WiFi Data Offloading: Churn Factor Measurement in Coopetition

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WiFi data offloadingis a technique by which the network traffic is reduced. Naghsh Aval Keyfiat company has a business model in a WDO implementation project by which all elements are recognized. One of these elements is the partners. In this case, there is a cooperative competition, called coopetition. The paper on hands addresses a controlling method of the partners to stop cooperation with them when it is required. This control is taken into account by measuring the churn factor (CF). Numerical results demonstrate the performance of the proposed method and prove the need to have such a controlling method.

INTRODUCTION

One of the most important challenges these cell phone operators have been facing is increasing data traffic. Meanwhile, the exponential increase in costs and the lack of an appropriate income increase is also the biggest challenge for the operators. With the growing number of devices connected to the network and the increasing need for them to connect to mobile networks and transfer their data, it may seem that the operators will generate revenue through the sale of bandwidth and data. But in practice, the data consumed by a device will be very small compared to the average revenue per user (ARPU).

A significant number of mobile operators use the Wifi data offloading (WDO) technique to reduce network traffics (Aijaz, Aghvami, and Amani 2013). WiFi access is free in some public areas, and most homes and offices have access to it with smartphones. In fact, it is not hard to encourage subscribers to use WiFi, as most subscribers have experienced it. An effective method for the WDO is to expand the operator's network of access so that they can directly manage their hotspots, whether they own the master or leasing it. To this end, operators must lower their operational expenses (OPEX) so that they can manage the growth of their network-connected devices. One of the best and least costly ways to deal with this problem is the WDO.

Today in the mobile telecom industry, dealing with expanding data traffic, expanding costs, and not increasing the proportion of revenue is among the most important challenges faced by mobile operators. The best and least costly way to deal with this increase is the WDO. A significant number of mobile operators use the WDO technology to reduce network crashes. The use of the WDO is one of the innovative ways to manage part of the tremendous traffic and has recently been welcomed by operators due to lower costs compared to other technologies. For example, China Mobile has increased its number of hotspots by the end of 2012 by 1 million (Aijaz, Aghvami, and Amani 2013). This method is mainly used in the telecommunications industry, and in particular the mobile telecommunication industry.

In fact, Aijaz et al. (2013) point out that WiFi hotspots are designed to reduce congestion on cellular networks. Operators can persuade their subscribers to use WiFi hotspots by offering attractive packages. For example, Vodafone UK introduced a data packet that provides 1 GB of data monthly in each of its hotspot areas (Aijaz, Aghvami, and Amani 2013). Therefore, it can be easily claimed that applying the strategy of WDO is inevitable. Meanwhile, WiFi has been taken into account of factors such as the possibility of operating in the unlicensed bands of 2.4 GHz and 5 GHz, as well as more economic issues. Another reason for WiFi's success is the industrial mechanisms used in advanced economies.

In the literature, WDO is referred to as a win-win strategy. Of course, this process is not an issue and faces various challenges such as infrastructure, services, pricing, business models, and the lack of relevant standards (Rebecchi, Dias de Amorim, Conan, Passarella, Bruno, and Conti 2015). Beneyam, Haile, Mutafungwa, and Warma (2012), who reviewed and evaluated the affordable data business model in Africa, point out that among the existing strategies, the WDO is considered as one of the most effective. Also, it should not be forgotten that WiFi access is often seen as an added value that will appeal to consumers (Gabriel 2015). Therefore, many service providers have chosen WiFi as a reasonable strategy for data traffic over cellular networks, given their limited range of radio stations. In fact, they were faced with the following questions (Gerhardt, Medcalf, Taylor, and Toouli 2012):

- Is this an opportunity or threat?
- Is this a cost-effective or revenue-generating strategy?
- Do business models go beyond the data drainage process?
- What is the return of this investment?

Actually, one of the most important developments in recent years has been the considerable expansion of WDO strategies and the move towards WiFi integration as the heart of the network and business model (Caroline Gabriel 2013). Key considerations for operators include hotspot locations, pricing strategies, and facilities.

Business models are main pars of all industries. Wrong business models lead to the failure of organizations to achieve its goals. Since the formation of the business model literature, we have seen several researchers address the definitions of business models and their dimensions and components. Researchers have given different approaches and priorities to define the business model. In addition to this, various researchers have presented several dimensions and components. A business model is a framework for creating money and wealth. This framework shows how and when a firm should do what it needs to do, so that customers will benefit from what the firm expects to achieve, and that the firm will benefit. The business model determines how a company can make money or profit, and for that purpose, identifies where the company is located in the value chain.

According to Osterwalder and Pigneur 's definition of a business model (Osterwalder and Pigneur 2009, 2010), a business model is how a company values, delivers, and derives values from a product or service. That is why they (Osterwalder and Pigneur 2009, 2010) introduced a new concept called a business Canvas in the same sense. A business Canvas is a schematic approach that represents the element of a business model. These elements are customer segments (CS), values proposed (VP), channels (CH), customer relationship (CR), revenue flows (RS), key resources (KR), key activities (KA), key partners (KP) and cost structure (CS). The Canvas is a strategic and managerial tool that allows each manager to describe, design, and analyze the business model. One of the key features of this tool is the ability to challenge the business model. Thereby, it is possible to use a plurality of views and to have the benefits of employing teamwork.

