

Assessing The Effect of Vendor Performance Management on Service Delivery and Network Uptime in The Telecom Industry: A Conceptual Review

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Abstract- The telecommunications sector relies heavily on a vast network of third-party providers to maintain its critical infrastructure, network operations and provide end-to-end service quality. The ability to effectively manage vendor relations is now a key driver of the operational resilience of telecom/ISP operators as networks become more complex, as 5G technology is deployed, fibre is expanded and as cloud-native technologies are adopted. This paper gives a conceptual analysis of vendor performance management (VPM) and its impact on service delivery and network uptime in the telecom industry. The review also consolidates the literature on the subject and applies the findings to the examination of VPM practices and their impact on contractual compliance, service level agreement (SLA) adherence and network availability metrics, leveraging theory from Principal-Agent Theory, Balanced Scorecard and IT Infrastructure Library (ITIL) vendor governance models. The paper outlines various key dimensions of VPM including KPI framework design, governance of contracts, relationship with suppliers, and performance feedback system and critically discusses their theoretical foundations and practical implications in a telecom environment. Results indicate that operators that have established well-developed vendor governance frameworks consistently achieve better results with respect to network uptime and service continuity, but there are still many unclear measurement standards and loose vendor governance structures across the field. The review also points out a mismatch with respect to the models of vendor governance and how they are implemented in the telecom operational context. Guidance is provided on how to create outcome-focused VPM frameworks that are integrated. This paper is a part of the body of knowledge on supply chain governance, IT service management and telecommunications operations management.

Keywords: Vendor Performance Management (VPM); Telecommunications Sector; Service Level Agreement (SLA); Network Uptime; Vendor Governance; Service Delivery; IT Infrastructure Library (ITIL).

I. INTRODUCTION

The telecom sector is one of the sectors most reliant on vendors in the world of critical infrastructure. Maintaining operational continuity is a persistent challenge for network operators, who routinely depend on equipment vendors, managed service providers, tower providers, and software vendors to keep them going (Peppard & Ward, 2016). The result of this dependency is that the quality of service and network uptime - is not just determined by their internal capacity, but is strongly linked to that of external parties. Vendor Performance Management (VPM) is the systematic management of organisations' supplier performance through the establishment, tracking, measurement and enhancement of their performance towards contractual and operational requirements (van Weele, 2018). Especially in the telecom industry, where network availability is a commercial as well as regulatory and societal requirement, the consequences of poor vendor governance are high. Vendors that cause service disruptions face financial loss, damage to reputation and may be subject to regulatory reprimand in certain jurisdictions.

Although its operational relevance, VPM is an incompletely theorised and under-studied field in the telecom industry. Other related fields like supply chain management, IT service management and contract governance have built up substantial bodies of knowledge, but VPM literature in the field of telecommunications is still in pieces and parts (Handley & Benton, 2013). The gap is especially stark on VPM and technical performance metrics like network uptime, mean-time-to-restore (MTTR). In this paper, an effort is made to fill this gap by presenting a theoretical conceptual review of the theoretical frameworks which could be applicable to

telecom VPM and assessing their applicability to service delivery and network uptime outcome. The review is based on thematic sections including: theoretical foundations, KPI and SLA designing, supplier relationship governance, and performance feedback mechanisms. The paper brings all of these views together to offer a clear analytical underpinning for academic researchers and industry professionals to better understand and enhance the governance of vendors in telecom operations. The review also follows the emerging understanding that in today's network disaggregation and multi-vendor open architecture world, the governance of vendor ecosystems is tied to the governance of network quality.

II. THEORETICAL FOUNDATIONS OF VENDOR PERFORMANCE MANAGEMENT

VPM has a theoretical underpinning, which spans across multiple disciplines. Perhaps the most lasting framework for understanding vendor relationships, Principal-Agent Theory comes from the fields of economics and organisational behaviour. The theory suggests that if the party doing the delegating (the principal in this case, the telecom operator) entrusts another party with tasks (the agent in this case, the vendor) there are risks that the other party will not do what's best for the delegating party (Eisenhardt, 1989). In telecom, this is especially interesting: A vendor who is managing the network elements can have a greater technical understanding of the assets in that network, whereas the operators can only assess the metrics and SLA compliance reports, which provides ample incentive for a network element vendor to take advantage of operators.

