The Influence of Outsourcing Technical Infrastructure on the Service Delivery of Mobile Operators in South Africa

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ABSTRACT

South Africa has been the backbone of the continent's business and the economic hub for decades. It is based on the conjecture that, high capital investment (Capex) is required to set up a mobile network infrastructure. This paper is set out to establish the influence of outsourcing technical infrastructure on the service delivery of mobile operators in South Africa, a field which is pivotal in both the private and public sector. Virtual Mobile Operators (VMO), which depend entirely on other operators' network infrastructure to carry their traffic increased competition in the industry. In an aim to lower Operational Costs (Opex) and Capex, some operators sold their network infrastructure to third party providers, who then maintain and operate these. Although this model lowers costs, the questions that this research sought to answer were; what the costs of outsourcing where for the mobile operators and whether there was really potential and benefit from outsourcing. The study explored various outsourcing models and mobile operators in South Africa who use these models to improve network quality, efficiency, customer growth, and attain competitive advantage. This research employed both qualitative and quantitative methods. Data was collected through, an extensive literature review, individual interviews, and observations. The study among other findings established that VMOs have no ultimate control over the network quality and performance they offer their clients, as they rely on an outsourced service. There is therefore a need to draft service level agreements with mobile operators that assure a certain level of service delivery and fully achieve the intended benefits.

Keywords: *Outsourcing, Service Delivery, Technical Infrastructure, Vendors Mobile Operator, Capex, Opex.*

INTRODUCTION

There has been a stiff debateable assumption in the mobile network industry of either there is prudence in outsourcing infrastructure or its is not of greater importance. In South African mobile industry set up network infrastructure forms the critical assets for mobile operators and the outsourcing of technical infrastructure. While supportive, has affected digital signals transmission and network quality and performance, worsening as the operating environment complexities advance (Venmani, 2020). There is an increasing demand for better network coverage, while smart handsets have an excessive affinity for high speed and data capacity. Also as building and maintenance costs for telecommunications infrastructure are rising, revenue is under competitive pressure from new and upcoming cheaper

communication platforms. Smart phones are at present the fastest spreading technology worldwide with technologies in network infrastructure requiring huge capital investment and great coordination with various suppliers due to lack of vertical integration within the industry. (Babbie & Mouton, 2017) posit that vertical integration would encourage specific investments and reduces holdup problems when markets are imperfect. (Parlakturk, Jayashankar, & Swaminathan, 2014) maintained that sometimes it is however more effective for a company to rely more on the expertise and economies of scale of other vendors instead of being vertically integrated.

The aim of the research was to evaluate the influence of outsourcing technical infrastructure on service delivery of mobile operators in South Africa. This is from the background that the

mobile operators' telecommunications environment is highly competitive. Some mobile operators have experienced a decline in market growth and profitability in recent years. There is a perpetuated compromise on service delivery by various mobile operators. (Martinez, 2019). A great challenge was presented by growth in data traffic which could rise by about 600% in mobile communications in the next 5 years, (GSMA, 2018) as to major investments to ensure security and reliability of transmission in light of the short technology cycles.

LITERATURE REVIEW

According to, (Nolle, 2017) stresses that mobile operators may outsource the operation and maintenance of their towers from third parties, and/or install equipment on towers owned and operated by third parties, at fees lower than an operator's equivalent Opex for its own towers. However, in defining the outsourcing scope, questions arise around structural variables and options for optimisation which comprise cost, quality, innovation, productivity and time to market. The "right configurations or architecture", depends on the mobile operator organisation and points to internal politics, credibility of internal processes to deliver service with adequate service value propositions, and maturity of mobile service business requirements (Kalakota, 2013). While indicating that there are vast justifications for outsourcing Nolle (2017), gave a sample of such for telecom carriers:

- Complexity of networks with multiple devise layers, optical, Ethernet and IP and more

- Complexity of mobile devices requiring more interfaces per device than before

- Complicated nature of services needing to be coordinated by more devices for performance, capacity and fault management

- Continually upgrading software and computer elements that require constant updating which telecom network operators have limited experience on

- Increase in compliance standards with varying interpretations which may make it challenging to maintain a stable network or be sustainable

Therefore, done correctly, network operations outsourcing can make the NOC a more responsive and powerful part of the overall Operation, Administration, Maintenance and Provisioning (OAM&P) process and a positive contributor to the network operator's revenue and profit (Meddour, Rashed, & Gourhant, 2016).

Conceptual Frameworks of Outsourcing

(GSMA, 2019) provides that Infrastructure sharing approaches come in forms; Passive, Active and national roaming. Passive infrastructure involves (Kakabadse & Kakabadse, 2016), sharing of non-electronic infrastructure at a cell site, or further sharing physical sites of base stations and shared backhaul. The cost-saving potential of passive sharing is limited relative to other forms of sharing.

Active infrastructure sharing is sharing of electronic infrastructure of the network including radio access network and core network, it is further classified into MORAN (Multi-Operator Radio Access Network), where radio access networks are shared and dedicated spectrum is used by each sharing operator, MOCN (Multi-Operator Core Network), where radio access networks and spectrum are shared, and core network sharing, where servers and core network functionalities are shared. The cost-saving potential is greater than site sharing despite complexities in operating and to maintaining strategic differentiation (Fatmir, 2019).

National roaming refers to roaming agreements in a national context, a subscriber from one network may roam into another provider's network when entering into non-overlapping coverage provided by the later and vice versa. Cost saving is comparable to or greater than core network sharing.

However, it also comes with complexities and regulatory issues in reduced competition. (GSMA 2019). Network sharing can also be divided into four dimensions, all linked and choice limits freedom of choice from other dimensions (Meddour, Rashed, & Gourhant, 2016). Another perspective (GSMA, 2019) gives different levels of infrastructure sharing as demonstrated in the diagram that follow.

