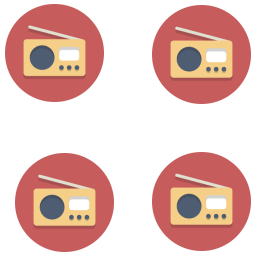
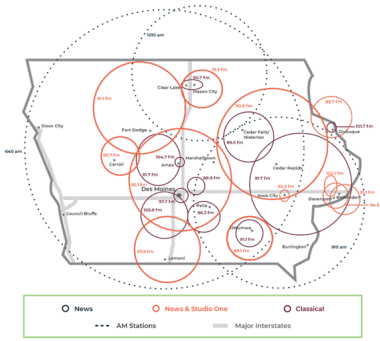
Implementing DAB+ in Thailand: An Analysis of Demand and Economic Impact

Kiatanantha Lounkaew, Faculty of Economics, Thammasat University

Household radio
"**Potential Penetration Rate**"



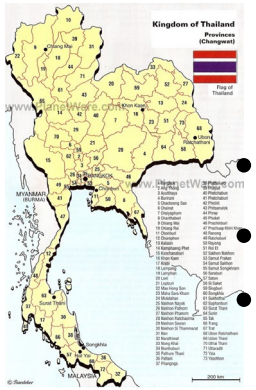
Final Architect



Household radio
"**Potential Penetration Rate**"

Demand for frequency
"**Household demand and Prices are unknown**"

Demand for frequency
"**Household demand and Prices are known**"



- National
- Regional
- Provincial

Provision costs

Approaches of Digital Radio Demand Forecasting

Author	Year	Country	Empirical model employed
Alexander Momit	2019	Middle East and North America	Regression and Autoregressive models
Korneev &Merkulov	2021	Russisa	Long Short-Term Memory Recurrent Neural Network
Barry L. Bayus	1993	United States	Segmentation Scheme
Bruno P. Costanzo &Joao Amato Neto	2003	Brazil	Bass Diffusion model
Sachin Gupta, Dipak C. Jain &Mohanbir S. Sawhney	1999	U.K.	Latent-class choice model
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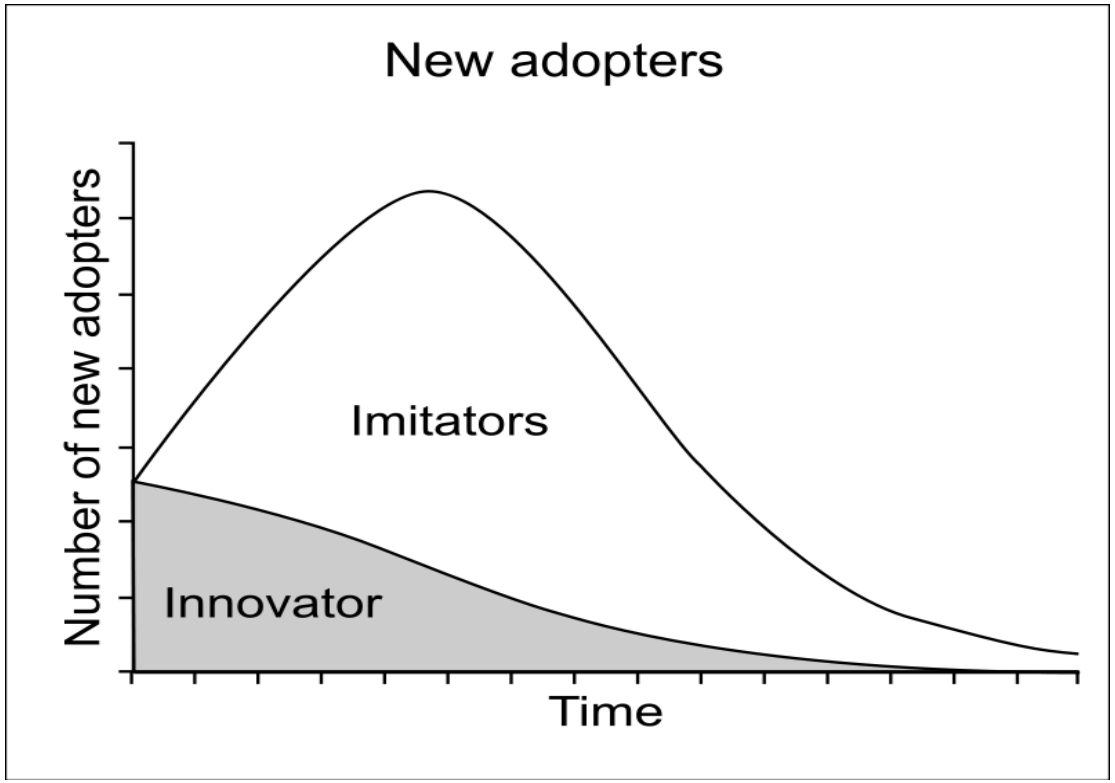
Overview of Bass Diffusion Model

$$S(t) = \left[p + \left(\frac{q}{m} \right) \left(N(t-1) \right) \right] \left[m - N(t-1) \right]$$

,µv[Ëİ S = Total number of digital radio adopters
p = Early adopters of digital radio
q = Subsequent adopters of digital radio
m = Potential market size
N = Cumulative number of adopters at time t-1



Source: Bass, Frank M; Trichy V. Krishnan; Dipak C. Jain (1994). "Why the Bass Model Fits without Decision Variables". Marketing Science. 13 (2): 203–223.

Household Demand Estimation

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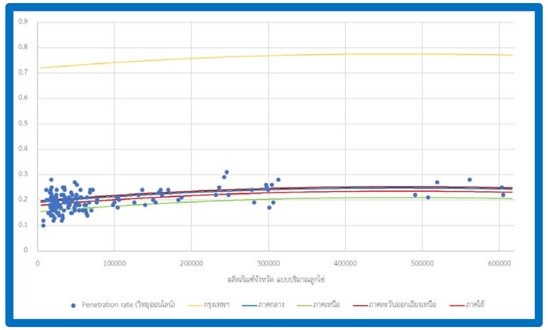

Gross provincial product were used to estimate potential adoption based on ratio internet adoption

Penetration rate using SES data

Analog radio penetration rates were used as a proxy for potential early adopters.

Step 1 Probit Model for household

$$p_i^j = \beta_0 + \beta_1 lnIncome + \beta_2 householdsize + \beta_3 householdSchooling$$
$$+\beta_4 householdAge + \delta_1 District + \delta_2 Region + \delta_3 Agri + e_i^j$$