Using the Canvas, resources for creating value can be better identified and mapped to the strategic goals of the organization. With this Canvas, you can make the best decisions for business development at the most appropriate times. The comprehensiveness of the Canvas makes it easier to understand and simplify it in terms of its nine important elements and its simplicity and thus more help to a business. In the opinion of many experts, the business Canvas is specifically for the business learning cycle.

The Canvas indicates the partners and cooperators. A cooperator may appear as a rival. In fact, there is a competition along with cooperation. This phenomenon is called coopetition (Nalebuff 1997). Therefore, in all cases there is a need to control them and know their latest status. In fact, coopetition is formed to create the synergy. So, if it leads to have a worse result than working alone, it must be finished. Churn is a phenomenon, which happens when the customers intend to use the products or services of our rivals. There are some references in which this phenomenon is studied (Park, Jung, and You 2015; Gürsoy and Tuğba 2010; Danish et al. 2015). This paper wants to model it as a linear equation regarding four factors called quality, price, brand, and changing barriers. Mokhtarnia and Amini (2018) developed a Canvas for the WDO of NAK in Iran and analyzed it in aspects of two criteria in different types of cooperation:

- Break-even point *(BEP)*
- Return of investment *(ROI)*

This paper aims at dealing with the proposed model of that paper. We introduce a controlling method for the cooperators in order to find out the possible churn of the host's customers to them. In fact, the host must be informed about the guests not to lose its customers. Section 2 provides the readers with the details of the problem. Then, section 3 gives some numerical examples and reports and analyzes their results. Finally, section 4 concludes the paper.

PROBLEM DESCRIPTION

This paper deals with a real problem of Naghsh Aval Keyfiat (NAK) Company, which is going to run the WDO. Its canvas is designed by Mokhtarnia and Amini (2018), figure (1). NAK wants to share its hotspots with some of its rivals in Iranian market. This decision is made to make income by renting the hotspots while it is using them. There are two types of costs: Capital Expenses *(CAPEX)* and *OPEX*. *CAPEX* includes Access point (AP) purchasing and implementing, core, and transmission network costs. Furthermore, *OPEX* includes site renting and acquisition, AP maintenance, core maintenance, transmission network maintenance, governmental, and other costs. Considering a rival as a partner, NAK is able to whether reduce its *CAPEX* by sharing it or increase its income by charging the partner.

An important criterion, which must be taken into account, is the risk of cooperation. Each rival is possibly able to convince the NAK users to churn form the NAK to itself. It strongly depends on the power of the rival. Four factors are introduced to measure the churn level of users:

- *Quality*: The most important factor in a competition is the quality of products or services. Experts score this factor by comparing two competitors. The score of each side is measured according to the number of obtained votes.
- *Price*: Users significantly seek for finding an inexpensive service. This factor is measured by finding the share of each operator's price in the total one.
- *Brand*: This factor is highly effective for users' decision-making. Sometimes they do not know about the reason for their decisions while they have made them by the existing image of a brand. This factor is scored by questionnaires.
- *Changing barriers*: Churning are not always the best decisions for users. They may be unhappy with qualities, prices, and brand, but there are some barriers for them to change the operator. It can be some fixed costs the have incurred to use the current services. Then, it may not be logical for them to change the operator. This factor is valued as a binary variable. It means that if the barrier of an operator is more than its competitor, it scores 0 and the competitor is assigned 1 as the score.

Fist three factors are leveled in the range [0 1] in which 0 means that NAK is perfect in that factor and 1 means that its rival is completely better in it. Table (1) presents the relationships between these factors and the level of churn.

TABLE 1
RELATIONSHIP BETWEEN FACTORS AND CHURN

Factor	Relationship with churn
Quality	-
Price	+
Brand	-
Changing barriers	-

In addition, there are following assumptions for this study:

- Equipment and facilities are instant during the planning horizon
- The power of rivals will not decrease during the planning horizon
- Income growth does not happen in compare to what is predicted at first during the planning horizon

Regarding the assumptions and the introduced factors, $CF = W_0 + \sum_{i \in I} W_i\, x_i + \sum_{(i,j) \in I} W_{ij}\, x_i x_j + \sum_{(i,j,r) \in I} W_{ijr}\, x_i x_j x_r + \sum_{(i,j,r,l) \in I} W_{ijrl}\, x_i x_j x_r x_l$ measures the churn factor (*CF*), where I is the set of factors, W_i is the weight of factor i, x_i is the obtained level of factor I, and W_0 is a constant level. This equation includes all relationships between factors. Simplifying the concept, this paper considers two first phrases of the equation. Table (2) provides the notations. Let X denotes the set of variables. As a result, CF_i is measured using equation (1).