Comparison of Infrastructure Sharing Forms (Technology)

Sharing form	Pros	Cons
Passive infrastructure sharing	• Significant CAPEX/OPEX savings • Lowered risk of site acquisition • Full differentiation and complete control of spectrum • Control over sites to be shared • No/little regulatory obstacles • Easy migration to other sharing forms. • Environmental benefits	• Availability of free space in existing sites (if existing sites are to be shared) • Similar cell planning may be required
MORAN, MOCN	• Limited marginal CAPEX savings compared to Site Sharing • Substantial marginal OPEX savings compared to passive infrastructure sharing • Control over base stations to be shared • Reduction of network footprint by sharing operators	• Regulatory approval necessary • Complexity of operation • Requires long term commitment between operators • Difficult to exit from sharing agreement
Core Network sharing	• Further CAPEX/OPEX savings compared to MORAN/MOCN • Significant investment can be diverted to services • Maximum sharing for operators sharing existing infrastructure	• Regulatory approval necessary • Complexity of operation and tight integration • Challenging to differentiate quality of service
National Roaming	• Significant CAPEX/OPEX savings • Clear ownership of equipment • Differentiation based on service layer • Low risk solution for both incumbent and new entrant	• Regulatory approval necessary • Interconnection required • Reduced control over the network (e.g., outage of visited network can affect home network service) • End to end inter-PLMN QoS and inter-PLMN handover very challenging

Source: GSMA (2019)

Build-Operate-Transfer Strategy

A Build-Operate-Transfer(BOT) outsourcing solution offers owning and operating Offshore Delivery Centres (ODC) in phases (CBSI: BOT Outsourcing, 2013). (Gatner, 2013) explains a BOT as a contractual relationship, in which an organisation elicits the services of an outsourcing provider to set up/construct, optimise and operationalise a business service delivery process, with the contractually stipulated intent of transferring the operation to the outsourcing client.
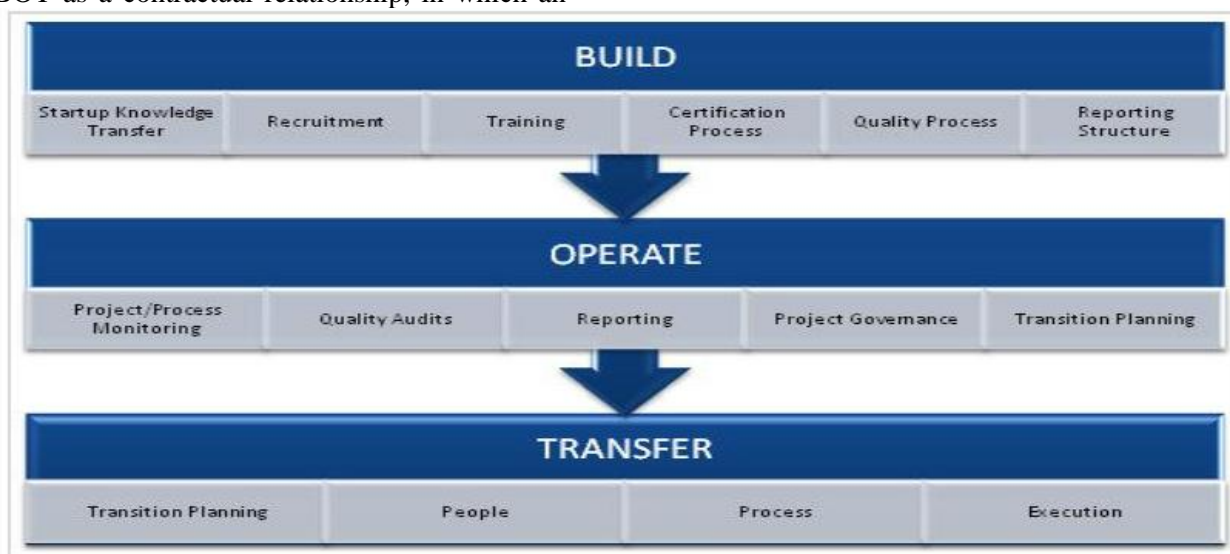

Figure1. *Build-Operate-Transfer Model*

Source: (CBSI: BOT Outsourcing, 2013)

The benefits of a BOT Outsourcing Option (Ahola, Laitinen, Kujala, & Wikstrom, 2008) and (CBSI: BOT Outsourcing, 2013) are that it minimised upfront investment. This phased approach allows an organisation to evaluate the effectiveness and benefits of ownership before

undertaking the risks and costs associated with starting and running ODC. The three critical phases of a BOT model are (CBSI: BOT Outsourcing, 2013). During Build and Operate, there is minimal investment. Companies can test the functionality of the products and services prior to committing to a Transfer that requires long-term resources and financial commitments. It minimised management involvement as the outsourced partner is responsible for all management and operational issues and for ensuring timely and quality delivery of products (Chen, 2008). BOT partner builds and operates with the team in order that clients need not address organisational training requirements and transfer issues. As such, a fully integrated and functional 'turn-key' team is available when specified by the client (CBSI: BOT Outsourcing, 2013). Low-to-no-investment exit option when compared to the mobile operator setting up its own ODC. The Factors to consider when looking to outsourcing a BOT Partnerin a minimum of an 18 to 24 month relationship, (CBSI:BOT Outsourcing, 2013) and (Chen, 2008) are; references and reputation, commitment to quality, access to qualified resources, competitive cost structure and, flexibility of contract terms.

Turnkey Outsourcing Framework

The turnkey outsourcing framework (Ahola, Laitinen, Kujala, & Wikstrom, 2008) entails a contract where the essential design emanates from, and is delivered by the contractor and not the owner. The legal responsibility for the design, suitability and performance of the work, after completion, will rest with the contractor. The responsibility for the execution and the coordination of the entire function and activities in a turnkey outsourcing strategy lies with the external supplier (Weele, 2010). The mobile operator then taps into the already built technology, as a required and outsourced service from the contractor. The specifics of the design are out of the mobile operator's scope of direct influence during design. However, the turnkey contractor executes comprehensive market requirements before infrastructural design and construction (Ahola, Laitinen, Kujala, & Wikstrom, 2008).

Service Level Agreements

In order to manage their relationship with an outsourcer or technology service provider, firms need a contract that includes an SLA with equipment vendors, as well as contractor companies (Laudon and Laudon, 2010: 219).

There are agreed deliverables and relationship continuations inherent to an outsourcing procession (Nahar & Kuivanen, 2010). SLAs provide a middle ground where terms of engagement can be crafted, designed to explicitly specify the services that a client expects, and how frequently downtime may occur, as well as remedies when the provider fails to meet agreed priorities (Perry, 2015).

Understanding Infrastructure Outsourcing through Theoretical Frameworks

As illustrated by figure 2 key aspects arising from the integrated conceptual approach are the proficiencies within the mobile operator, their priority and implications to the overall functioning of the operator. However, the process of establishing the most competitive, accessible and available partner is inherent with costs that need management control and justification. The **agency approach (Neptuno, 2014)** determines that a mutual business relationship with a vendor must exist. The vendor must be amenable to enter into a binding monitoring clause of its engaged services to regulate and mitigate on the potential opportunistic costs in the form of hidden costs during project implementation. Penalties must be established and illuminated within the SLA documentations. A specific task, also identified as a milestone, must have a performance incentive to ensure trust and commitment (World Telecomms: Indicators, 2014).