Step 2 : Provincial aggregation

$$\overline{p^j} = \sum_{i=1}^{n} p_i^j$$

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```
import spss using "D:\กสทช\กสทช\New folder\New folder\2 ICTHTV 2563 (2020)\Microdata ICTHTV 2563\Microdata ICTH 2563.sav"
global x REG CWT AREA PSU_NO EA_SET SAMSET MONTH YR HH_NO TYPE
foreach v of varlist $x  {
tostring `v',gen(`v'_c)
}
gen hhnumber_c= REG_c+CWT_c+AREA_c+PSU_NO_c+EA_SET_c+SAMSET +MONTH_c+YR_c+HH_NO_c+TYPE_c
gen age15radio=(H5>=15&H47==1)
gen ysch=.
replace ysch = 0 if (H8A == 0 | H8A == 110 | H8A == 111 | H8A == 001)
replace ysch = 1 if H8A== 211
replace ysch = 2 if H8A == 212
replace ysch = 3 if H8A == 213
replace ysch = 4 if (H8A == 214 | H8A == 219)
replace ysch = 5 if H8A == 215
replace ysch = 6 if (H8A == 216 | H8A == 210 | H8A == 240 | H8A == 250)
replace ysch = 7 if (H8A == 311 | H8A == 321)
replace ysch = 8 if (H8A == 312 | H8A == 322 | H8A == 319 | H8A == 329)
replace ysch = 9 if (H8A == 313 | H8A == 323 | H8A == 310 | H8A == 320 | H8A == 330 | H8A == 340 | H8A == 350)
replace ysch = 10 if (H8A == 411 | H8A == 421)
replace ysch = 11 if (H8A == 412 | H8A == 422 | H8A == 419 | H8A == 429)
replace ysch = 12 if (H8A == 413 | H8A == 423 | H8A == 420 | H8A == 410| H8A == 430 | H8A == 440 | H8A == 450)
replace ysch = 13 if (H8A == 461 | H8A == 511 | H8A == 519 | H8A == 521| H8A == 611)
replace ysch = 14 if (H8A == 462 | H8A == 460 | H8A == 510 | H8A== 512 | H8A == 522 | H8A == 529 | H8A == 612 | H8A == 619)
replace ysch = 15 if (H8A == 520 | H8A == 423 | H8A == 613)
replace ysch = 16 if (H8A == 610 | H8A == 614 | H8A == 630 | H8A == 640 | H8A == 650)
replace ysch = 17 if (H8A == 615 | H8A == 660 | H8A == 661 | H8A == 711 | H8A == 719)
replace ysch = 18 if (H8A == 616 | H8A == 710 | H8A == 712)
replace ysch = 19 if (H8A == 760 | H8A == 761 | H8A == 811 | H8A == 871)
replace ysch = 20 if (H8A == 812 | H8A == 819 | H8A == 872)
replace ysch = 21 if (H8A == 810 | H8A == 873 | H8A == 879)
replace ysch = 22 if (H8A == 860 | H8A == 861 | H8A == 874)
replace ysch = 23 if (H8A == 870 | H8A == 875)
replace ysch=. if H9==2
gen Agri=(H11>=1000&H11<=3999)
replace Agri=. if H9==2
gen kid6=(H5<=15)
```

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```
replace ysch = 7 if (H8A == 311 | H8A == 321)
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replace ysch=. if H9==2
gen Agri=(H11>=1000&H11<=3999)
replace Agri=. if H9==2
gen kid6=(H5<=15)
gen elderly=(H5>=60)
rename H5 age
replace AREA=0 if AREA==2
preserve
collapse (max) age15radio REG AREA CWT Agri (rawsum) kid6 elderly (mean) MEMBERS ysch Wgthouse age [aw= Wgtpop], by(hhnumber_c)
tab CWT  age15radio [aw= Wgthouse]
rename CWT cwt
merge m:1 cwt using C:\Users\User\Desktop\กสพช\GPP2020.dta
rename gpp gpppercap
gen lngpppercap =ln(gpppercap)
xi: probit age15radio MEMBERS ysch AREA i.REG Agri age kid6 elderly [pw= Wgthouse],vce(robust)
predict pr
tabstat pr [aw= Wgthouse],stat(mean) by(cwt)
```

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```
. xi: probit age15radio MEMBERS ysch AREA i.REG Agri age kid6 elderly [pw= Wgthouse],vce(robust)
i.REG             _IREG_1-5           (naturally coded; _IREG_1 omitted)

Iteration 0:   log pseudolikelihood = -4344950.1
Iteration 1:   log pseudolikelihood = -4120119.4
Iteration 2:   log pseudolikelihood = -4117717.4
Iteration 3:   log pseudolikelihood = -4117717.3

Probit regression                                      Number of obs =   63,008
                                                       Wald chi2(11) = 1561.06
                                                       Prob > chi2   =   0.0000
Log pseudolikelihood = -4117717.3                      Pseudo R2     =   0.0523
```

age15radio	Coefficient	Robust std. err.	z	P>|z|	[95% conf.	interval]
MEMBERS	.1231097	.0090098	13.66	0.000	.1054508	.1407685
ysch	.0267108	.0023731	11.26	0.000	.0220595	.031362
AREA	.0769106	.0199551	3.85	0.000	.0377993	.1160219
_IREG_2	-.0727293	.0352958	-2.06	0.039	-.1419077	-.0035509
_IREG_3	-.2333758	.0388571	-6.01	0.000	-.3095344	-.1572173
_IREG_4	-.1259042	.0369741	-3.41	0.001	-.198372	-.0534364
_IREG_5	-.1823192	.0377949	-4.82	0.000	-.2563959	-.1082425
Agri	-.1169491	.0211233	-5.54	0.000	-.15835	-.0755483
age	-.0153793	.001079	-14.25	0.000	-.0174942	-.0132644
kid6	-.2367526	.01672	-14.16	0.000	-.2695233	-.203982
elderly	-.0472161	.0156873	-3.01	0.003	-.0779627	-.0164695
_cons	-.4750666	.0693261	-6.85	0.000	-.6109433	-.3391899

```
. predict pr
(option pr assumed; Pr(age15radio))
(9,724 missing values generated)

.
. tabstat pr [aw= Wgthouse],stat(mean) by(cwt)

