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ELECTRICAL ENGINEERING

Investigation of Telephone Traffic Demands in Saudi Arabia

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Abstract. This paper is concerned with the growth of telephone traffic demands in the various parts of Saudi Arabia, as this would be useful for planning the future expansion of the Saudi telephone network. The paper describes a mathematical model that can be used for this purpose. The model considers both the traffic generated by the network subscribers, and offered at the local exchange level, and the incoming international traffic placed on the network at the international exchange level. The traffic generated by the network subscribers is viewed as intra-traffic, and local level outgoing traffic. Busy-hour and total traffic have been given in Erlang, and considered for an average day. For forecasting the future traffic growth, the subscriber behaviour has been considered, together with a previously developed model on the future telephone access development required to achieve satisfactory level of access. The method used in the practical applicaiton of the model to Saudi Arabia has been described; it includes: information collection, evaluation, and forecasting. The results produced give values on the various traffic streams associated with an average user for an average day. The results also show the expected annual growth of traffic demands for each major region in Saudi Arabia, considering two different future development scenarios, together with three different target dates of achieving satisfactory telephone access level in the country.

1. Introduction

Telephone Demands

The investigation of telephone demands is one important problem in planning the future expansion of telephone networks. Such demands are basically some type of human demands; and they are therefore related to the human behaviour and activities. Two types of human demands on the telephone can be distinguished: demands for access, and demands for use. A potential telephone subscriber demanding a telephone line is considered to be placing an access demand, while a subscriber making a telephone call is considered to be making a use demand. Meeting the access demand of a potential subscriber increases the overall accessibility of the network for the other subscribers. In addition, an increase in the provision of telephone access is likely to increase the use demands placed on the network [1–6].

A Telephone Access Model

A methodology for the investigation of telephone access demands in Saudi Arabia has been developed [6]. Further more a mathematical model for the investigation of telephone access demands in the country has been produced [7]. The factors considered by the model, include: a time scale representing past, present, and the future; population factors considering households and business offices; factors concerned with telephone access needs versus telephone access provided or can be provided; and access evaluation factors. Table 1 list the factors considered.

Table 1. Basic factors involved in the investigation of telephone access demands

Issue	Factor	Description
Time scale	t	Time in years.
	t = 0	The base year when investigation starts.
	t = T	The future target year when satisfactory telephone access can be achieved.
Population	P(t)	Population for the year t.
	P	Annual growth proportion of population.
	H	Number of persons per household.
	W	Working population proportion.
	V	Number of persons per business office.
Access need	E	Telephone access interest (average number of telephones needed per household and business office).
Access Given	N(t)	Number of working telephone lines for the year t.
	n	Annual growth proportion of working telephone lines.
Evaluation	Z	average annual increase in the number of working lines, needed to achieve satisfactory access.
	DEN	Telephone density of satisfactory access per 100 population.

Using the factors of Table 1, formulae have been derived for the problem of achieving a satisfactory level of telephone access, at a future target year [7]. The formulae were based on the principle of balancing the access needs with the access provision at the target year. The formulae include: one formula that provide the needed annual growth proportion of working telephone lines, n; another formula for the average annual increase in the number of lines, Z; and a third formula for the telephone density reached at the target year, DEN. The formula for n is as follows:

$$n = \exp(x) - 1 \tag{1}$$

where

$$x = \frac{\ln[P(0)] + T[\ln(1+p) + \ln(1/H) + \ln(W/V)] + \ln(E) - \ln[N(0)]}{T}$$

The formula for Z is as follows.

$$Z = \frac{N(0)\,[(1+n)^T - 1]}{T} \tag{2}$$

The formula for DEN is as follows.

$$DEN = 100\,\frac{N(0)}{P(0)} \left(\frac{1+n}{1+p}\right)^T \tag{3}$$

The above formulae can be applied to any case-study, at any level of detail, such as a whole country level, a region within a country, and an area within a region which may be a rural area or an urban area. To provide ease and flexibility in the use of the model, computer tools have been developed for the representation of the factors involved, and their mathematical inter-relationships [8].

A Telephone Access Plan for Saudi Arabia

The above analysis has been applied to Saudi Arabi, at the whole country level, and considering separately major regions in the country [9]. For this purpose information has been collected on the various factors involved. The starting year considered, where, t = 0, is 1987. For that year, Fig. 1 shows the map of Saudi Arabia, with two numbers for each of its 11 major regions, giving: the population proportion of the region, Pop, out of the total of P(0) = 10,000,000; and the working lines proportion of the region WL, out of the total of N(0) = 950,000.