TABLE 2
NOTATIONS OF THE CF MEASUREMENT MODEL

Notation	Description
x_i^Q	Variable of quality for i^{th} rival
x_i^P	Variable of price for i^{th} rival
x_i^B	Variable of brand for i^{th} rival
x_i^C	Variable of Changing barriers for i^{th} rival
W^Q	Weight of quality
W^P	Weight of price
W^B	Weight of brand
W^C	Weight of changing barriers
W^0	Constant weight

$$CF_i = W^0 + W^Q x_i^Q + W^P x_i^P + W^B x_i^B + W^C x_i^C \qquad \forall\, i \qquad (1)$$

Please note that this factor affects the data usage of the users. Final decreasing percentage of the users is measured by $\sum_i \max(0, CH_i - \mu)$ where μ is a threshold from which the churn happens. *CF* affects the data usage of NAK and, as a result, may damage its income. So, *ROI* and *BEP* are employed to measure the performance of the cooperation. These indicators are calculated using equations (3) and (4) with notations introduced by Mokhtarnia and Amini (2018) provided by Table (3).

FIGURE 1
THE WDO CANVAS OF NAK (MOKHTARNIA AND AMINI 2018)

<table>
<tr>
<td rowspan="2">KP
- Owners of WiFi hotspots
- Equipment suppliers
- Rivals</td>
<td>KA
- Acquisition of hotspots
- Designing
- Installation
- Advertising
- Sale
- Post-sales service</td>
<td rowspan="2">VP
- Variety of services and products
- Reducing prices for customers
- More compatible with different mobile phones
- Lower battery consumption of mobile phones compared to other similar services</td>
<td>CR
- Face-to-face contact via centers and offices
- Self-service communication via the website and application</td>
<td rowspan="2">CS
- Mobile operator data users
- Users of other operators
- Non-operator users</td>
</tr>
<tr>
<td>KR
- Physical: equipment, spaces, and headquarters
- Intellectual: NAK brand, NAK users, and knowledge
- Human
- Financial: NAK capital</td>
<td>CH
- NAK website
- Wifi application
- NAK store
- Public and field advertising
- NAK centers</td>
</tr>
<tr>
<td colspan="3">CS
- Equipment
- Installation and commissioning
- Maintenance and repair
- Electricity
- Lease payments
- Transfer
- Utility</td>
<td colspan="2">RS
- WiFi packages
- Existing data packages
- Promotions</td>
</tr>
</table>

TABLE 3
NOTATIONS OF EQUATIONS THAT MEASURE *ROI* AND *BEP*

Notation	Description
E_t	Income of t^{th} year
$C_{t,PAP}$	AP purchasing cost of t^{th} year
$C_{t,Core}$	Core cost of t^{th} year
$C_{t,EAP}$	AP implementing cost of t^{th} year
$C_{t,TN}$	Transmission network cost of t^{th} year
$C_{t,O}$	Renting and acquisition cost of t^{th} year
$C_{t,MAP}$	AP maintenance cost of t^{th} year
$C_{t,MCore}$	Core maintenance cost of t^{th} year
$C_{t,MTN}$	Transmission network maintenance cost of t^{th} year
$C_{t,GS}$	Governmental cost of t^{th} year
$C_{t,Others}$	Other cost of t^{th} year
α_O	Renting and acquisition share in annual income
α_{MAP}	AP maintenance share in AP purchasing cost
α_{MCore}	Core maintenance share in core cost
α_{MTN}	Transmission network maintenance share in transmission network cost
α_{GS}	Governmental share in the annual income
α_{Others}	Other cost's share in he annual income
$P_{t,P}$	Pure profit of t^{th} year
$P_{t,C}$	Cumulative profit of t^{th} year

Regarding that $C_{t,O} = \alpha_O E_t$, $C_{t,MAP} = \alpha_{MAP} C_{t,PAP}$, $C_{t,MCore} = \alpha_{MCore} C_{t,Core}$, $C_{t,MTN} = \alpha_{MTN} C_{t,TN}$, $C_{t,GS} = \alpha_{GS} E_t$, $C_{t,Others} = \alpha_{Others} E_t$, and $P_{t,C} = \sum_{t'=1}^{t} P_{t,P}$ we have:

- $P_{t,P} = (1 - \alpha_O - \alpha_{GS} - \alpha_{Others})E_t - (1 - \alpha_{MAP})C_{t,PAP} - (1 - \alpha_{MCore})C_{t,Core} - C_{t,EAP} - (1 - \alpha_{MTN})C_{t,TN}$.

$$ROI = \frac{\sum_t P_{t,p}}{\sum_t (C_{t,PAP} + C_{t,Core} + C_{t,EAP} + C_{t,TN})} \tag{3}$$

$$BEP = \max_t \{0, (x_t - x_{t-1}) \times ((t-1) \times 12 + \left\lceil \frac{\left(\frac{P_{t,C} - P_{t-1,C}}{P_{t-1,C}}\right)}{12} \right\rceil)\} \tag{4}$$