Summary for variables: pr
Group variable: cwt ((max) CWT)
```

cwt	Mean
10	.2983688
11	.2571914
12	.2618041
13	.2602449
14	.2363291
15	.2011948
16	.2110232
17	.1928602
18	.2018939
19	.2283608
20	.2561733
21	.245525
22	.205135
23	.2046615
24	.2171148
25	.2186678
26	.2102673
27	.1968721
30	.178007
31	.1711303
32	.1612744
33	.1598787
34	.1840087
35	.1589736

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5 Scenarios of Household Demand for DAB+

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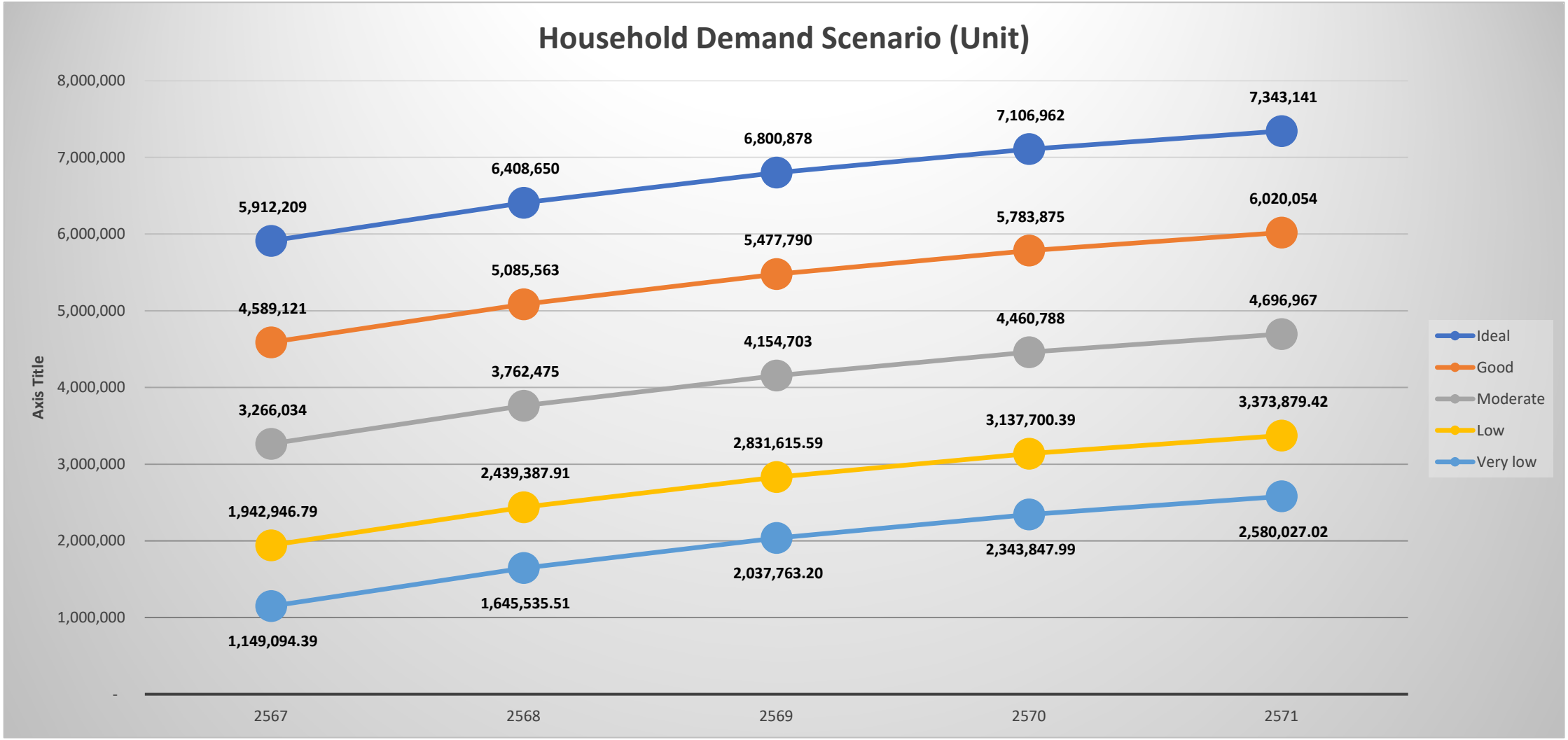
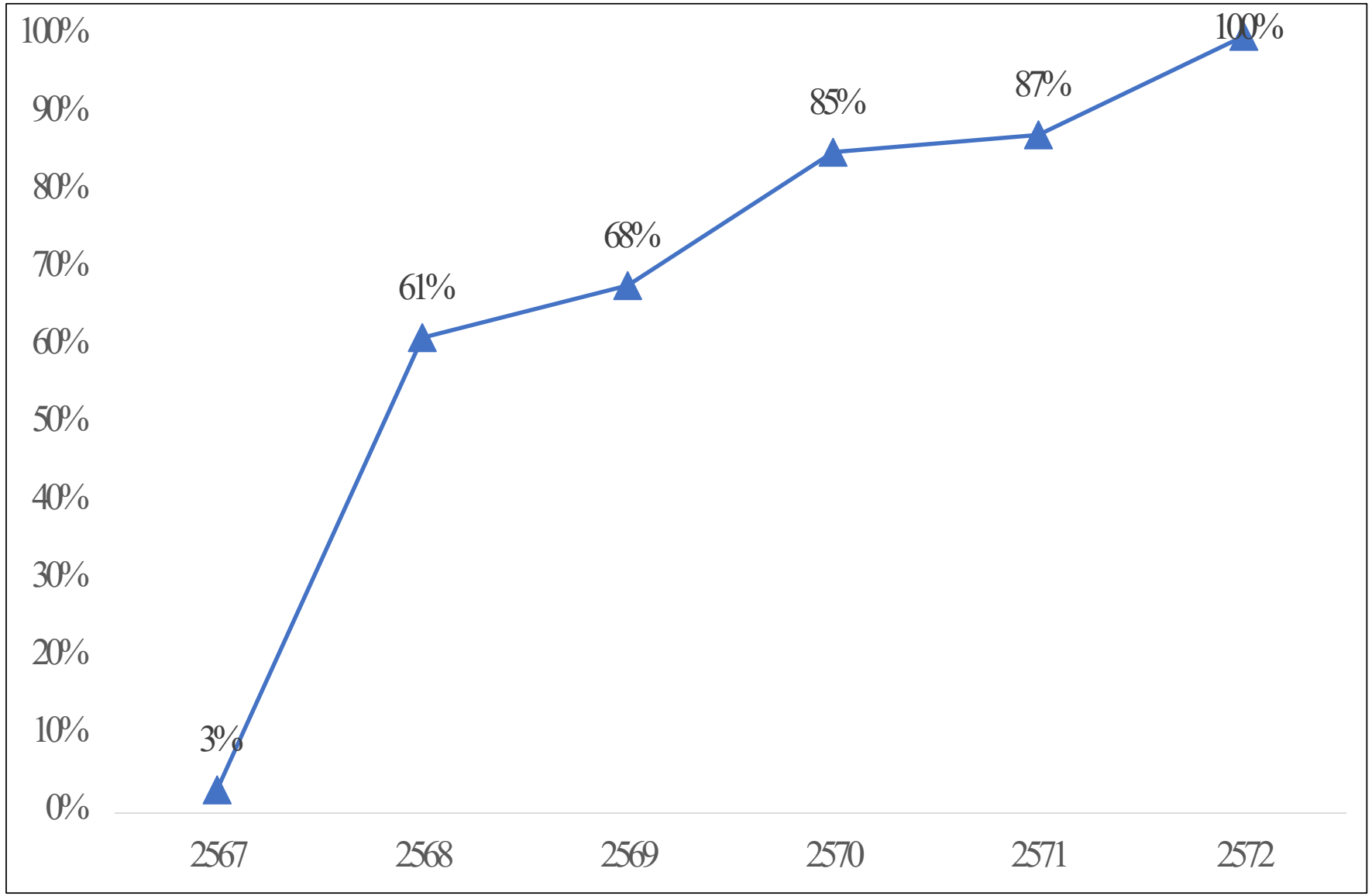


Demand for DAB+ Licenses

Survey-Based Cumulative Adoption Rates of DAB+ (fromm 1,539 Radio Station Operators)



