

The Hong Kong Polytechnic University
Department of Logistics and Maritime Studies
Research Seminar

Investigating Practices in Telecommunications Supply Chain Management

by

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(Conducted in English)

Abstract:

This thesis aims at investigating some important issues in telecommunications industry.

The first study looks at the fixed broadband industry, and studies the settlement problem among Internet Service Providers (ISPs) who interconnect with each other through a Network Access Point (NAP). A cooperative game framework is adopted for the analysis. Two commonly adopted allocations, i.e., the non-settlement profit allocation and the Shapley-value based profit allocation, are analyzed and compared. We check whether these two allocations can encourage ISPs to interconnect with each other (i.e., in the core of the game) and, at the same time, demonstrate fairness in settlement. Our results show that the non-settlement allocation is not in the core and does not preserve fairness, and the Shapley-value based profit allocation is in the core and demonstrates fairness. However, the complex structure of Shapley-value makes it difficult to understand for ISPs and hard to be implemented at NAP especially when ISPs can only make their pricing decisions independently. Therefore, we propose a Characterized Profit Allocation (CPA) which is in the core, preserves fairness and is easy to interpret. We further propose a settlement rule based on CPA which enables the ISPs to act independently but achieve global optimality. We also extend our basic model to incorporate interconnection quality decisions and market competition, and show that the proposed settlement rule and its extended form work well in these scenarios. Numerical experiments confirm that CPA and its corresponding settlement rule can effectively encourage interconnection among ISPs and motivate ISPs to expand their networks.

The second study looks at the mobile broadband industry, and investigates the impact of Sponsored Data Plan (SDP) on players on the telecommunications supply chain. Sponsored data plan is an emerging practice, where users' data usage does not count against their data cap, and instead, Content Provider (CP) pays to Internet Service Provider (ISP) for its users' data usage. A Stackelberg game consists of one ISP and one CP is formulated, and CPs are categorized into Subscription CP and Platform CP to be studied respectively. ISP's pricing decision and CP's subsidization decision are derived, and the impact of SDP on ISP's and CP's profit and users' benefits are examined. We show that SDP can facilitate more users to access mobile Internet and lower their data usage cost. ISP always finds it profitable to offer Sponsored Data Plan (except for a specific case). For Subscription CP, SDP always decreases its profit; for Platform CP, SDP can increase its profit when its profitability is modest. We also extend the basic model in two directions. First, we incorporate the quality decision of Subscription CP, and numerical experiments show that Subscription CP can actually benefit from SDP when it makes the subsidization decision and quality decision at the same time. Second, we investigate the case where ISP can charge different prices for end-users and CPs.

Bio:

PU Yaqi received her BSc in Information Management and Information Engineering from Zhejiang University. She is currently a PhD candidate in Department of Logistics and Maritime Studies, The Hong Kong Polytechnic University, and a PhD candidate in Department of Management Science and Engineering, Zhejiang University.

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All are welcome!