Two different sets of assumptions have been considered for the evaluation of the equations. The first leads to an upper limit in the needed telepohone lines, and it is called the U scenario, while the other leads to a lower limit and is called the L scenario. In addition, different target years for achieving satisfactory access have been considered. Telephone access has been assumed satisfactory, if every household and every business-office has a working telephone line.

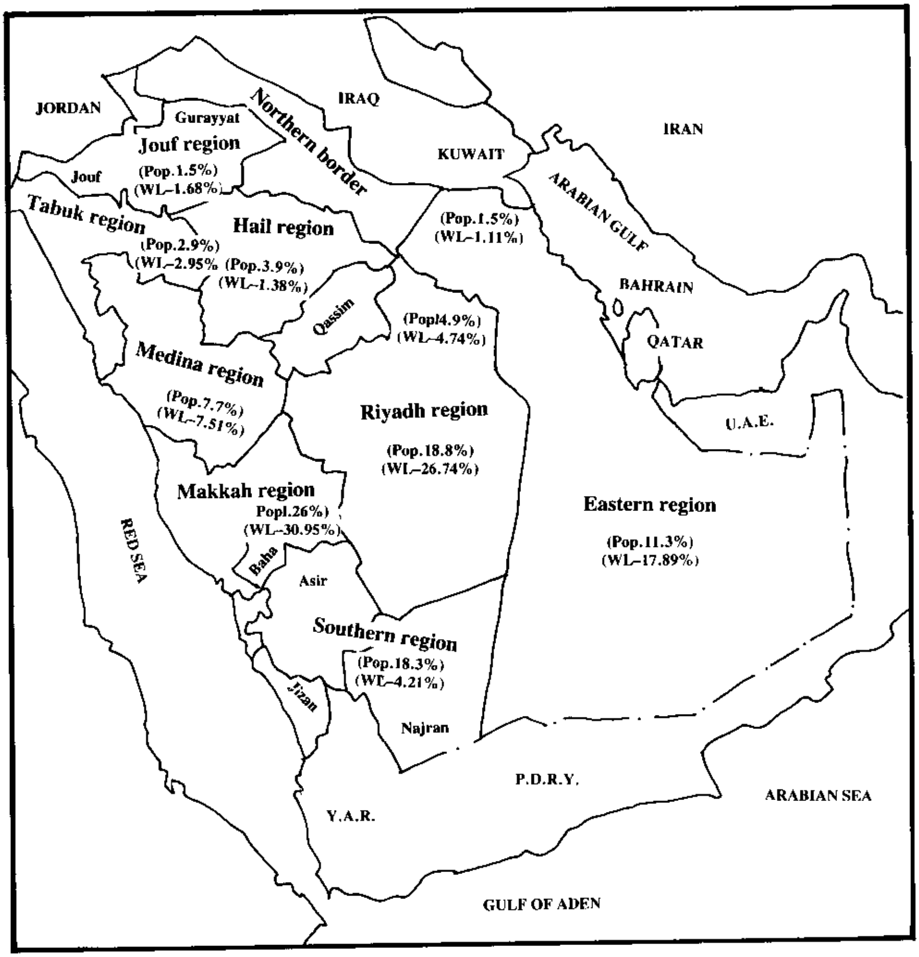

Fig. 1. Map of the Kingdom of Saudi Arabia with the population proportion and the working telephone lines proportion for each of the 11 major regions.
(Total population 1987 = 10,000,000)
(Total working telephone lines 1987 = 950,000)

Table 2 presents the U and L assumptions, and the derived values of n and Z for the whole country and for every major region, considering three different target years. In addition, the Table gives the telephone density to be reached, for the two scenarios, U and L.