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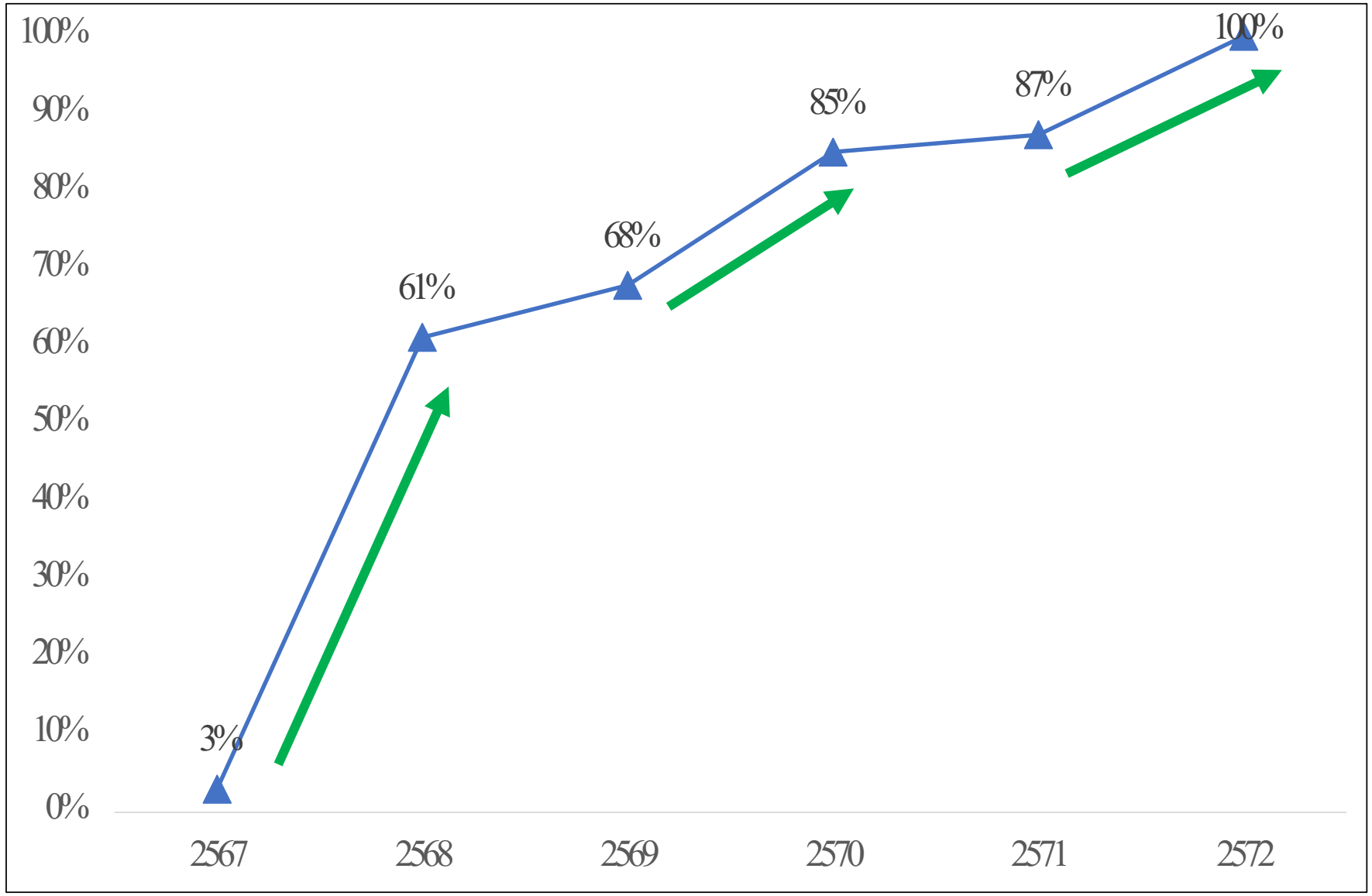

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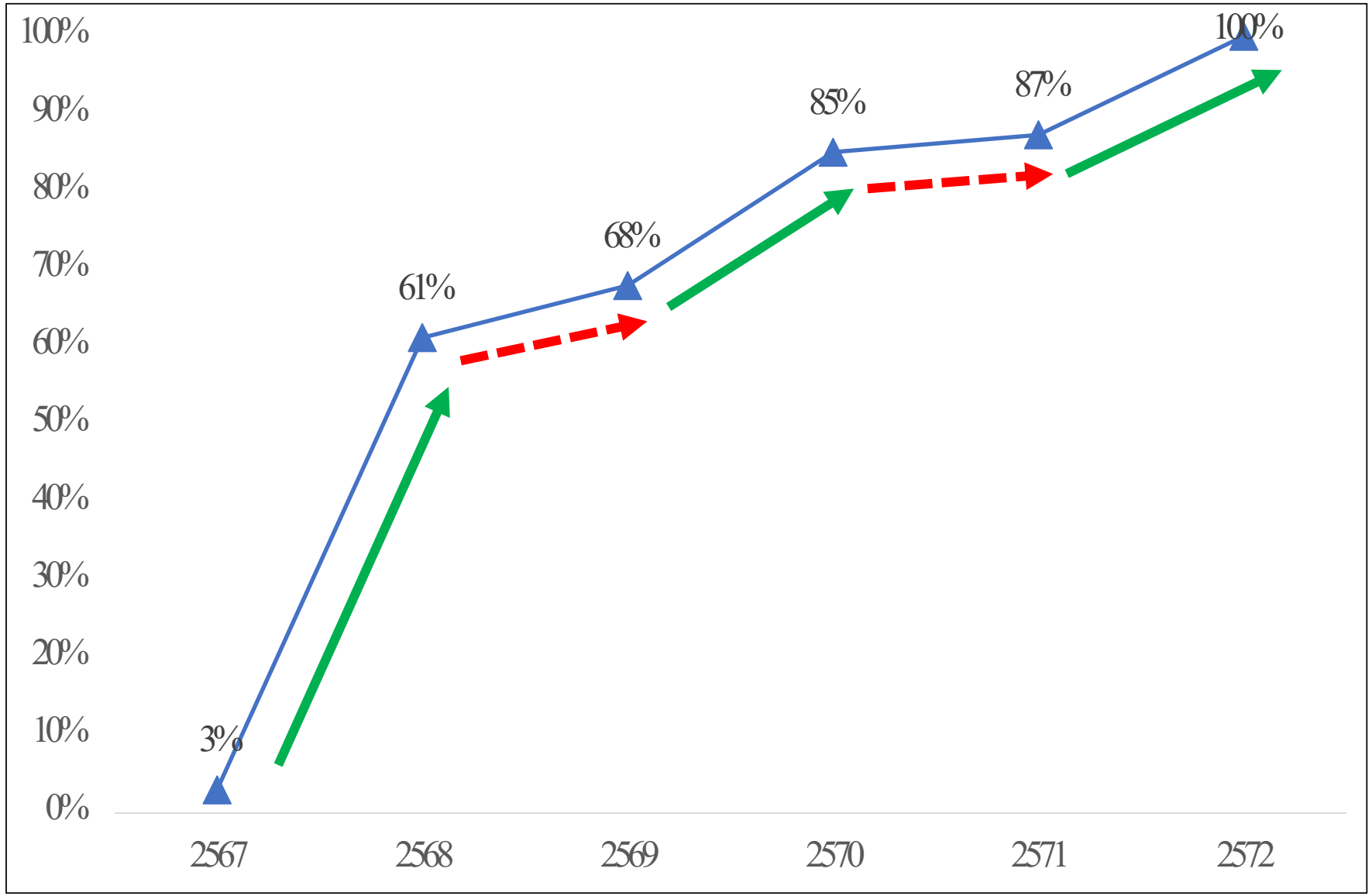

Overview of Bass Diffusion Model

$$S(t) = \left[p + \left(\frac{q}{m} \right) \left(N(t-1) \right) \right] \left[m - N(t-1) \right]$$

,µv[Ëz S = Total number of digital radio adopters
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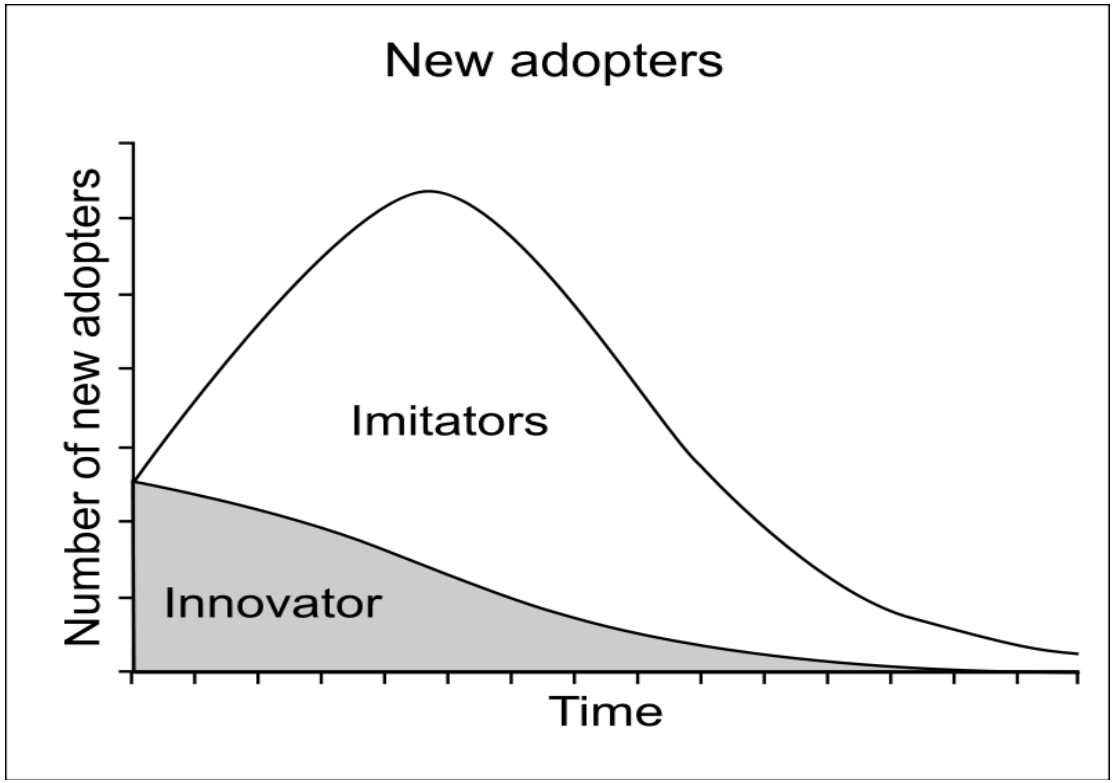

Source: Bass, Frank M; Trichy V. Krishnan; Dipak C. Jain (1994). "Why the Bass Model Fits without Decision Variables". Marketing Science. 13 (2): 203–223.