NUMERICAL RESULTS

The data is same as those provided by Mokhtarnia and Amini (2018). The readers may find them as follows:

- There are at most three rivals which can be considered as partners, called R1, R2, and R3
- The planning horizon is 5-year. The i^{th} year is called *Ti*.
- Forecasted incomes for the 5-year planning horizon are 9.54, 59.07, 103.97, 120.04, and 137.63 billion IRR, respectively.
- AP purchasing cost is 30.77, Core cost is 4.61, AP purchasing cost is 3.69, and transmission network cost is 19.08 billion IRR.
- $\alpha_O = 0.10$, $\alpha_{MAP} = 0.05$, $\alpha_{MCore} = 0.05$, $\alpha_{MTN} = 0.05$, $\alpha_{GS} = 0.05$, and $\alpha_{Others} = 0.02$

- There are two assumptions for depreciation: no depreciation (D1) and 5-year depreciation (D2).

NAK is the host and investor on this project. Furthermore, incomes have been predicted regarding data usage and capacities of NAK. We also introduce the rest parameters as follows:

- There are two different set of weights: *W1*=[0.25 0.25 0.25 0.25] and *W2*=[0.30 0.30 .30 0.10], where the sets displays [W^Q W^P W^B W^C]. Please note that W^0 is assumed zero.
- There are five independent scenarios to assume X called S1 to S5.
- Regarding three rivals, there will be 8 combinations for cooperation: *C0*={}, *C1*={1}, *C2*={2}, *C3*={3}, *C4*={1,2}, *C5*={1,3}, *C6*={2,3}, *C7*={1,2,3}. This paper considers *C1* to *C7* to study the *CE* when there is at least one rival as a cooperator.
- μ=0.50

Table (4) presents assumed levels of X for different types. There are thresholds for *ROI* and *BEP* in this paper. We have considered 5.085 as the threshold of *ROI* for both *D1* and *D2* and 33 and 29 months as the threshold of *BEP* for *D1* and *D2*, respectively. These thresholds are those obtained for this problem when there are no guests in the network.

TABLE 4
DIFFERENT SETS OF X

		S1			*S2*			*S3*			*S4*			*S5*		
		R1	*R2*	*R3*	*R1*	*R2*	*R3*	*R1*	*R2*	*R3*	*R1*	*R2*	*R3*	*R1*	*R2*	*R3*
x^Q	*T1*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T2	0.00	0.65	0.00	0.00	0.00	0.28	0.45	0.30	0.50	0.00	0.00	0.00	0.00	0.00	0.00
	T3	0.00	0.65	0.45	0.00	0.43	0.28	0.45	0.88	0.50	0.08	0.00	0.45	0.15	0.00	0.00
	T4	0.39	0.65	0.45	0.00	0.43	0.28	0.76	0.94	0.50	0.22	0.00	0.69	0.15	0.94	0.00
	T5	0.39	0.92	0.59	0.00	0.61	0.28	0.85	0.94	0.50	0.24	0.00	0.84	0.73	0.97	0.00
x^P	*T1*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.48	0.40	0.00	0.00	0.35	0.00	0.00
	T2	0.00	0.41	0.67	0.00	0.76	0.00	0.00	0.56	0.48	0.40	0.00	0.46	0.35	0.21	0.67
	T3	0.25	0.41	0.99	0.40	0.77	0.52	0.00	0.83	0.48	0.60	0.26	0.88	0.35	0.21	0.67
	T4	0.25	0.74	0.99	0.92	0.77	0.57	0.67	0.83	0.68	0.77	0.26	0.91	0.35	0.21	0.93
	T5	0.35	0.84	1.00	0.92	0.77	0.73	0.67	0.98	0.68	0.77	0.26	0.91	0.35	0.21	0.93
x^B	*T1*	0.97	0.34	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.27	0.92	0.02	0.88	0.00	0.00
	T2	0.97	0.34	0.00	0.00	0.97	0.90	0.08	0.78	0.00	0.27	0.92	0.02	0.88	0.00	0.44
	T3	0.98	0.34	0.00	0.00	0.97	0.90	0.85	0.78	0.84	0.28	0.92	0.02	0.88	0.00	0.44
	T4	0.98	0.85	0.24	0.67	0.97	0.93	0.85	0.78	0.86	0.28	1.00	0.14	0.99	0.84	0.66
	T5	0.99	0.85	0.24	0.67	0.97	0.93	0.86	0.98	0.86	0.97	1.00	0.14	0.99	0.93	0.83
x^C	*T1*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
	T2	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00
	T3	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00
	T4	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00
	T5	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00

Figures (2) and (3) compare the *ROI* calculation at the end of each period for different kinds of cooperation for the first and second scenarios, for instance, in which there is no depreciation. Please note that *ROI*s measured when the depreciation is considered are same as the case it is neglected. In fact, depreciation only affects the *BEP*.