In the procurement and supply chain literature the Balanced Score Card (BSC) framework of Kaplan and Norton (2005) has been adapted widely and has been used to assess vendor performance from a variety of aspects and dimensions – financial, operational, relational, and developmental. The BSC can be used in the Telecom industry to shift the emphasis from simply measuring technical KPIs (e.g. uptime percentages) to a more comprehensive measurement that includes KPIs such as Vendor

Innovation Capability, Relationship Quality, and Strategic Alignment. Such a multi-dimensional view is particularly important in today's telecom world, where the quality of the network is increasingly co-produced among a variety of vendors and partners.

The ITIL (IT Infrastructure Library) series have offered an operationally-based approach to supplier management in an IT and telecommunication services environment. ITIL's Supplier Management process prescribes the practices regarding contract negotiation, performance review and continuous improvement and the theoretical constructs of VPM (Axelos, 2019) are highly similar. It has been widely adopted in telecom organisations, and is thus an important benchmark for a conceptual review of VPM for these organisations.

These two frameworks set out that effective VPM is not a single contract but a multi-layer governance approach which needs to span the strategic, operational and relational dimensions. Importantly, none of these theories is enough on its own – they need to be used together to create a more robust governance structure. Agency theory is used in combination with relational and process models, which is understandable with the complexity of telecom vendor ecosystems where technical, commercial and behavioural dynamics constantly influence the outcome of the performance of the networks.

III. KPI DESIGN AND SLA STRUCTURING IN TELECOM VENDOR GOVERNANCE

Key Performance Indicators (KPIs) and Service Level Agreements (SLAs) used to assess and monitor vendor performance have a significant impact on the effectiveness of VPM. SLAs are contractual agreements between the operator and the vendor and outline the expectations for availability, response time, fault resolution and escalation. But the literature has repeatedly identified incongruence between design intentions and effectiveness of SLA (Goo et al., 2009). The SLA should be an outcome-based, not activity-based, in the telecom scenario. Input-based SLAs, like number of maintenance visits, or hours of engineering support, have limited predictive power

with regards to network up time outcomes. The SLA that can be directly linked to availability metrics, MTTR and incidents impacting customers is more aligned with operational objectives, compared to other SLAs (Selviaridis & Wynstra, 2015). This distinction is relevant as it gives rise to the following implications: the information asymmetry which can be exploited by vendors for underperformance is reduced in operators that organize the SLAs around outcomes, consistent with the requirements of Principal-Agent Theory.

KPIs in telecom VPM usually include availability-related metrics (such as percentage of network uptime), responsiveness-related metrics (such as time to respond, MTTR), quality-related metrics (such as defect rates, repeat fault rates), and compliance-related metrics (such as percentage of changes in accordance with change management). The difficulty of course doesn't just come in picking the right KPIs, it's whether the data they provide is accurate (data integrity). This is an acknowledged weakness in the reporting of vendors that might lead to manipulation and presentation of data. Therefore, independent verification mechanisms, automated network monitoring tools and contractual audit rights are essential in order to make SLAs more than just a static document, but a tool for governance. In addition, KPI frameworks need to be updated regularly to keep them in line with changing network architectures. With the shift towards virtualised and software-defined infrastructure in the telecom sector, traditional hardware-focused measures are becoming useless and are being replaced with new measurement paradigms that include software performance measures, API reliability and availability of cloud infrastructure, in addition to the traditional hardware uptime.

IV. SUPPLIER RELATIONSHIP MANAGEMENT AND ITS INFLUENCE ON NETWORK UPTIME

In addition to contractual arrangements, the relational aspect of vendor governance is also important for outcomes of network performances. Supplier Relationship Management (SRM) has been proven in the broader supply chain literature to have a positive

impact on the performance outcomes of such relationships via trust, knowledge sharing and collaborative problem solving (Cousins et al., 2008). For telecom, whose vendor ecosystems are extremely dependent, and where network faults can involve many parties, the impact of inter-organisational relationships on the quality of restoration time and proactive maintenance behaviours is significant. A vendor that is seen as a strategic partner is more likely to invest in assets that are specific to the relationship, like a dedicated support team, a jointly developed monitoring system, and a joint outage prevention effort, that directly lower outage frequency and duration.

The differences between transactional and relational vendor governance model have already been discussed in the procurement literature (Cox, 2004). Relational governance focuses on value creation, risk sharing and improving over time, while transactional governance provides cost minimising and monitoring of contractual compliance. As complex and integrated vendor ecosystems are built and become more common in the telecom industry, especially in 5G and open RAN, transactional governance is becoming increasingly inadequate. If though several vendors provide the same network service layer, then the fault resolution logic is more dependent on a collaborative protocol than rules enforced in a contract and the blame falls on the involved ones.