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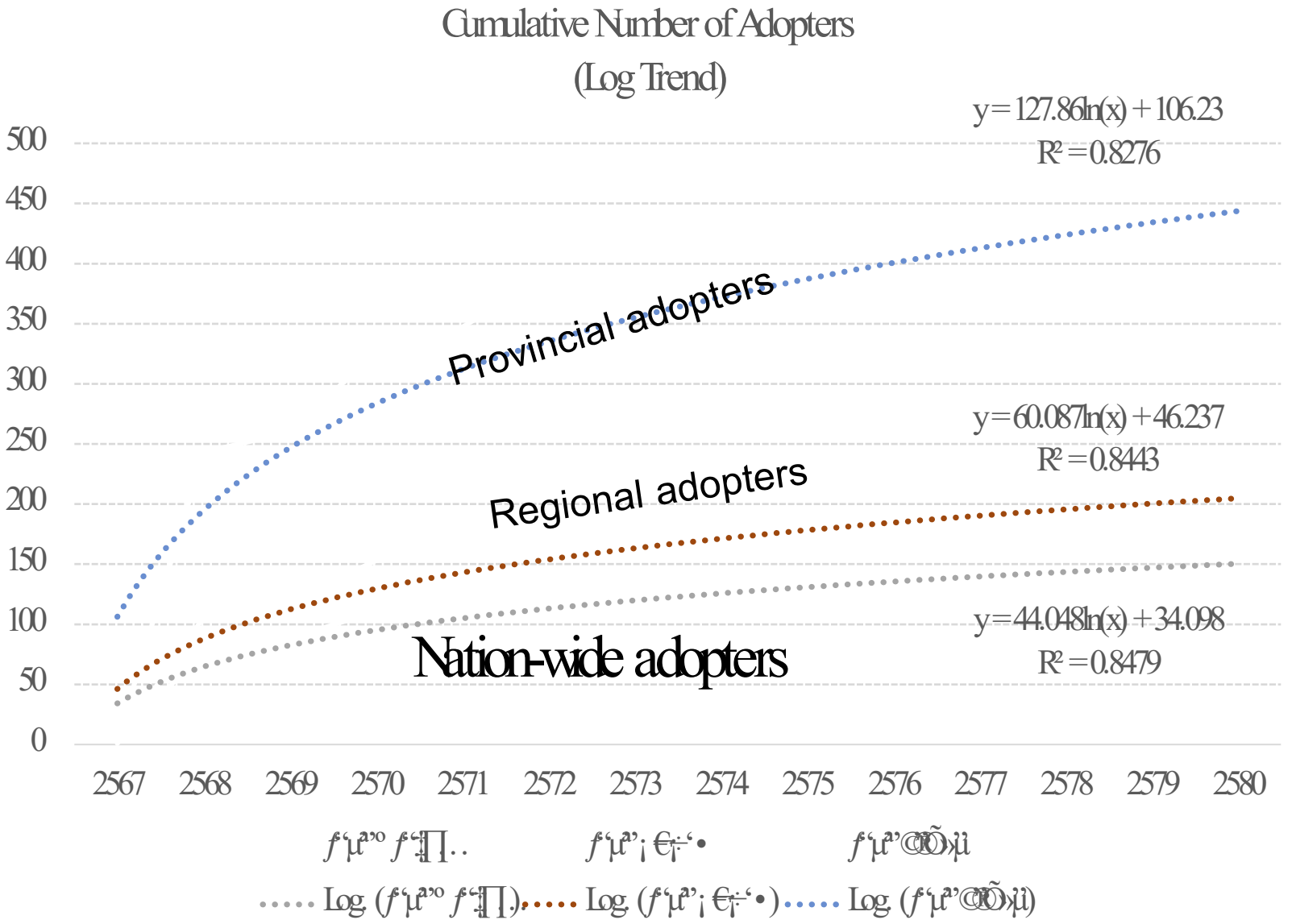
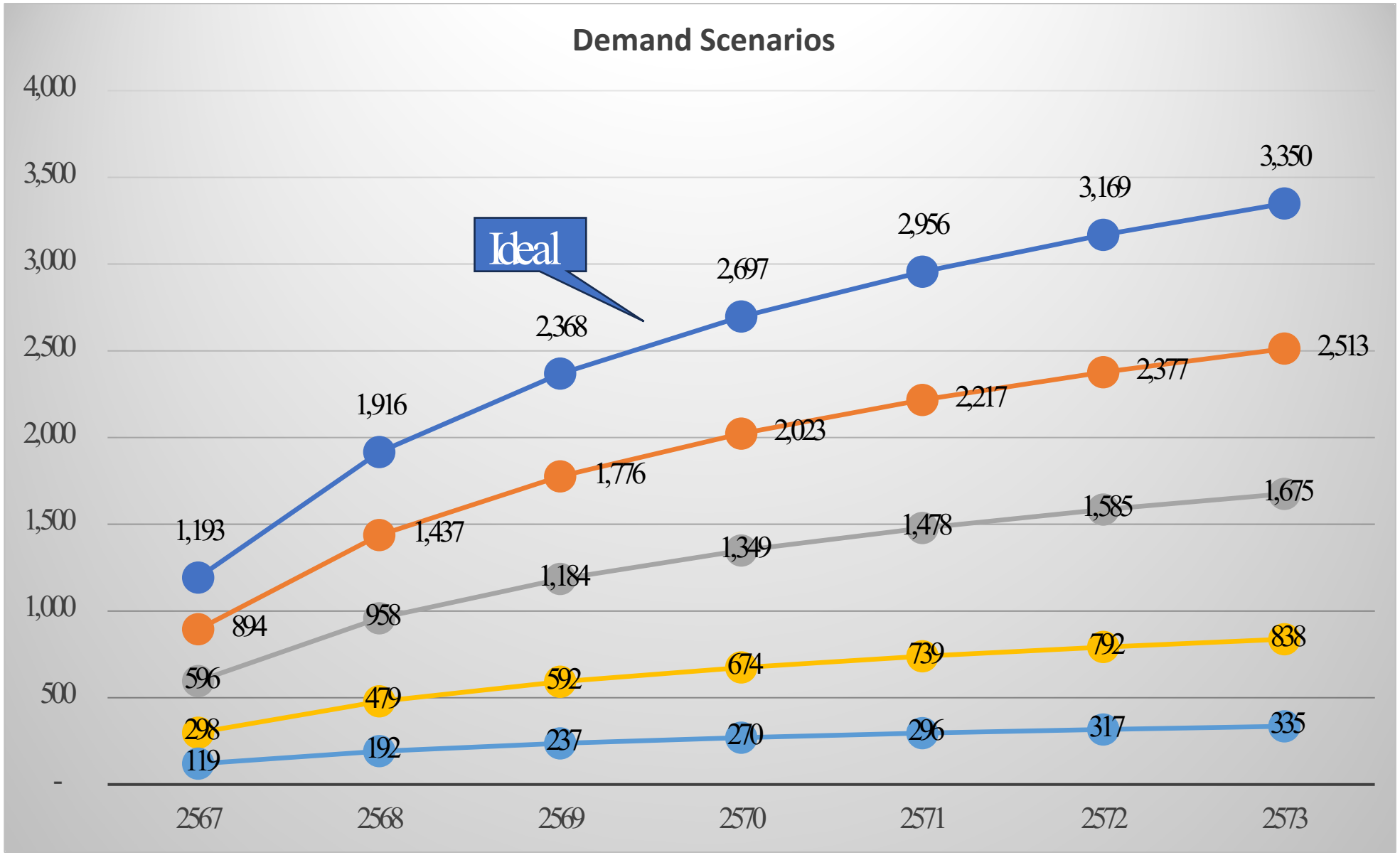


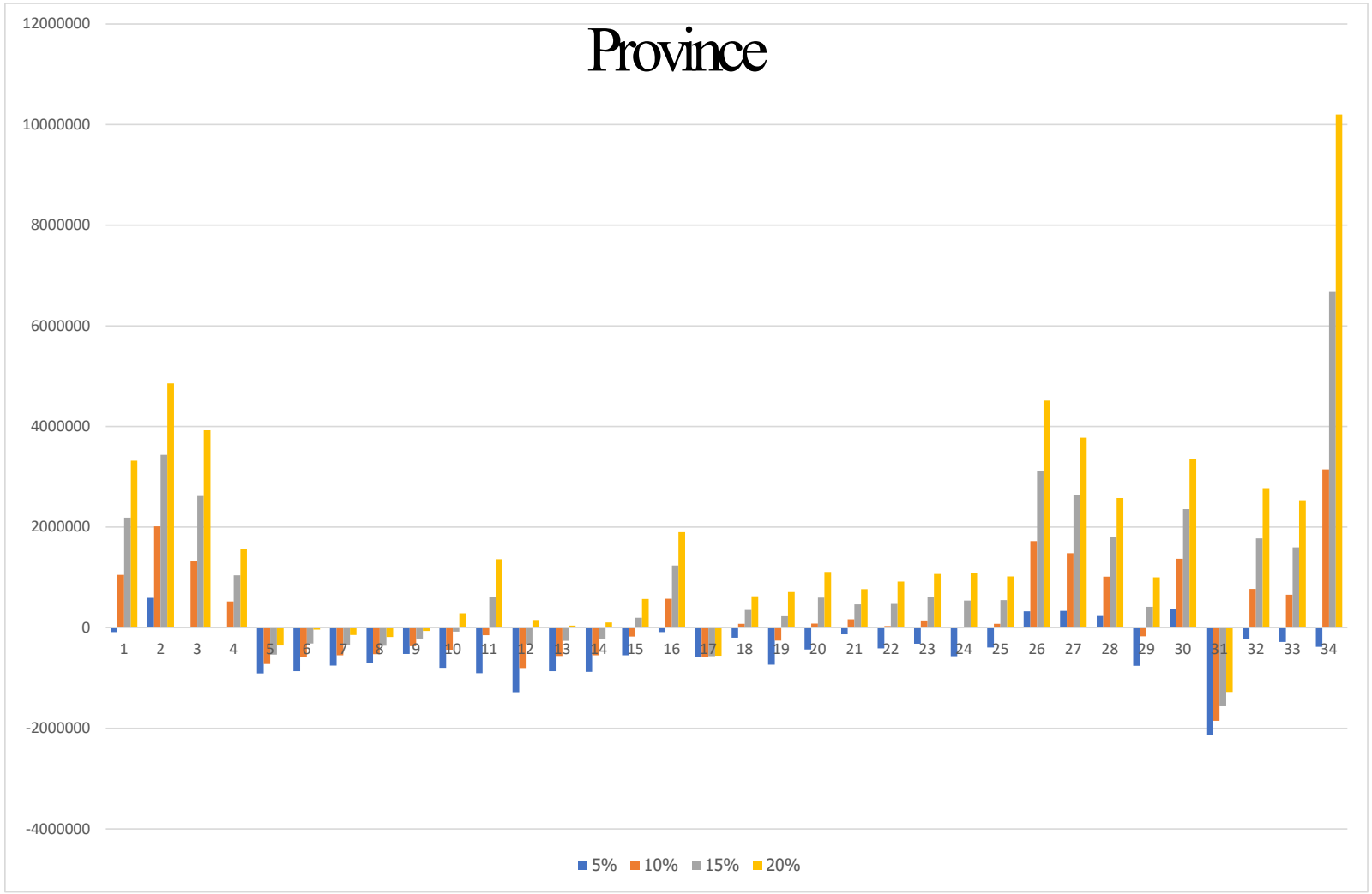
5 Scenarios of Operator Demand for DAB+



NPV Estimates

Option 1 (Nation/Region/Province/Population Coverage)

- / Mux (18 freq'-/ Mux (18. "' -"2"Mux (0,226"freq'/95% coverage

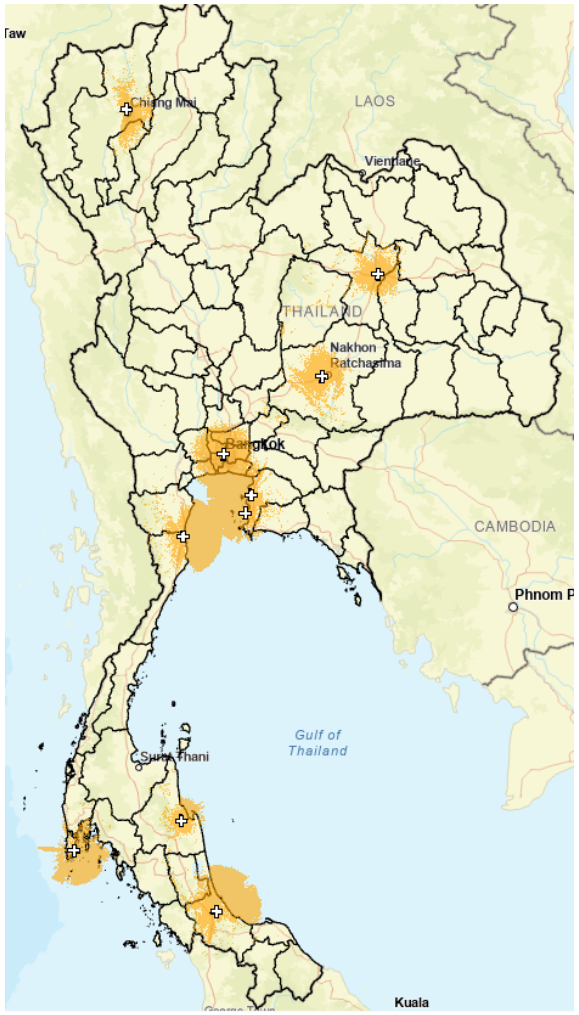


Economic Impact of DAB+ (in Million Baht)

[2]	Base Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Total revenue from operators (Million Baht)	-	31,905.91	33,185.34	34,516.07	35,900.17	37,339.76	38,837.09	40,394.45
Economic multiplier	-	1.38	1.38	1.38	1.38	1.38	1.38	1.38