Transaction costs must be determined against coordinated costs, engagement costs and the cost of establishing linkages with other potential vendors to enhance competition. The other critical approach is that there is no one size fits all but a scenario assessment is applied since some choice decisions are situational and therefore a contingency approach is needed on the firm specific factors as well as industry specific factors (Rouse, 2013). To build a service system, there are three components in the service delivery framework that need to function effectively (PicoTeam, 2014) and (Ivatury, Gautam, & Mas, 2014) Organising the Demand, Responding to the Demand, Supporting the Response and offer higher speed, higher value, more expertise, more integrated and more flexible services, than the company's internal resources can offer. February 12, 2018 Armend Ukshini. There is emphasis however that the need for access to talent will lead companies to think about outsourcing as a means of accelerating innovation and gaining

competitive advantage by concentration on **core competencies**. 'This will lead to a transformation of the outsourcing profession where innovation will be valued much higher than pure cost savings' in the words of Michael Corbett, Chairman of IAOP (2018).

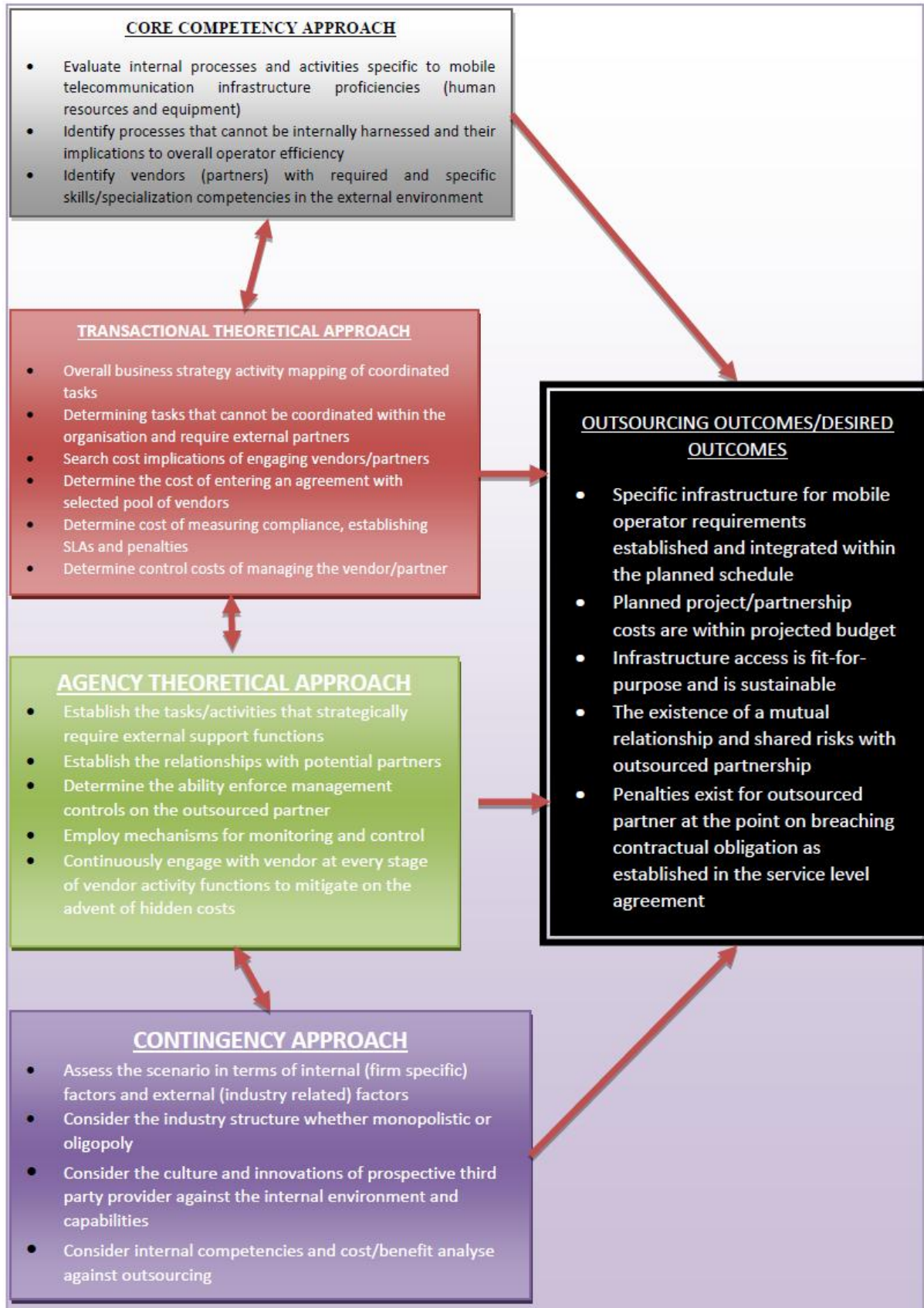## Theories of Infrastructure Outsourcing and Mobile Industry Service Delivery

CORE COMPETENCY APPROACH

- Evaluate internal processes and activities specific to mobile telecommunication infrastructure proficiencies (human resources and equipment)
- Identify processes that cannot be internally harnessed and their implications to overall operator efficiency
- Identify vendors (partners) with required and specific skills/specialization competencies in the external environment

TRANSACTIONAL THEORETICAL APPROACH

- Overall business strategy activity mapping of coordinated tasks
- Determining tasks that cannot be coordinated within the organisation and require external partners
- Search cost implications of engaging vendors/partners
- Determine the cost of entering an agreement with selected pool of vendors
- Determine cost of measuring compliance, establishing SLAs and penalties
- Determine control costs of managing the vendor/partner

AGENCY THEORETICAL APPROACH

- Establish the tasks/activities that strategically require external support functions
- Establish the relationships with potential partners
- Determine the ability enforce management controls on the outsourced partner
- Employ mechanisms for monitoring and control
- Continuously engage with vendor at every stage of vendor activity functions to mitigate on the advent of hidden costs

CONTINGENCY APPROACH

- Assess the scenario in terms of internal (firm specific) factors and external (industry related) factors
- Consider the industry structure whether monopolistic or oligopoly
- Consider the culture and innovations of prospective third party provider against the internal environment and capabilities
- Consider internal competencies and cost/benefit analyse against outsourcing

