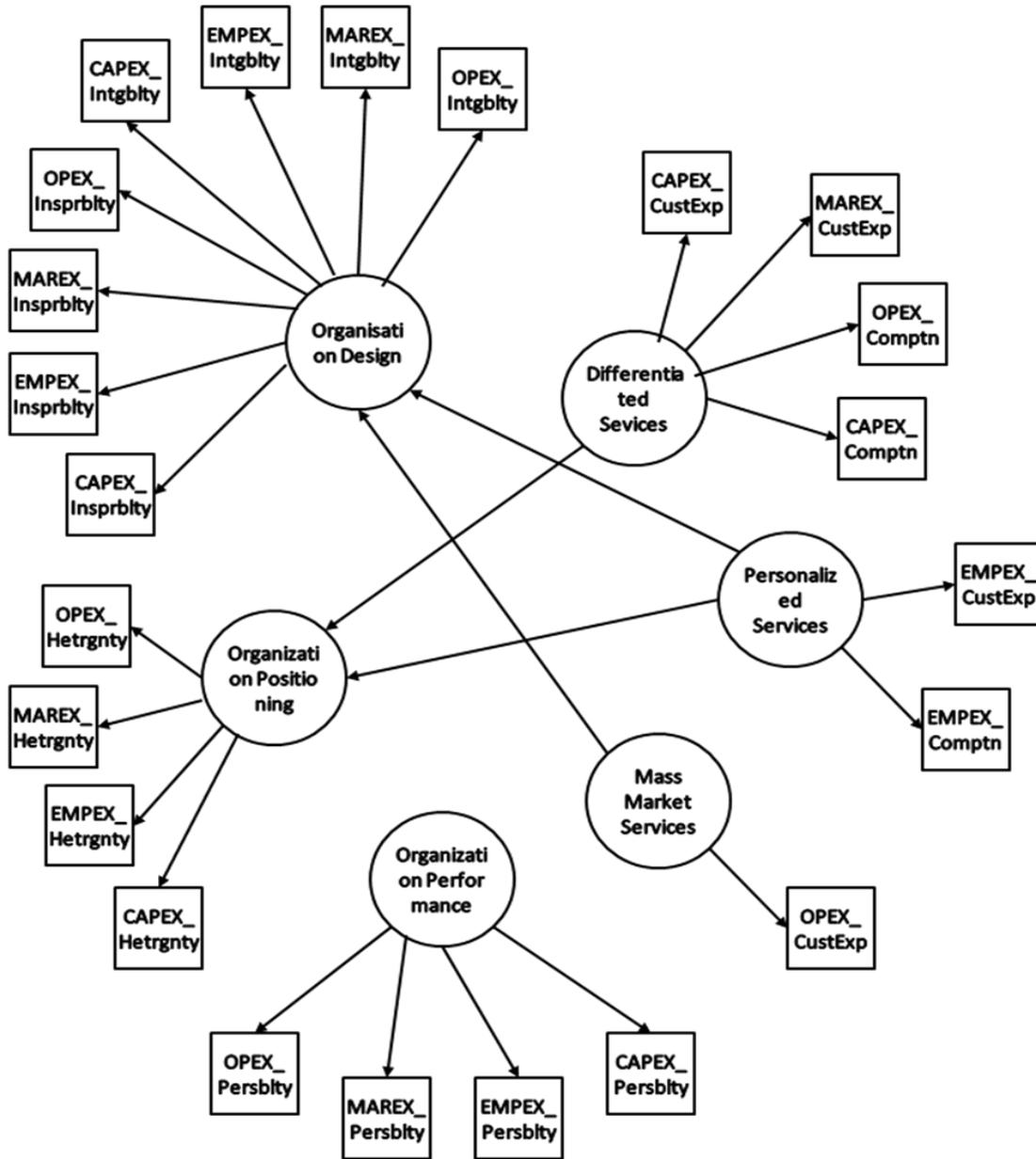


Figure 1 : Structural Model

**6. RESULTS****Summary of model fit statistics**

Chi-square/ degrees of freedom	: 2.83
CFI (Comparative fit index)	: 0.775
RMSEA (Root mean square Error or approximation)	: 0.101
SRMR (Standardized root mean Square residual)	: 0.075

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lavaan (0.5-20) converged normally after 50 iterations

	Used	Total
Number of observations	181	196
Estimator	ML	
Minimum Function Test Statistic	613.310	
Degrees of freedom	216	
P-value (Chi-square)	0.000	

Model test baseline model:

Minimum Function Test Statistic	2018.764
Degrees of freedom	253
P-value	0.000

User model versus baseline model:

Comparative Fit Index (CFI)	0.775
Tucker-Lewis Index (TLI)	0.736

Loglikelihood and Information Criteria:

Loglikelihood user model (H0)	-5362.015
Loglikelihood unrestricted model (H1)	-5055.360

Number of free parameters	60
Akaike (AIC)	10844.031
Bayesian (BIC)	11035.941
Sample-size adjusted Bayesian (BIC)	10845.917

Root Mean Square Error of Approximation:

RMSEA	0.101
90 Percent Confidence Interval	0.091 0.110
P-value RMSEA <= 0.05	0.000

Standardized Root Mean Square Residual:

SRMR	0.075
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## Parameter Estimates:

Information	Expected
Standard Errors	Standard

## Latent Variables:

	Estimate	Std.Err	Z-value	P(> z )
OrgPositioning =~				
Hetrgnty_OPEX	1.000			
Hetrgnty_MAREX	0.712	0.082	8.682	0.000
Hetrgnty_EMPEX	0.769	0.087	8.809	0.000
Hetrgnty_CAPEX	0.937	0.093	10.074	0.000
OrgDesign =~				
Intngblty_OPEX	1.000			
Insprblty_OPEX	1.341	0.216	6.220	0.000
Intngblt_MAREX	1.079	0.193	5.580	0.000
Insprblt_MAREX	1.230	0.207	5.944	0.000
Intngblt_EMPEX	1.221	0.210	5.828	0.000
Insprblt_EMPEX	1.229	0.200	6.140	0.000
Intngblt_CAPEX	1.202	0.200	5.998	0.000
Insprblt_CAPEX	1.418	0.219	6.474	0.000
OrgPerformance =~				
Pershblty_OPEX	1.000			
Prshblty_MAREX	0.823	0.104	7.886	0.000
Prshblty_EMPEX	0.884	0.114	7.775	0.000
Prshblty_CAPEX	0.938	0.107	8.783	0.000
MassMarketServices =~				
CustExp_OPEX	1.000			
PersonalizedServices =~				
CustExp_EMPEX	1.000			
Compettn_EMPEX	0.836	0.113	7.409	0.000
DifferentiatedServices =~				
CustExp_MAREX	1.000			
Compettn_CAPEX	0.980	0.127	7.743	0.000
CustExp_CAPEX	1.037	0.129	8.064	0.000
Competitn_OPEX	1.102	0.145	7.595	0.000

## Regressions:

	Estimate	Std.Err	Z-value	P(> z )
MassMarketServices ~				
OrgPositioning	0.170	0.088	1.935	0.053
PersonalizedServices ~				
OrgPositioning	0.417	0.096	4.338	0.000
DifferentiatedServices ~				
OrgPositioning	0.357	0.080	4.449	0.000

MassMarketServices ~				
OrgDesign	0.325	0.157	2.067	0.039
PersonalizedServices ~				
OrgDesign	0.508	0.173	2.932	0.003
DifferentiatedServices ~				
OrgDesign	-0.008	0.122	-0.063	0.950
MassMarketServices ~				
OrgPerformance	0.113	0.091	1.247	0.212
PersonalizedServices ~				
OrgPerformance	-0.023	0.095	-0.239	0.811
DifferentiatedServices ~				
OrgPerformance	0.126	0.074	1.696	0.090

## Covariances:

	Estimate	Std.Err	Z-value	P(> z )
OrgPositioning ~~				
OrgDesign	0.199	0.052	3.804	0.000
OrgPerformance	0.319	0.081	3.947	0.000
OrgDesign ~~				
OrgPerformance	0.191	0.052	3.670	0.000
MassMarketServices ~~				
PersonlzdSrvcs	0.201	0.055	3.651	0.000
DifferntdSrvcs	0.276	0.052	5.341	0.000
PersonalizedServices ~~				
DifferntdSrvcs	0.223	0.051	4.401	0.000

## Variances:

	Estimate	Std.Err	Z-value	P(> z )
Hetrgnty_OPEX	0.390	0.068	5.758	0.000
Hetrgnty_MAREX	0.553	0.068	8.190	0.000
Hetrgnty_EMPEX	0.617	0.076	8.125	0.000
Hetrgnty_CAPEX	0.545	0.077	7.119	0.000
Intngblty_OPEX	0.745	0.084	8.920	0.000
Insprblty_OPEX	0.583	0.072	8.143	0.000
Intngblt_MAREX	0.693	0.079	8.769	0.000
Insprblt_MAREX	0.653	0.077	8.484	0.000
Intngblt_EMPEX	0.716	0.083	8.590	0.000
Insprblt_EMPEX	0.535	0.065	8.258	0.000
Intngblt_CAPEX	0.591	0.070	8.429	0.000
Insprblt_CAPEX	0.476	0.062	7.635	0.000
Pershbilty_OPEX	0.547	0.087	6.264	0.000
Prshbilty_MAREX	0.720	0.092	7.867	0.000
Prshbilty_EMPEX	0.875	0.110	7.954	0.000
Prshbilty_CAPEX	0.556	0.083	6.692	0.000

CustExp_OPEX	0.000			
CustExp_EMPEX	0.326	0.087	3.752	0.000
Compettn_EMPEX	0.689	0.091	7.536	0.000
CustExp_MAREX	0.629	0.076	8.313	0.000
Compettn_CAPEX	0.421	0.054	7.772	0.000
CustExp_CAPEX	0.370	0.051	7.280	0.000
Competitn_OPEX	0.588	0.074	7.944	0.000
OrgPositioning	0.824	0.132	6.228	0.000
OrgDesign	0.275	0.079	3.493	0.000
OrgPerformance	0.789	0.144	5.481	0.000
MassMarktSrvcs	0.656	0.070	9.334	0.000
PersonlzdSrvcs	0.451	0.103	4.376	0.000
DifferntdSrvcs	0.297	0.070	4.231	0.000

## 7. DISCUSSION AND CONCLUSION

In sum, six structural cost drivers of telecom service in two sets of three latent variables are identified. Among the first set, the first one factor is “organization design”. The next is “positioning of organization”. And the last is behaviour and performance of the firm. The first set includes organization design, organization positioning and organisation performance while the second set include mass market services, differentiated services, personalized services.

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