The results display the effect of the host's reactions on the *ROI*. In fact, removing a bad cooperation will result in improvement of the indicators. This fact is also verified by figures (4) and (5) in which *BEP* is analyzed at the end of each horizon. In addition, figures (4) and (5) demonstrate that changing barrier can highly affect the churn because its variable is a binary one. Considering a positive level for x_i^C, there will be a higher churns and the *ROI*, as a result, will decrease. Furthermore, figures (1) and (2) display that higher level of risks when the number of guests increases. At the end of first period, more guests are preferred, while they may damage he income of the host in a long-term horizon. Of course, this decision is highly dependent on the obtained variables for rivals.

FIGURE 2
ROI ANALYSIS OF S1

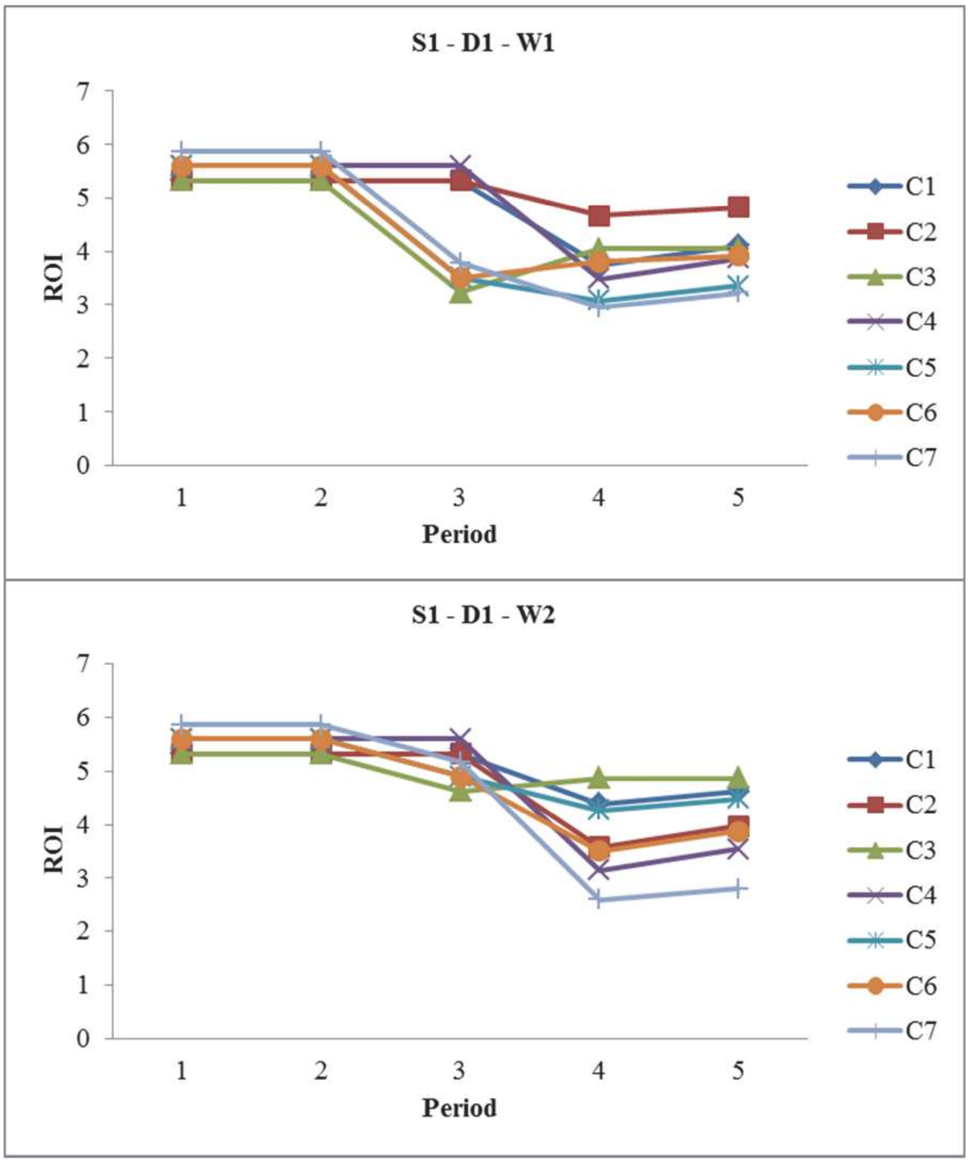

FIGURE 3
ROI ANALYSIS OF S2

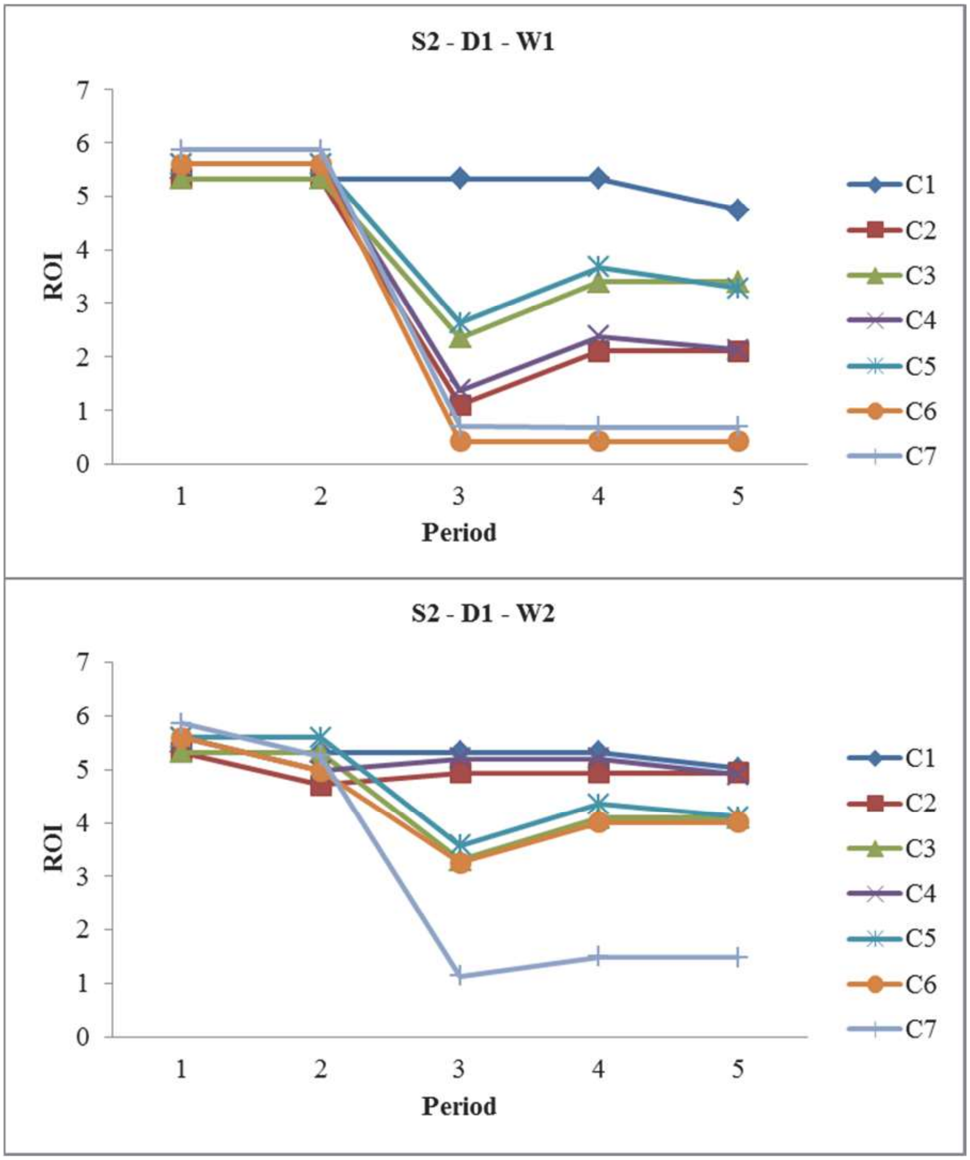

FIGURE 4
BEP ANALYSIS OF S1 – C7

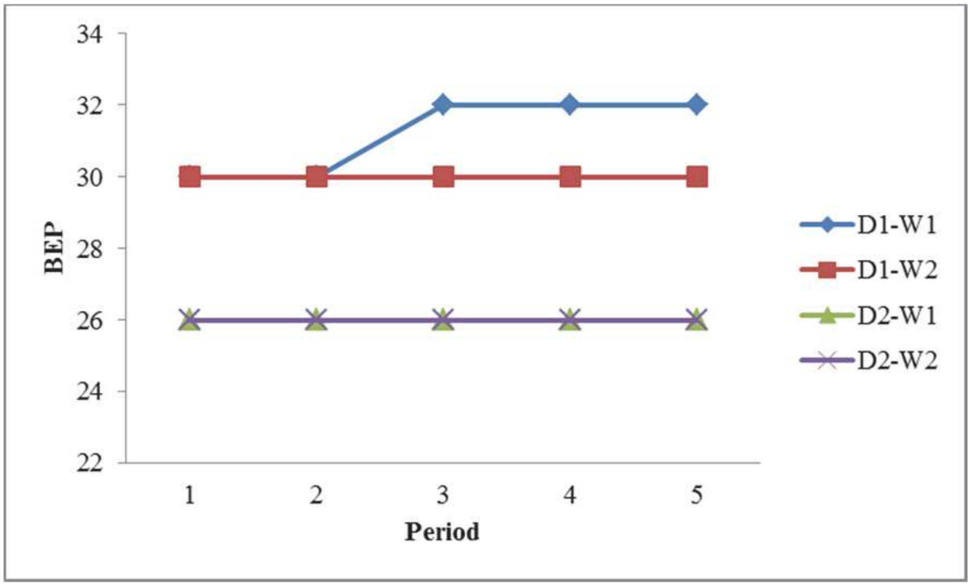

FIGURE 5
BEP ANALYSIS OF S2 – C2

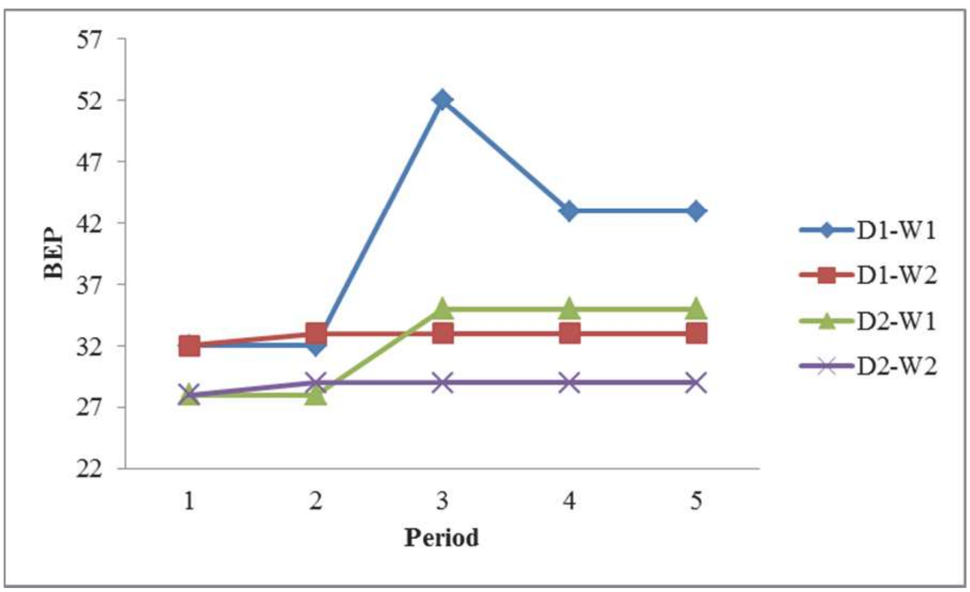

Table (5) compares the final the *ROI*s for all cases with and without controlling the rival. This comparison is also made for the *BEP*s reported in Table (6). Results prove that this kind of control does not adversely affect the indicators. Then, it can be considered as a