OUTSOURCING OUTCOMES/DESIRED OUTCOMES

- Specific infrastructure for mobile operator requirements established and integrated within the planned schedule
- Planned project/partnership costs are within projected budget
- Infrastructure access is fit-for-purpose and is sustainable
- The existence of a mutual relationship and shared risks with outsourced partnership
- Penalties exist for outsourced partner at the point on breaching contractual obligation as established in the service level agreement

**Figure2.** *An integrated view of the four concepts*

Service Licensing in South Africa

The two types of service licensing under ECA are Electronic Network Service License (ECNS) and Electronic Communications Service (ECS). ECNS authorises the holder to roll-out and operate a physical network (2009). The Independent Communications Authority of South Africa (ICASA) currently handles all the regulations of the telecommunications industry in South Africa including the voice over internet protocol providers (VOIP). According to Mitchell Barker (2013), under the Electronic Communications Act (ECA), licences for electronic communications are issued, with the available service licences divided basically into two categories: Electronic Communications Network Service (ECNS) licences, and Electronic Communications Service (ECS). The ECNS applies to mobile operators, such as Vodacom, Cell C, MTN, Virgin Mobile and Telkom Mobile (8*ta*) for mobile services. However, these mobile operators still need licensing for ECS for their voice over internet services, which has enabled them to provide data related communications that include voice communication (Cull, 2009). ICASA is also commonly regarded as having other regulatory powers, as it acts to prevent future anti-competitive conduct, responding to specific objections or instances of anti-competitive conduct Turrito Networks Aug 2017.

The Mobile Operators and their Market Share in South Africa

The fibre boom in South Africa started when the government signed legislation that allowed private operators to build their own networks, allowing companies like Vodacom, Neotel, Telkom, to construct their own country wide fibre networks (Turrito Networks Aug 2017). The DTPS see the wireless open access network (WOAN) as a liberation of the communications industry Hans van de Groenendaal 2018, while most of industry see this as creating the monopoly that South Africans suffered for many years. Vodacom and MTNl completely dominate the South African mobile market but Telkom's recent growth in mobile subscribers changed the picture and market structure significantly. Specifically, Telkom appears to have almost doubled its market share, now accounting for 9.4% of the reported numbers, eating away at both MTN and Vodacom as Fig.. demonstrates.
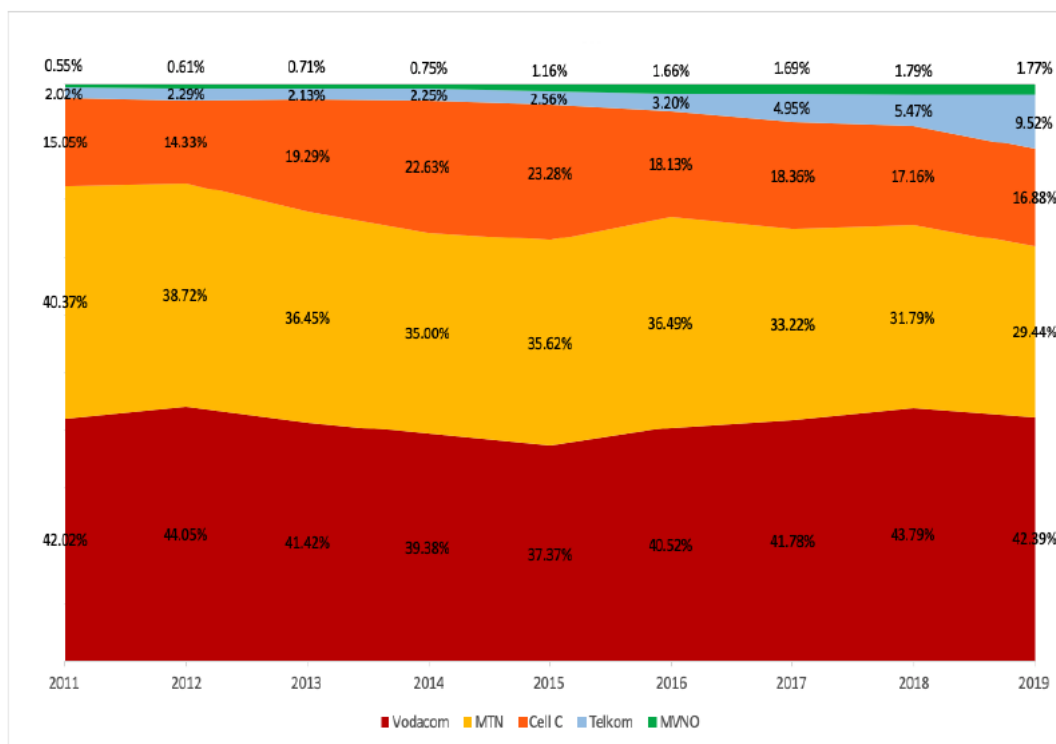
In 2005, MTN outsourced a partnership with Ericsson for its third generation 3G network. Ericsson, by mid-year 2005, had begun implementing MTN's 3G network rollout (Balancing Act Africa: News, 2005). Huawei has been partnering with South African Mobile operators in delivering eLTE Broadband, HRL technology. Nokia Siemens is one of South Africa's leading, managed services, outsourcing providers. Vodacom is one of South Africa's

mobile operators that have outsourcing services from NSN and the relationship has expanded to include other projects in Africa, including Tanzania. MTN moved from outsourcing undersea submarine broadband data services by investing in the West African Cable System (WACS), a submarine cable that links South Africa and the west coast of Africa with Europe. According to MTN South Africa (2013), this strategy has greatly improved MTN's broadband capacity to give its customers world class internet.

MTN South Africa (2013), acquired iTalk Cellular, which was contracted to be its cellular service provider, in terms of contracting directly with MTN customers on MTN airtime provision, handsets and other linked products that MTN could not produce on its own. This significantly improved MTN's distribution competence across South Africa. (Molapo Technology: Site Installations, 2014).

Undersea Cables and International Connectivity

As mobile service operators drive usage, data costs are being driven down by the increase of undersea cables connecting sub-Saharan Africa to the rest of the world. At the end of 2011, undersea cable capacity to South Africa was at 2.69 Terabits per second (Tbps) and this capacity was further anticipated to grow to 11.9 Tbps by the beginning of 2013. This capacity doubled at the end of the last quarter of 2013. Other cables in progress include the Africa Coast to Europe cable (between France and South Africa) and the South Atlantic Express Cable (between South Africa, Angola and Brazil).