Table 2. **The future telephone access demands development needed to achieve satisfactory access service for every region in the Kingdom of Saudi Arabia, considering two different future development scenarios, and three possible target dates of achieving satisfactory access**

Assumptions of upper limit (U) and lower limit (L) scenarios	Scenario	Anl.Gwth. of pop. %	Persons per household	Working pop. prop. (%)	Persons per bus. office	Access interest
	Upper limit (U)	3.00	5	35.00	5	1
	Lower limit (L)	2.50	6	30.00	6	1

	Region	Case 1 T = 13 (2000 AD)				Case 2 T = 23 (2010 AD)				Case 3 T = 33 (2020 AD)			
G		Scenarios				Scenarios				Scenarios			
R		U		L		U		L		U		L	
O		Anl.ght of Wrk.lin (%)	Average annual line increase	Anl.ght of Wrk.lin (%)	Average annual line increase	Anl.ght of Wrk.lin (%)	Average annual line increase	Anl.ght of Wrk.lin (%)	Average annual line increase	Anl.ght of Wrk.lin (%)	Average annual line increase	Anl.ght of Wrk.lin (%)	Average annual line increase
W	Riyadh region	8.27	35,384	5.93	21,794	5.95	30,616	4.43	18,856	5.05	31,308	3.84	18,981
	Qassim region	12.08	11,784	9.66	8,019	8.03	9,620	6.50	6,350	6.48	9,481	4.85	5,123
	Hail region	21.11	11,151	18.50	8,173	12.87	8,689	11.25	6,078	9.78	8,177	8.52	5,539
T	Tabuk region	11.77	6,993	8.36	4,736	7.86	5,725	6.32	3,769	6.36	5,657	5.15	3,601
	Al-Baha region	23.07	8,530	20.42	6,310	13.90	6,593	12.27	4,635	10.48	6,259	9.21	4,205
	Northern region	16.83	5,294	14.30	3,782	10.60	4,176	9.01	2,863	8.24	4,022	7.00	2,649
	Al-Jouf region	13.10	4,868	10.66	3,360	8.60	3,931	7.03	2,624	6.86	3,847	5.64	2,478
	Southern region	24.81	51,784	22.12	38,265	14.81	39,936	13.16	28,155	11.10	37,776	9.82	25,457
H	Makkah region	10.13	56,739	7.75	37,196	6.97	47,375	5.44	30,395	5.75	47,390	4.54	29,627
	Medina region	12.16	18,898	9.74	12,880	8.08	15,420	6.53	10,203	6.51	15,171	5.29	9,675
	Eastern region	7.51	20,454	5.20	12,181	5.53	18,071	4.01	10,885	4.75	18,699	3.55	11,159
	Kingdom (Total)	11.61	231,879	9.21	156,696	7.78	190,152	6.24	124,813	6.31	187,787	5.07	118,494

Telephone density to be reached	U	L
	27	23

This Work

The objective of the work presented in this paper is to take the previous work one step further, and consider the future development of telephone use demands expected to result from the future development of telephone access needed to provide satisfactory access level. For this purpose, a mathematical model for the evaluation of telephone use traffic streams placed on a national telephone network is described. The application of the model to Saudi Arabia is then presented; and expected future traffic streams are derived, using the results produced previously for the future access demands.

A Mathematical Model

Telephone Traffic Streams

The use demands placed on a national network, such as the Saudi network can be viewed as consisting of the following telephone traffic streams.

- Traffic generated by the network subscribers of a local exchange and addressed to other network subscribers who belong to the same local telephone exchange. Such traffic is serviced directly by the local exchange concerned, and does not place any load on the trunk routes of the network. This traffic stream is usually known as intra-traffic.
- Traffic generated by the network subscribers and addressed to other network subscribers who are not associated with the same local exchange, or directed to
- telephone subscribers of other national networks. This traffic stream can be described, from the generating local exchange viewpoint, as outgoing traffic placing load on at least one trunk route in the network. On the receiving side, this traffic is incoming, but it should not be counted twice.
- Traffic generated by subscribers of other national networks, and directed to subscribers of the national network concerned. This traffic is normally known as the incoming international traffic, and it places loads on various routes from the international exchange, at which it arrives, to the local exchanges of the target subscribers.

Telephone use traffic streams, can also be viewed from another angle as busy-hour traffic, and total traffic for a specified period of time, such as an average day. The busy-hour traffic is of great importance for the evaluation of network requirements using the teletraffic theory, while the importance of the total traffic is related to the economic considerations of network utilization [1–6].