powerful managerial tool to check the latest status of our partners in the business model. For instance, consider the obtained result for case *D1-C2-W1-S2*. There is a 10-month difference between having and not having churn measurement in *BEP*. This is a huge difference in a 5-year horizon of planning. Also, comparing *ROI*=2.109 for measuring the churn and *ROI*=1.073 for not measuring it, verify its importance. Also, consider D2-C6-W2-S3. It is found that stopping the cooperation will result in having the *ROI*=2.004 while continuing will result in not reaching the initial investment. It emphasizes on the necessity of controlling the churn factor.

TABLE 5
ACTUAL ROIS AT THE END OF THE PLANNING HORIZON

			W1					*W2*				
			S1	*S2*	*S3*	*S4*	*S5*	*S1*	*S2*	*S3*	*S4*	*S5*
Controlling Rivals	*D1*	*C1*	4.103	4.734	4.444	5.325	4.379	4.623	5.018	3.131	4.936	5.073
	D1	*C2*	4.821	2.109	3.911	4.737	5.225	3.977	4.934	2.592	5.325	4.546
	D1	*C3*	4.046	3.397	5.217	5.325	4.816	4.869	4.090	4.763	4.891	4.692
	D1	*C4*	3.869	2.136	3.299	5.007	4.560	3.545	4.909	1.731	5.206	4.307
	D1	*C5*	3.353	3.280	4.622	5.594	4.181	4.480	4.119	3.023	4.789	4.449
	D1	*C6*	3.912	0.415	4.100	5.007	4.992	3.877	4.012	2.004	5.160	4.183
	D1	*C7*	3.218	0.684	3.504	5.277	4.367	2.805	1.486	1.342	5.059	3.960
	D2	*C1*	4.103	4.734	4.444	5.325	4.379	4.623	5.018	3.131	4.936	5.073