Challenges with Outsourcing between South African Mobile Operators

According to (Research ICT Africa, 2013), what hampers the efficient rollout of services is; telecommunications infrastructure sharing, inter-agency coordination, regulations, Reluctance to Share Infrastructure with New Entrants, and approval bottlenecks. This is despite the identification of the need for an integrated, countrywide rights-of-way plan for fibre rollout. Wholesale access to mobile operators' networks is a key competitive issue and yet, as with fixed facilities, these mobile operator facilities have not been regulated to ensure they are offered to the myriad of service providers in the liberalised environment. This limits new entrants' opportunities to compete fairly in South Africa's highly entrenched mobile market, dominated by incumbents Vodacom and MTN (ResearchICT Africa, 2013). In relation to network sharing resistance Friedrich, Pattheeuws, Trimmel, and Geerdes (2012) indicates that operators offer a variety of reasons for not engaging in sharing deals, often fearing the operational complexity, up-front transformation costs, and the potential loss of control over destinies. Friedrich *et al.* (2012) *St. Dr. Shpetim Robaj (2018)* points that the early movers were in a position to shape deals with partners of their choice, giving them a distinct cost advantage in their markets

RESEARCH METHODOLOGY

The research employed both qualitative and quantitative methods to gather research data (Burns and Grove, 2003: 46). According to (Cohen, Manion & Morrison, 2011), the qualitative paradigm subscribes to the insider perspective of social action, where information is drawn from the natural environment. Mixed methods were used, to obtain the benefits of the triangulation of the research data from both research approaches, hence providing more rigor and validity to the research. Furthermore, the research protocol and field procedure were examined to ensure that the samples chosen and the interviewing method used, provided unbiased and accurate research data. (Creswell, 2014).

This research is informed by the mobile industry players in South Africa namely MTN, Cell C, Vodacom and Telkom Mobile (8ta). This research population was large; therefore, the drawing of a representative sample was a viable option to complete the research within the stipulated timelines.

Table1. *Population size*

Population group	Population Size	Sample Size
MNO	160	80
VMO	20	10
Vendors	40	5
Contractors	40	5
Total Target Population	**260**	**100**

The research's data collection instruments comprised questionnaires, interviews, and direct observations. The research utilised unstructured interviews in conducting both focus group and in-depth interviews the qualitative was analysed electronically, using computer-aided software,

such as IBM SPSS Statistics version 26 and NVivo Software, to interpret the transcribed information. Validity and Reliability refer to legitimacy and unwavering quality of examination as part of quantitative exploration. Saunders et al. (2007:102) and Krishnaswamy, Sivakumar, and Mathirajan (2006:144). According to Saunders *et al.* (2009:193), the objective of morals in examination is to guarantee that trustworthiness and experimental legitimacy, and dependability in quantitative exploration is present or that reliability in

qualitative examination are set up and that there is no creation, contemptibility and written falsification.

FINDINGS

Summarising the primary research outcomes on the models used by mobile operators in South Africa in their outsourcing strategy, findings reveal that the majority of technical demands, particularly in technical infrastructure, were done by the outsourcing service provider.

Outcomes on Mobile Industry Outsourcing Models
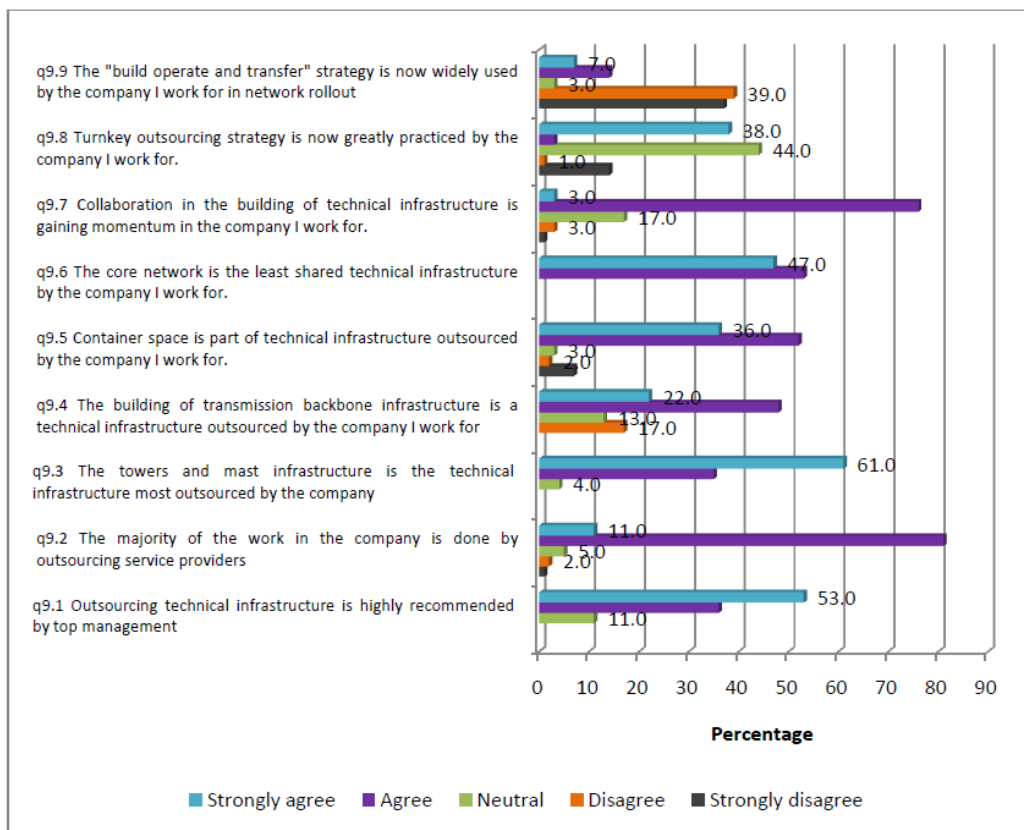
Figure3. *Summarised Outsourcing Strategies in the Mobile Industry*