Basic Issues

The mathematical model presented here considers various issues and factors related to the three main traffic demand streams placed on a national network: the intra-traffic; the outgoing traffic, at the local exchange level; and the incoming international traffic. As the model is concerned with the future development of such demands, it has been considered, that the value of each factor may change with time, according to a certain change proportion during a specific time interval, which may be a certain year or a season within a year. The basic issues considered by the model are as follows:

- Issues concerned with the generated traffic demands, both busy-hour and total, placed on a local exchange, by its subscribers, for an average day, of a specific year, or season.
- Issues concerned with international traffic.
- Issues related to the evaluation of traffic demands per subscriber for an average day, within a specific region.

Traffic Demands on a Local Exchange

The traffic generated by the subscribers of the national network concerned is placed at first on local exchanges. For each local exchange, this generated traffic consists of: intra-traffic, directed to other subscribers connected to the same local exchange, and outgoing traffic directed to subscribers of other local exchanges, or may be to telephone subscribers in other countries. The proportion of intra-traffic to the generated traffic would be expected to increase as the number of subscribers in the local exchange increases. This is discussed further in the coming sections of the paper.

In addition to the generated traffic, a local exchange receives incoming traffic generated by subscribers of other local exchanges in the national networks, and directed to the subscribers of the local exchange concerned. Usually, the average value of the incoming traffic would be almost equal to the average value of the outgoing traffic.

For the evaluation of the requirements and usage of the national network concerned, it is important to consider the busy-hour traffic, and its proportion to the total traffic for an average day of a specific period of time, considering the various types of traffic streams discussed above.

Table 3 presents, in mathematical terms, the various issues and factors related to the traffic demands placed on a local exchange.

International Traffic

In addition to the traffic generated by subscribers, at the local exchange level, a national telephone network is also loaded with incoming international traffic. The average incoming internaitonal traffic is approximately equivalent to the outgoing international traffic which is a proportion of the outgoing traffic at the local exchange level. it is also important here to consider the busy-hour incoming international traffic and its proportion to the total, for the evaluation of the requirements and usage of the network considered.

Table 3. Basic issues and factors concerned with traffic demands placed on a local exchange for an average day for the year t

Issue	Factor	Description	Change Proportion
Local exchange specifications	i	Local exchange identity.	
	N(i,t)	Number of subscribers (Working Lines) for exchange (i) at time (t).	n(i,t)
	M(t)	Number of local exchanges in the country.	m(t)
Total traffic	G(i,t)	Generated traffic in Erlang for an average day, for exchange (i) at time (t)	g(i,t)
	GI(i,t)	Intra-traffic, in Erlang, for an average day, for exchange (i) at time (t).	gi(i,t)
	GO(i,t)	Outgoing traffic, in Erlang for an average day, for exchange (i) at time (t). G(i,t) = GI(i,t) + GO(i,t)	go(i,t)
	R(i,t)	Incoming traffic, in Erlang for an average day, for exchange (i) at time (t).	r(i,t)
Busy-hour traffic	GH(i,t)	The busy-hour generated traffic.	gh(i,t)
	GIH(i,t)	The busy-hour intra-traffic.	gih(i,t)
	GOH(i,t)	The busy-hour outgoing traffic, GH(I,T)=GIH(i,t)+GOH(i,t)	goh(i,t)
	RH(i,t)	The busy-hour received traffic.	rh(i,t)

Table 4 presents, in mathematical terms, the various issues and factors related to international traffic.

Table 4. Basic issues and factors concerned with international traffic demands placed on a national network for an average day for the year t

Issue	Factor	Description	Change proportion
Total international traffic	A(t)	Outgoing international traffic, in Erlang, for an average day.	a(t)
	D(t)	Incoming international traffic, in Erlang, for an average day.	d(t)
International busy-hour traffic	AH(t)	The busy-hour outgoing international traffic.	ah(t)
	DH(t)	The busy-hour incoming international traffic.	dh(t)

Traffic Demands Per Subscriber

For the investigation of the future traffic demands expected to be placed on a national network, it is important to evaluate the average traffic per subscriber, for the various types of traffic streams. The average generated traffic, and the average incoming international traffic per subscriber of a national network, may depend on the region, or area, where the subscriber is located, but would not depend on the size of the local exchange, to which the subscriber is connected, as is the case with the average intra-traffic. It is, therefore important to consider the average intra-traffic per subscriber using the idea of an average exchange, which is the exchange whose number of subscribers is the average number of subscribers per exchange.

Table 5 presents, in mathematical terms, the various issues and factors related to the traffic demands per subscriber.