	D2	*C2*	4.821	2.109	3.911	4.737	5.225	3.977	4.934	2.592	5.325	4.546
	D2	*C3*	4.046	3.397	5.217	5.325	4.816	4.869	4.090	4.763	4.891	4.692
	D2	*C4*	3.869	2.136	3.299	5.007	4.560	3.545	4.909	1.731	5.206	4.307
	D2	*C5*	3.353	3.280	4.622	5.594	4.181	4.480	4.119	3.023	4.789	4.449
	D2	*C6*	3.912	0.415	4.100	5.007	4.992	3.877	4.012	2.004	5.160	4.183
	D2	*C7*	3.218	0.684	3.504	5.277	4.367	2.805	1.486	1.342	5.059	3.960
Not Controlling Rivals	*D1*	*C1*	3.649	4.734	2.067	5.325	2.091	4.279	5.018	2.640	4.936	4.069
	D1	*C2*	4.340	1.073	1.494	4.207	5.225	3.289	1.326	1.057	5.325	4.178
	D1	*C3*	2.728	2.174	5.217	5.325	3.228	3.802	2.999	3.787	4.891	4.309
	D1	*C4*	3.211	1.242	1.230	4.477	2.312	2.873	1.524	1.074	5.206	3.435
	D1	*C5*	2.090	2.206	2.288	5.594	1.393	3.285	3.091	2.092	4.789	3.528
	D1	*C6*	2.470	0.415	1.732	4.477	3.435	2.582	0.801	0.976	5.160	3.612
	D1	*C7*	2.075	0.684	1.500	4.746	1.637	2.450	1.067	1.213	5.059	3.069
	D2	*C1*	3.649	4.734	2.067	5.325	2.091	4.279	5.018	2.640	4.936	4.069
	D2	*C2*	4.340	1.073	1.494	4.207	5.225	3.289	1.326	1.057	5.325	4.178
	D2	*C3*	2.728	2.174	5.217	5.325	3.228	3.802	2.999	3.787	4.891	4.309
	D2	*C4*	3.211	1.242	1.230	4.477	2.312	2.873	1.524	1.074	5.206	3.435
	D2	*C5*	2.090	2.206	2.288	5.594	1.393	3.285	3.091	2.092	4.789	3.528
	D2	*C6*	2.470	0.415	1.732	4.477	3.435	2.582	0.801	0.976	5.160	3.612
	D2	*C7*	2.075	0.684	1.500	4.746	1.637	2.450	1.067	1.213	5.059	3.069