Findings further show that towers, mast infrastructure, container space, and the building of a transmission backbone were the most

prevalent outsourced infrastructural competencies by the outsourcing clients. (Figure 4).
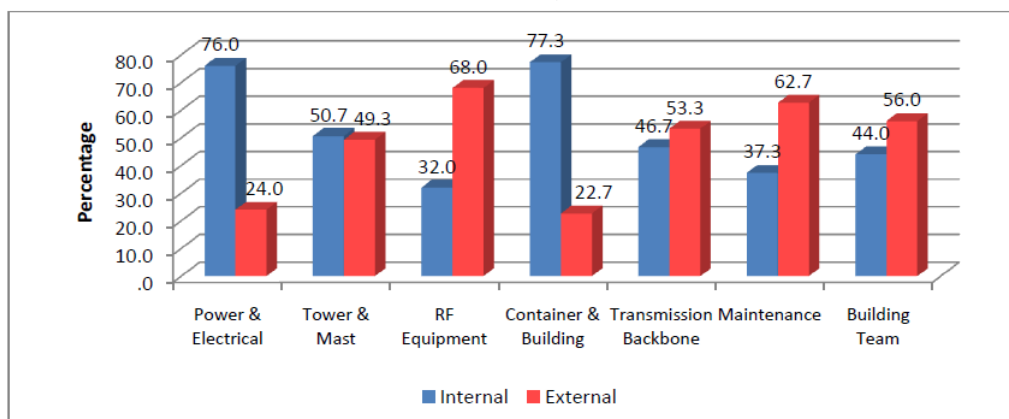
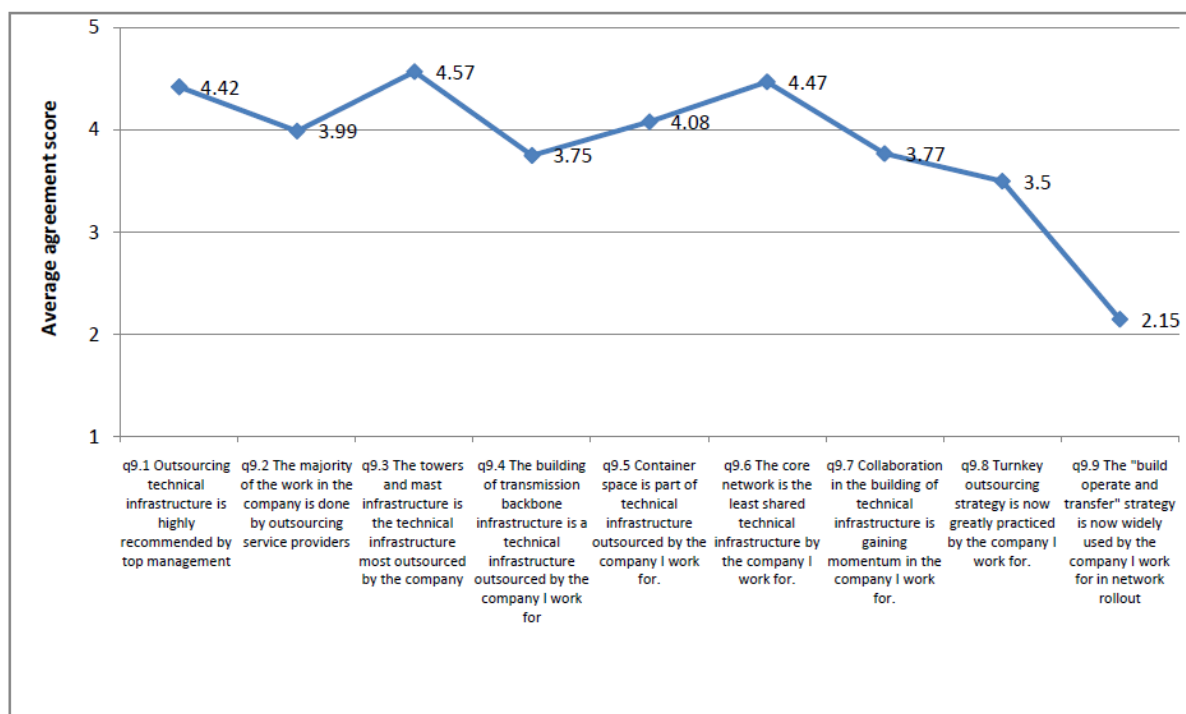**Figure4.** *Internal and External Outsourcing Relative to Outsourced Infrastructure*

Figure5. *Statistical Significance of Average Agreement Scores on Outsourcing Models*

While core network was revealed as least shared network infrastructure a BOT strategy by mobile operators was revealed to be uncommonly used within the South African mobile industry.

Determining the Level of Work Outsourced to Service Providers

Research findings from empirical data revealed more of selective outsourcing strategy of and that concerning the Technical Infrastructure most outsourced the study revealed that tower and mast infrastructure and skilled staff constituted the most outsourced phenomena as well as skilled staff. From the nine possible technologies and infrastructure, findings reveal only two as most outsourced technical infrastructure and competencies. The study shows that there are external and internal factors that influence outsourcing decisions from top management. In relation to the mobile industry of South Africa, these are explained as follows:

Internal Factors that determine Outsourcing Strategies

Internal factors included; the need for the mobile operator to focus on its core competencies and leave specialised skills that have a direct bearing on their overall competencies to outsourced service providers; the need by the mobile operators for service quality guarantees upon engagement with an outsourced service provider on improved mobile service quality to the ultimate clients. The significance of the internal factors is the impact of the outsourced technologies on an improved mobile subscriber base due to newly attained mobile service qualities. Meddour, Rasheed, and Gourhant (2012) maintain that mobile operators seek to be more flexible and increase growth potential by focusing on their core business and achieving all peripheral activities.

It was found critical to consider firm specific factors such as strategic objectives and the assets and capabilities of the company. The preservation of the mobile operator's corporate image was therefore established a factor that influences an outsourcing strategy. From the empirical evidence, outsourced core competencies were found to advance the branding strategy of the engaged mobile operator.

External Factors that Influence Outsourcing Strategies

External factors are the industry related factors such as industry structure, a comparison between the cost of outsourcing against the cost of internal development; and also the distinctions on the types of players available in terms, market position and strategic incentive among others. Empirical evidence pointed to compliance with OHSCA regulations, performance capabilities of the outsourcing service provider as critical external factors to an outsourcing strategy in the mobile service

industry. The need to attain a competitive advantage was further highlighted by empirical evidence as another external factor to outsourcing. These assertions resonate with Feeny *et al.* (2012), who stress that outsourcing provides a key link to competitive advantage, where the specification and management of "right sourcing" develops an improved presence in the mobile operator market. Research findings concur that, both internal and external factors of an outsourcing strategy in the mobile industry, play an equal role in determining outsourcing decisions that have a principal objective of advancing qualities in service delivery. This in turn, brings about positive synergies to competitive advantages, as well as an improved subscriber base for the outsourcing clients.