Future Traffic Demands

The question now is how to evaluate the future growth of traffic demands, that would result from the telephone access growth that leads to a satisfactory access level at a target future year T. An answer to this question using the results of the previous work summarized in the Introduction section, and the factors defined in Tables 3 through 5, is given in the following.

Table 5. Basic issues and factors concerned with the overall traffic demands per subscriber placed on a national network for an average day for the year t

Issue	Factor	Description	Change proportion
Average generated traffic at the local level	GS(t)	Average generated traffic per subscriber at the local level. $GS(t) = \frac{\sum_{\text{for all } (i)} G(i,t)}{\sum_{\text{for all } (i)} N(i,t)}$	gs(t)
Average intra-traffic	GI(t)	Average intra-traffic for an average exchange. $GI(t) = \frac{\sum_{\text{for all } (i)} GI(i,t)}{M(t)}$	gi(t)
	GIS(t)	Average intra-traffic per subscriber. $GIS(t) = \frac{GI(t)\,M(t)}{\sum_{\text{for all } (i)} N(i,t)}$	gis(t)
Average outgoing traffic at the local level	GOS(t) subscriber	Average outgoing traffic per $GOS(t) = GS(t) - GIS(t)$	gos(t)
Average incoming international traffic	DS(t)	Average incoming international traffic per subscriber. $Ds(t) = \frac{D(t)}{\sum_{\text{for all } (i)} N(i,t)}$	ds(t)
Average busy-hour traffic	GHS(t) GIH(t) GISH(t) GOSH(t) DSH(t)	As above for the busy-hour.	ghs(t) gih(t) gish(t) gosh(t) dsh(t)

The traffic streams at the starting year of growth or at the base year, where t=0, are given in the following

- The total traffic for an average day of the starting year, Q(0), can be given as follows.

$$Q(0) = GI(0) + GO(0) + D(0) \quad (4)$$

where: the generated intra-traffic GI(0) is

$$GI(0) = \sum_{\text{for all } i} GI(i,0)$$

; the generated outgoing traffic GO(0) is

$$GO(0) = \sum_{\text{for all } i} GO(i,0)$$

; and the received international trafic is D (0).

- The busy-hour traffic for an average day QH(0), can be given in the same way. One useful measure here is the ratio [QH(0)/Q(0)].
- The total traffic per subscriber QS(0) is as follows.

$$QS(0) = GIS\ (0) + GOS\ (0) + DS\ (0) \quad (5)$$

- The busy-hour traffic per subscriber QSH(0), can be given in the same way. The ratio [QSH(0)/QS(0)] would be equal to the ratio [QH(0)/Q(0)].

The average growth of traffic per year for the growth period from t = 0 to t = T, when satisfactory access is to be achieved, need to be computed. Considering this growth to be Y, and assuming the user traffic remains unchanged, that is

$$QS(t) = QS(0) \quad \text{for the period } t = 0 \text{ to } t = T, \quad (6)$$

Y can be given as follows.

$$Y = QS(0)\,Z \quad (7)$$

where Z is given in equation (2), and QS(0) is given in equation (5). By substitution Y becomes

$$Y = \frac{[GIS(0)+GOS(0)+DS(0)]\,N(0)[(1+n)^T - 1]}{T} \quad (8)$$

n which is related to the previous work can be computed from equation (1), and information on GI(0), GO(0) and D(0) need to be collected.

The average growth of busy-hour traffic YH can be derived in the same way. A useful ratio to consider here is [YH/Y].

An Application to Saudi Arabia

Basic Objectives

The application of the mathematical model presented above to Saudi Arabia requires access to a large volume of information related to the traffic in each local telephone exchange, in the various parts of the country as demanded by equation (4), so that a comprehensive picture can be obtained. Such information may not be available at the required comprehensive level, in which case it would be the role of the engineers in the field to try to accumulate such information, and perform the needed investigation, using the model, and the general approach presented here.

The application given in the following has two main objectives:

- To present a demonstration of how the mathematical model described above can be employed for the investigation of traffic demands in the country, using the telephone access investigation considered previously [7–9].
- To provide some estimation of the future traffic demands expected to be placed on the Saudi telephone network for an average day, considering both busy-hour and total traffic, for the intra-traffic, outgoing traffic, at the local level, and the incoming internaitonal traffic.

In handling the collected information, and computing the required factors for the application, the computer tools used previously in the investigation of telephone access demands in Saudi Arabia, namely the computer spreadsheet software with its tabulation and programming facilities, have also been used here [8].