TABLE 6
ACTUAL BEPS AT THE END OF THE PLANNING HORIZON

			W1					*W2*				
			S1	*S2*	*S3*	*S4*	*S5*	*S1*	*S2*	*S3*	*S4*	*S5*
Controlling Rivals	*D1*	*C1*	32	32	34	32	35	32	32	32	32	32
	D1	*C2*	32	43	35	33	32	32	33	40	32	32
	D1	*C3*	34	36	32	32	33	33	34	33	32	32
	D1	*C4*	31	40	35	32	34	31	32	38	31	31
	D1	*C5*	33	34	32	31	35	32	33	32	31	31
	D1	*C6*	33	-	33	32	32	32	34	40	31	31
	D1	*C7*	32	-	33	31	34	30	44	37	30	30
	D2	*C1*	28	28	29	28	31	28	28	28	28	28
	D2	*C2*	28	35	29	28	28	28	29	33	28	28
	D2	*C3*	29	30	28	28	29	28	29	28	28	28
	D2	*C4*	27	31	29	27	29	27	27	30	27	27
	D2	*C5*	28	28	27	27	30	27	28	27	27	27
	D2	*C6*	28	-	28	27	28	27	28	31	27	27
	D2	*C7*	26	-	27	26	29	26	32	28	26	26
Not Controlling Rivals	*D1*	*C1*	32	32	34	32	40	32	32	32	32	32
	D1	*C2*	32	53	35	33	32	32	45	47	32	32
	D1	*C3*	34	36	32	32	34	33	34	33	32	32
	D1	*C4*	31	43	35	32	37	31	40	46	31	31
	D1	*C5*	33	34	32	31	42	32	33	32	31	31
	D1	*C6*	33	-	33	32	32	32	-	-	31	31
	D1	*C7*	32	-	33	31	38	30	53	38	30	30
	D2	*C1*	28	28	29	28	34	28	28	28	28	28
	D2	*C2*	28	35	29	28	28	28	34	33	28	28
	D2	*C3*	29	30	28	28	29	28	29	28	28	28
	D2	*C4*	27	31	29	27	31	27	31	30	27	27
	D2	*C5*	28	28	27	27	33	27	28	27	27	27
	D2	*C6*	28	-	28	27	28	27	-	31	27	27
	D2	*C7*	26	-	27	26	31	26	32	28	26	26

CONCLUSION

Regarding the increasing trend in data traffics usage in the world, operators must find an efficient way to cope with it. WiFi data offloading (WDO) is a technique, which has been recently employed by them. This paper dealt with the business model of the WDO implementation project of Naghsh Aval Keyfiat (NAK) in which there will be up to three rivals as the cooperator. In fact, NAK rents its equipment and make money. Therefore, there will be a competition along with cooperation, called coopetition. Of course, it can damage the business of NAK because of the effect of the customers by giving them extra options to choose. Hence, churn factor (*CF*) should be measured at the end of each period. The *CF* is measured regarding the developed equation, which includes four factors called quality, price, brand, and changing barriers.

The numerical results of our examples proved the need for having such a metric and its performance. In fact, the host of the network must be informed about the conditions of its rivals to stop the cooperation when they endanger its business. The findings insist on having a periodic churn facto control when there are coopetitions. This paper considered an annually control, while it can be quarterly, for example, in a larger and more sensitive project not to lose a significant amount of the market share. Please note that the contracts must be flexible enough to stop cooperation while it is needed. Different kinds of churn predictions along with the proposed model, proposing reacting strategies for hosts, and taking the rate of return into account are strongly recommended as the future researches.

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