Outsourcing Models Currently Employed by the Mobile Industry

The mobile industry in South Africa makes use of three main outsourcing models, in order to conduct their technical infrastructure outsourcing support services. Empirical evidence from the research established that MNOs use Turnkey outsourcing, BOT outsourcing and collaborative outsourcing strategies. Primary research findings reveal that mobile operators in South Africa mainly use a Turnkey approach, followed by a collaborations strategy to outsource technical infrastructural services. The BOT strategy is the option least employed by the mobile industry operators. These models are analysed in detail below. As the contingency approach explains, the choice of outsourcing strategy/ model to a greater extent the scenario based approach is best to use to effectively manage change and remain competitive. Adamantia et.al. (2005) conclude in their study that the current highly volatile and dynamic environment need not have a traditional approach but quick and prudent short and long term decisions because of the abrupt evolutions in mobile technology that have both threats and opportunities to telecoms players.

Turnkey Outsourcing Strategies

Mobile industry operators are comfortable in using the turnkey model to outsource technical infrastructure in the industry. This is evidenced by a cumulative majority (85 percent) of the research respondents. After successful completion and site testing for desired outputs, the "key" is given to the mobile operator. This augers well for the competitive principals and the need to safeguard intellectual property,

which is rampant in the mobile industry of South Africa.

Research identified several drawbacks associated with the turnkey outsourcing strategy; concerns with content limitations, where turnkey solutions do not allow for any variation from their design templates also, ownership of the blueprints used in the strategy; usually control must be maintained of the technological design scripts and software (Ahola *et al.,* 2008). This scenario makes it difficult for the mobile operator to engage other outsourcing providers, in the event that the turnkey provider is no longer available.

The Relationship between Outsourcing and Performance

The research reveals that there is a positive correlation between outsourcing of technical infrastructure and the performance of the mobile industry operator. Outsourcing in the mobile industry has a positive impact on quality of service delivered, efficiency of the operator, and quality of the network provided by the operator and customer base growth, as well as the maintenance of a competitive advantage by the mobile operator.

Service providers are expected to have the capacity to interpret the density of demand and identification of the types of services appropriate to support the different client niches. A cumulative of slightly above three quarters, (78 percent) of findings highlight small and large positive impacts to mobile service delivery due to outsourcing strategies. The mobile operators with a 20: 80 (internal and external) outsourcing ratio are the major beneficiaries of improved service delivery in outsourcing strategies. It is critical to point out that this group consists largely of vendor operators and virtual mobile operators. The attainment of a competitive advantage was found to resonate with a majority of (88 percent) of the research participants views expressed in the study. Feeny *et al.* (2012) outline the key characteristics amplified in a core competency theory as customer focus, knowledge basis and a link to competitive advantage. This involves the specification and management of "right-sourcing".

Benefits of Outsourcing in the Mobile Telecommunications Industry

Empirical evidence identified the need to control and manage Capex and Opex expenditures, access to technical expertise,

realisation of a competitive advantage, the ability to focus on core operations, and access to resources, as the major benefits realised from mobile operators' outsourcing stratagems. The process of strategic outsourcing typically begins with strategic managers identifying the value chain activities that form the basis of a company's competitive advantage (Lowndes, 2010). On the other hand, (Meddour, Rashed, & Gourhant, 2016), highlight that cost saving is the main driver to decision-making towards an outsourcing strategy in the mobile telecommunications industry, due to the high costs involved in infrastructural development and maintenance. Medout *et al,* (2012), however, stress the significant financial benefits for mobile operators in the long run that are realised as ROI in situations where a "right – sourcing" strategy is accomplished. Increased network capacities ensure minimal call drops and world class data communication service qualities provided by the mobile operators (MTN South Africa, 2013).

Access to technical expertise and functional infrastructural resources in the mobile industry were found to benefit largely the 20:80 and 40:60 ratio groups in an outsourcing strategy. These groups are largely a constituent of virtual mobile operators and vendor operators who do not have infrastructural resources of their own, Meddour *et al.* (2012) stress that virtual mobile operators tap into established infrastructure of stable MNOs, who already enjoy and own their own network architectures and topologies for a fee.

Risks of Outsourcing in the Mobile Telecommunications Industry

Empirical data highlighted the risk of mobile operators' data being compromised by third parties, below expectations of operational cost reduction projections and the existence of hidden costs, as well as loss of business knowledge and lack of knowledge transfer, organisational culture mismatch, and a failure to achieve mobile subscriber satisfaction.

The lack of knowledge transfer and business knowledge is found to be common in outsourcing models, such as the BOT strategy. For the minority section of South Africa's mobile industry operators who employ this strategy, the main challenge becomes significant when the "key" is given to the operator to run the built and functional technical infrastructure and its maintenance.

The threat of data compromise from third parties is highlighted in several research studies on mobile telecommunications outsourcing strategies. Mobile operators constantly fear the loss of data and technologies to their rivals. Primary data reveal that the compromising of data is a major risk among the research participants, with a sig mean value of '3.57'. The vendor operators in effect become middle men, facilitating the technology transfer and or setup from their suppliers to the mobile operator client. Therefore, mobile operator data security is relatively exposed by the involvement of unknown third parties providing solutions behind the contracted vendor operators.

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

Factors Influencing Outsourcing of Technical Infrastructure

Most mobile operators in South Africa decide outsourcing options premised on the need to gain a competitive advantage, a desire to attain service quality guarantees for their specific subscriber bases and the need to protect their corporate identity. The need to comply with the statutory mobile operator regulatory frameworks was determined as one of the main drivers to an outsourcing strategy. However, the need to reduce operational costs was not a major factor of influence among the respondents. High operational costs, determined in economies of scale, are critical in opting for an outsourcing strategy. There are transaction costs evaluations that must always be strategically quantified to ensure and inform when and which partners to outsource in telecommunications infrastructure corporates. The respondents' assertions attempt to determine that they are vulnerable to hidden costs particularly in outsourcing options that have limited coordination between the client and the outsourcing provider.

Outsourcing Models Currently Employed by the Mobile Operators

Turnkey outsourcing option resonates well with most of the research participants in the phenomena. The Build-Operate-Transfer is the least commonly employed in mobile operator services in South Africa, whereas collaborations are the second best options of the three options. Quite rightly, the BOT strategy in outsourcing is expensive as the outsourced service provider maintains the operation of the mobile network infrastructure in which the costs of maintenance have a long cycle of revenue realization. This

takes away the short to long term potential for the mobile operator to gain revenue from improved infrastructure. The design of the infrastructure however is commonly found to be very competitive and specifically and highly functional when executed by the private firms (outsourcing service providers).