Information Collection

At present there are around 950,000 telephone subscribers in Saudi Arabia, linked to around 190 local telephone exchanges, with approximately 5,000 telephone subscribers per local exchange [6–9]. To investigate the traffic streams in the exchanges and obtain values for the traffic per average day, large scale measurments, and information collection tasks are needed. While it is recommended that such tasks should be performed, in the future, by engineers at each local exchange level; for the purpose of the application presented here, information has been collected from some exchanges so that a general view of a problem can be developed. In addition, information regarding international traffic have been collected for different days [10–13].

In general, the collected information has illustrated in the following:

- As would be expected, the ratio of the intra-traffic to the generated traffic at the local exchange level [GI(i,t)/F(i,t)] is proportional to the value of the number of subscribers connected to the local exchange N(i,t).

- The outgoing traffic is almost equal to the incoming traffic, at both the local exchange level, [GO(i,t) ≈ R(i,t)], and the international level [A(t) ≈ D(t)]. This is also true during the busy-hour.
- The proportion of the busy-hour generated traffic to the total generated traffic is around 9% for the various exchanges, [GH(i,t)/G(i,t)] = 0.09. This is true for the various traffic streams.

Subscriber Behaviour

The collected information has been used for the determinaiton of an average subscriber behaviour for the whole country, during an average day of the year 1987, which is assumed to be the base year, where t = 0. The results show that an average subscriber in Saudi Arabia generates around 0.57 Erlang per day, and receives about the same, with the international traffic representing around 1.7% of the total. The proportion of intra-traffic to the total generated is around 19%. Table 6 presents the results obtained showing the intra-traffic, the outgoing traffic at the local level, and the international incoming traffic considering both busy-hour traffic and total traffic, per average subscriber and for the whole network.

Table 6. The loads of the basic traffic streams placed on the saudi national telephone network per subscriber and for the whole country during an average day of the year 1987

Traffic stream	Per Subscriber (Erlang)	For the whole country (Erlang)
Intra-traffic	0.1065	101170.13
Outgoing traffic (Local)	0.4513	428760.62
Incoming international	0.0096	9131.77
Total	0.5674	539062.52
Busy-hour intra-traffic	0.0096	9105.31
Busy-hour outgoing (Local)	0.0406	38588.46
Busy-hour incoming international	0.0009	821.86
Total busy-hour	0.0511	48515.63

The future telephone traffic demands expected to be placed on the Saudi network have been derived from equation (8), using the results produced in Table 6 on the average subscriber behaviour, and the results given in Table 2 on the future development of telephone access demands needed to provide satisfactory access level at a specific target date. No change has been assumed in the average user behaivour, as in equation (6), and both scenario (U), and scenario (L) have been used for the three different target dates of achieving satisfactory access, namely the years 2000, 2010, 2020 A.D.

The base year estimated state of the intra-traffic, the outgoing traffic, at the local level, and the international incoming traffic, are given for each of the 11 major regions in the country in Table 7. In addition, Table 8 shows the average annual growth of traffic, for each of the 11 regions, considering the two scenarios (U) and (L), for every target date of achieving satisfactory telephone access.

Table 7. The loads of the basic traffic streams placed on the saudi national telephone network for each of the 11 major regions in the country during an average day of the year 1987

Region	Intra-traffic	Outgoing traffic (Local)	Incoming traffic (International)	Total traffic
Riyadh region	27052.89	114650.59	2441.83	144145.32
Qassim region	4795.46	20323.25	432.85	25551.56
Hail region	1396.15	5916.90	126.02	7439.06
Tabuk region	2984.52	12648.44	269.39	15902.34
Al-Baha region	849.83	3601.59	76.71	4528.13
Northern region	1122.99	4759.24	101.36	5983.59
Al-Jouf region	1699.66	7203.18	153.41	9056.25
Southern region	4259.26	18050.82	384.45	22694.53
Makkah region	31312.16	132701.41	2826.28	166839.85
Medina region	7597.88	32199.92	685.80	40483.60
Eastern region	18099.34	76705.28	1633.67	96438.29
Kingdom	101170.14	428760.62	9131.77	539062.52

Note: Busy-hour traffic represents around 9.00% of an average day traffic

Table 8. The expected average annual growth of traffic load placed on the Saudi National Telephone Network for each of the 11 major regions in the country during an average day for a growth period starting in 1987 and leading to a satisfactory access level