Industry experience, as summarised by TM Forum, shows that operators who have a structured SRM programme and regularly review their performance in joint services, have SRM programmes with vendor development and have executive level governance over their services, are more likely to report fewer long service outages and better vendor responsiveness than operators who focus strictly on SLA enforcement. This relational capital can be especially important in large network events, technology migrations or when there is a disruption in supply chain, as the ability to flexibly respond to the crisis in a cooperative way from vendors can mean the difference between experiencing a service degradation and a long ramp up of end-users and regulatory requirements.

V. PERFORMANCE FEEDBACK MECHANISMS AND CONTINUOUS IMPROVEMENT IN VPM

A well-developed VPM system has a well-developed conceptualization of feedback mechanisms that make VPM data into processes for improvement. Without such mechanisms, it becomes a compliance process instead of a governance tool for VPM. In the telecom space, with technology generations constantly changing the needs of the network, continuous improvement capability in the vendor management cycle is more than just desirable: it's essential. The Plan-Do-Check-Act (PDCA) cycle is a theory which has been widely used in Quality Management and incorporated into the Continual Service Improvement (CSI) of ITIL (Deming, 1986). Applied to VPM the cycle requires performance data gathered in the Check stage of the cycle (KPI monitoring and SLA review) be fed into the Act stage to support the revision of vendor requirements, the revision of the contract itself or a capability development plan, instead of just archived as compliance data.

In the telecom VPM practice, monthly performance review meetings, quarterly business review (QBR) and annual strategic review are the key institutional forums for exchanging performance feedback. The literature indicates that the mechanisms can be effective if reviews are conducted regularly, participants have high status, data presented is of quality and if the results of reviews are formally recorded and monitored (Lumineau & Malhotra, 2011).

Furthermore, the use of Digital performance management platforms, including vendor score cards, that are integrated with enterprise resource planning (ERP) or IT service management (ITSM) has been highlighted as one of the important enablers of responsive vendor governance (Rahman & Arifur Rahman, 2022). These platforms provide visibility to the performance in real time, automate escalation actions and enable trend analysis over time, significantly enhancing the telecom operator's ability to identify issues with poor vendor performance before they impact service. These digital tools are not just for detection purposes, however—they also

facilitate predictive governance to help operators proactively identify potential performance trend deterioration, and initiate remediation conversations with vendors in advance, instead of after service disruption has taken place, and impact has been experienced by customers.

VI. IMPLICATIONS OF THE STUDY

Both practice and scholarship are of importance when considering this review. It is important for telecom operators to transition from compliance-based to value-based vendor management, especially with the addition of 5G and open RAN deployments and the growing complexity of networks. The combination of Principal-Agent Theory, BSC and ITIL offers principles and practices that are useful to procurement and operations professionals to redesign VPM systems. The review also identified a significant lack of empirical research examining the direct link between the maturity of VPM and measurable network performance outcomes, in the field of telecoms, highlighting a rich area for future work that will investigate this link in both a quantitative and qualitative manner and across various market contexts.

VII. RECOMMENDATIONS

To minimize incentive misalignment as per Principal-Agent Theory, Telecom operators should move towards outcome-based SLA frameworks which are directly tied to metrics like network uptime and MTTR to the vendors. KPI structures should include a way to verify the data to mitigate data integrity concerns with vendor reported performance regimes. The operators need to put in place formalized programmes of SRM for strategic suppliers, move from transactional to relational governance, especially in the context of 5G and open RAN. Structured reviews of business performance should be incorporated within quarterly meetings and be supported by digital vendor scorecards which are part of the ITMS platform, making performance feedback loops institutionalised. Regulators should enforce minimum VPM standards with licensed telecom operators to have a uniform minimum governance standard industry-wide.

VIII. CONCLUSION

This conceptual review has shown that Vendor Performance Management is a multi-dimensional governance system which is designed and matures to a great extent service delivery and uptime of the network in the telecom industry. Based on the Principal-Agent Theory, Balanced Scorecard and ITIL concepts, the review shows that integration of KPI design, outcome-based SLAs, supplier's governance based on relational aspects and institutionalised performance feedback systems are critical for effective VPM. As the technology becomes more complex in the telecom field especially with the emergence of 5G strong VPM is not only a procurement best practice, but a business operation needs. The conceptual propositions can be pursued in future research in the context of different telecom market situations, with the aim of obtaining empirical validation.

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