Relationship between Outsourcing and Performance

Analysed data showed that a positive correlation between outsourcing of technical infrastructure and the performance of the mobile industry operator exists. It is found that outsourcing in the mobile industry positively impacts the quality of service delivered, network efficiency, customer base growth and the maintenance of a competitive advantage by the mobile operator. The main areas where this relationship is largely amplified are on network service quality. Quite rightly, network service quality is found to entail the need to significantly reduce intermittent call drops, enhance inbound and outbound data speeds, and reduce bottlenecks at peak hours where most subscribers would be adding to the body of network traffic.

However, a deeper analysis of the analysed data shows that mostly vendors and contractors who clinch service level agreements with mobile operators are some of the major beneficiaries of an outsourcing strategy. This reveals again a potentially common scenario where outsourced service providers engage third parties to fulfil their contractual agreements with mobile operators. This points to deficiencies that are inherent in adequately evaluating qualified and competent outsourcing service providers in the mobile industry. However, the major point or driver to the high outsourcing relationship levels was found to be a motivation to gain a competitive advantage among the mobile operators, with established mobile players investing heavily for advanced systems in the network infrastructural development.

Benefits and Risks of Outsourcing in the Mobile Service Industry

Analysed data shows that access to technical expertise, realisation of a competitive advantage, the ability to focus on core operations, and access to resources as the major benefits realised from mobile operators' outsourcing stratagems. The need to mitigate on Capex and Opex expenditures was largely revealed in secondary literature. Analysed data shows that strategic outsourcing typically begins with strategic managers identifying the value chain activities that form the basis of a company's competitive advantage. Cost saving were found to be the main driver to decision making towards an outsourcing strategy in the mobile telecommunications industry due to the high costs involved in infrastructural development and maintenance, though depending on 'right-sourcing'.

Mobile operator infrastructure is shown to be critical for an effective network capacity supported by radio network access technologies at base stations is one of the major benefits realised from an outsourcing strategy. Analysed data showed resonance on these remarks with all internal and external outsourcing ratios reflected from cross tabulated data findings. A competitive advantage attainment was realised by Cell C upon its upgrade of ngHLR technologies in Gauteng which enabled the mobile operator to improve on its network capacity and data storage for the growing subscriber base. In addition to the competitive advantage notion, MTN's partial collaborations in its outsourcing strategy enabled the company to expand and edge out competitors even in foreign markets. Partnerships, such as the NLD Consortium, were shown to reduce Capex and Opex expenditures.

Service Level Agreements

Service level agreements have been shown to play a critical role in the outsourcing of mobile operator technical infrastructure in South Africa. Analysis of data showed that SLAs in the mobile industry are largely concerned with clarity of contractual obligations, the issues to do with non-compliance to agreements and the mitigation of risks in outsourcing options. Service level agreements were shown to provide a middle ground in which terms of engagement are tacitly crafted. Analysed data shows that SLAs are designed to explicitly specify the services that a client expects, how frequent downtime may occur, correctional remedies applied when provider fails to meet agreed priorities. Consequently and expectedly, a high number of outsourcing partners in the study are well informed and have clarity of the service level agreements in the outsourcing of mobile technical infrastructure. Largely, both the outsourcing partner and the outsourced service provider are clear on the agreements that they engage in. it is revealed that the body of service level agreements must clarify warranties,

remedies, liabilities, indemnities and penalties for a breach.

Recommendations

- Encouraging Network Infrastructural Sharing Among Mobile Operators
- Strengthening of the Design of Service Level Agreements
- A continuous Evaluation and Upgrade of Internal Core Competencies
- Advocating for a Balanced Consideration on BEE Certified Contractors
- Encouraging Turnkey and Collaborations over the BOT

- Regulatory frameworks for the Mobile Telecommunications Industry
- Comprehensive Competency Profiling and Evaluations

The conceptual framework is mapped from the factors that stood out from contemporary research information and conclusions as well as the current study results and conclusions

The conceptual Model for Outsourcing technical Infrastructure

Below is recommended and summarised six criteria of the research findings which were established for effective and profitable outsourcing of mobile network infrastructure in South Africa
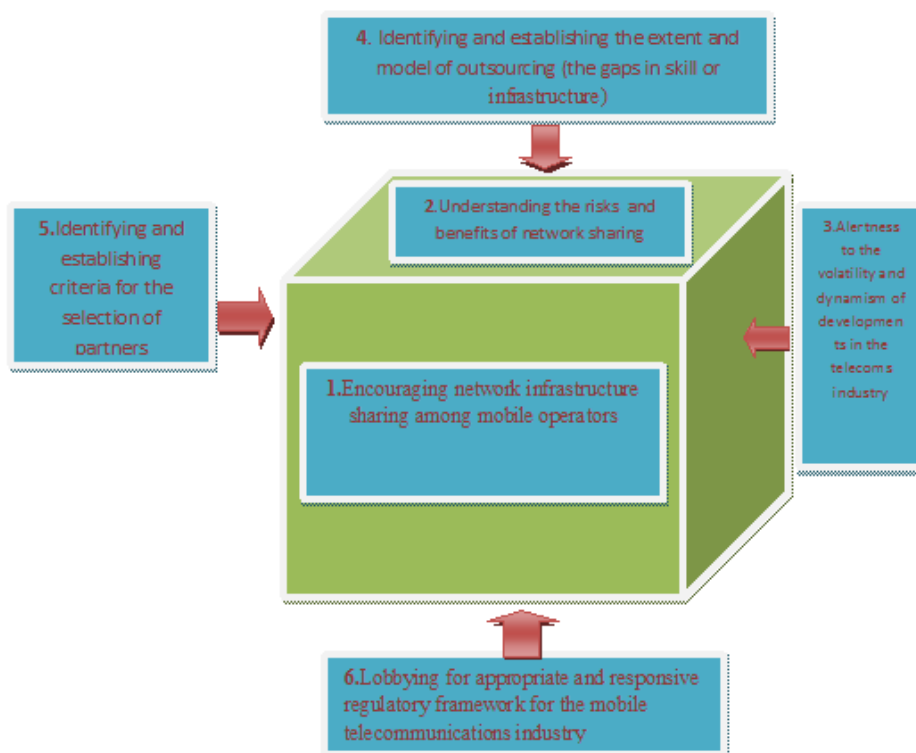
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