Region	Case 1 T = 13 (2000 AD)		Case 2 T = 23 (2010 AD)		Case 3 T = 33 (2020 AD)	
	Scenarios		Scenarios		Scenarios	
	U	L	U	L	U	L
Riyadh region	20076.88	12365.92	17371.52	10698.89	17764.16	10769.82
Qassim region	6686.24	4549.98	5458.39	3602.99	5379.52	2906.79
Hail region	6327.08	4637.36	4930.14	3448.66	4639.63	3142.83
Tabuk region	3967.83	2687.21	3248.37	2138.53	3209.78	2043.21
Al-Baha region	4839.92	3580.29	3740.87	2629.90	3551.36	2385.92
Northern region	3003.82	2145.91	2369.46	1624.47	2282.08	1503.04
Al-Jouf region	2762.10	1906.46	2230.45	1488.86	2182.79	1406.02
Southern region	29382.24	21711.56	22659.69	15975.15	21434.10	14444.30
Makkah region	32193.71	21105.01	26880.58	17246.12	26889.09	16810.36
Medina region	10722.73	7308.11	8749.31	5789.18	8608.03	5489.60
Eastern region	11605.03	6911.50	10253.49	6176.15	10609.81	6331.62
Kingdom	131567.58	88909.31	107892.27	70818.90	106550.35	67233.51

Note: Busy-hour traffic represents around 9.00% of the average day traffic.
Intra-traffic represents around 19.00% of the total.
Outgoing traffic (Local) represents around 79% of the total.
Incoming traffic (International) represents around 1.70% of the overall total traffic.
Traffic is given in erlang.

Consusclusions

This paper has served two main purposes. On the one hand, it presented a mathematical model for the evaluation of telephone traffic demands placed, or expected to be placed on a national telephone network. On the other hand, the paper demonstrated the use of the model for the investigation of such demands in Saudi Arabia, and it provided a forecast on the future growth of telephone traffic in the country. The paper has made use of a previously developed model and results on the future telephone access development needed to achieve satisfactory telephone access level in Saudi Arabia. The results produced would provide useful guidelines in the practical planning of the future expansion of the Saudi telephone network, and may be of use for other networks with similar features.

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دراسة الحركة الهاتفية في المملكة العربية السعودية

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ملخص البحث. يهتم هذا البحث بتطور الحركة الهاتفية في مختلف مناطق المملكة العربية السعودية، لما في ذلك من فائدة في تخطيط مستقبل تطور الشبكة الهاتفية السعودية. ويقدم البحث نموذجا رياضيا ينظر إلى الحركة الهاتفية على أنها تنقسم إلى قسمين هما: الحركة المولدة من مشتركي الشبكة والمطبقة على البدّالات المحلية، والحركة الدولية القادمة إلى الشبكة والمطبقة على البدّالات الدولية. وفيما يتعلق بالحركة المولدة من قبل المشتركين يميز النموذج نوعين منها هما: الحركة الضمنية بين المشتركين داخل البدّالة المحلية، والحركة الخارجة عن البدّالة المحلية. وبالإضافة إلى ذلك يأخذ النموذج التقسيمات السابقة للحركة الهاتفية عند ساعة الزحمة، وكذلك كمجموع عام على مدى يوم وسطي. وفي سبيل دراسة مستقبل تطور هذه الحركة، يؤخذ أسلوب المشترك في توليدها بعين الاعتبار، كما يستفاد أيضا من نموذج رياضي آخر، جرى تطويره سابقا لدراسة مستقبل تطور النفاذ الهاتفي والوصول به إلى مستوى مُرضٍ. ويقدم البحث طريقة لتطبيق المحتوى النظري السابق عمليا على الشبكة الهاتفية السعودية. وتتضمن هذه الطريقة: جمع المعلومات، وتقويم الوضع الحالي، ودراسة التوقعات. وتعطي النتائج قيما للحركة الهاتفية الخاصة بمشترك وسطي ليوم وسطي. وتبين النتائج التطور السنوي للحركة لكل منطقة من مناطق المملكة، على أساس أسلوبين مختلفين من التغيرات المستقبلية الممكنة وعلى أساس احتمال الوصول إلى خدمة هاتفية مرضية خلال ثلاث فترات زمنية مختلفة.