Cumulative deployment coverage based on the proposed rollout plan		49.9%	68.0%	95.5%	96.4%	97.0%	98.9%	100.0%
Economic impact (Million Baht)	-	21,986.24	31,128.99	45,506.17	47,763.71	49,967.71	53,011.30	55,744.35
GDP of Telecommunication Industry without DAB+ Million Baht)	485,814.33	485,814.33	514,088.72	544,008.69	575,669.99	609,173.99	644,627.91	682,145.26
GDP of Telecommunication Industry with DAB+ Million Baht)	-	507,800.56	545,217.72	589,514.86	623,433.70	659,141.70	697,639.22	737,889.60
% Change in Telecommunication Industry GDP when DAB+ is added	-	4.53%	6.06%	8.36%	8.30%	8.20%	8.22%	8.17%

**$1 is approximately 36.5 Baht

Policy Implication : "Go" or "No Go"



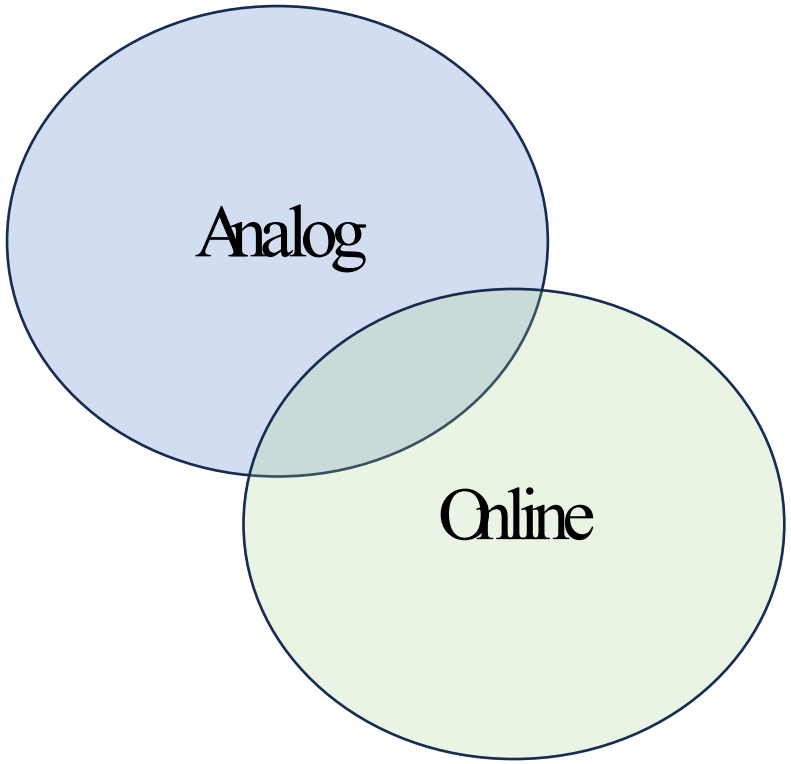
Communication theme:

"Digital life, Digital radio"

Nation drives, Market follows

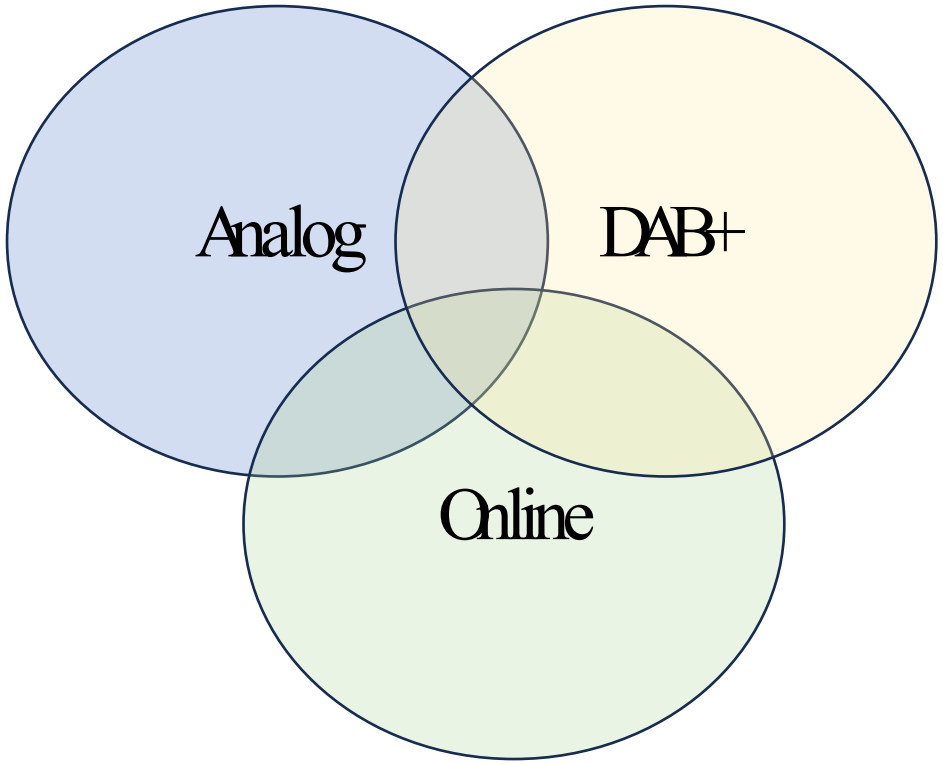
Policy Implication : "Go" or "No Go"

As-Is situation

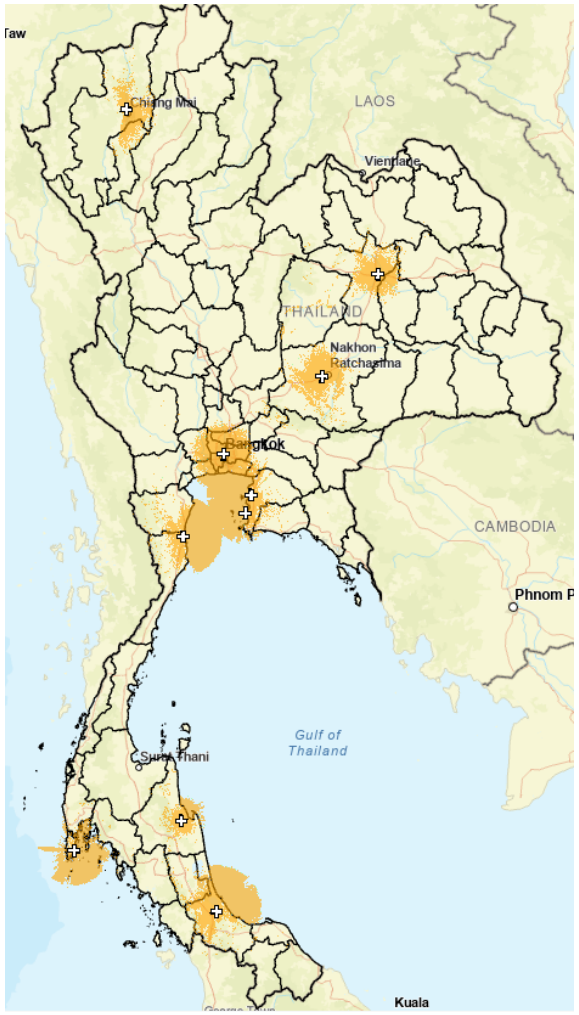


Policy Implication : "Go" or "No Go"

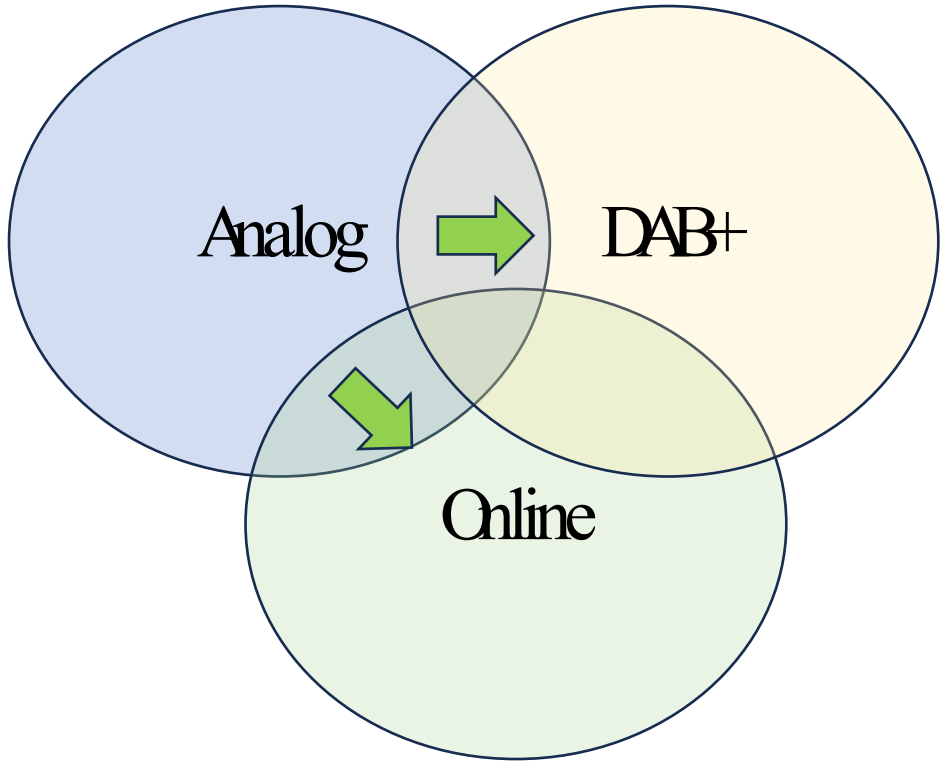
Future scenario



Policy Implication : "Go" or "No Go"

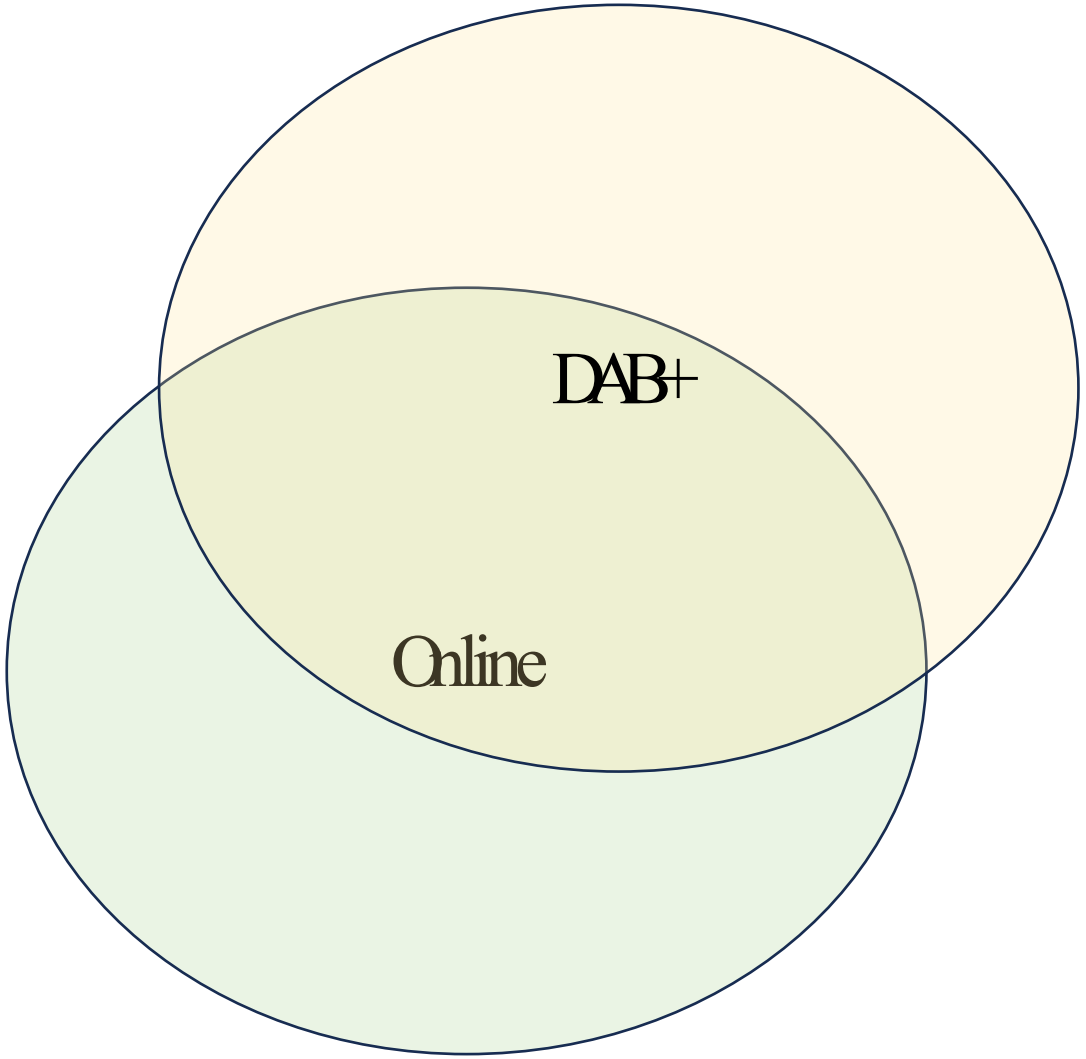


Customer Migration

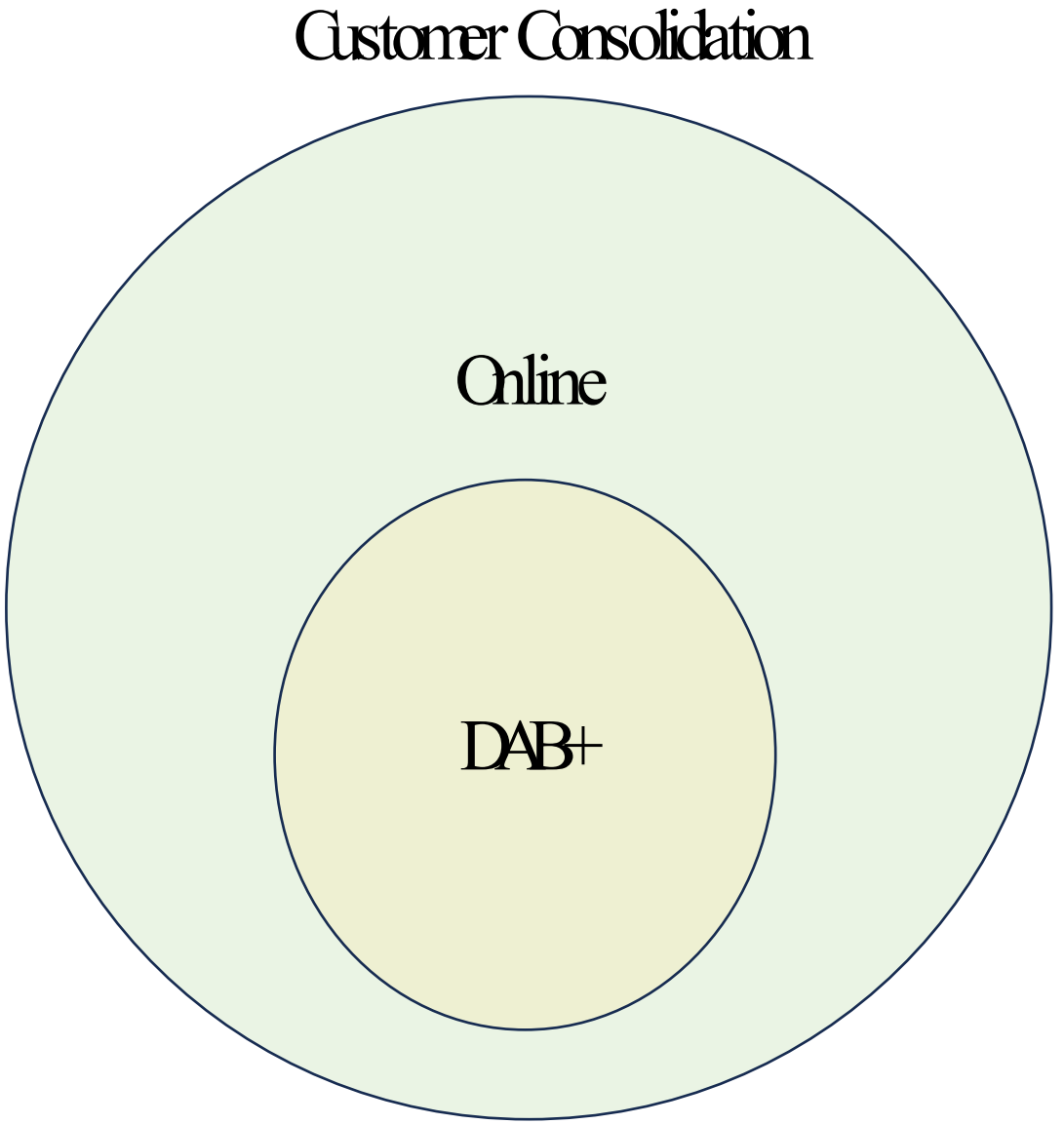


Policy Implication : "Go" or "No Go"

Customer Migration wit Analog Radio switch-off



Policy Implication : "Go" or "No Go" (2)



Policy Implication : "Go" or "No Go" (3)

Policy	Go	No Go
The clarity of the policy towards Analog Radio licensing	Is there a specific time frame set for whether the license will be extended or not, and until when?	There is no clear time frame specified, creating a perception that the license can be continuously renewed.
Analog Switch Off Policy	There is a clear year for the Switch Off.	The year is not clearly specified.
Market stimulation policy to create business potential.	• There is a policy that encourages Analog radio users to switch to DAB+. • There is a policy to create a new market.	There is no clear supporting policy.
Broadcasting by government agencies.	Government agencies close to the public cooperate in switching to DAB+.	There is a lack of cooperation or not as much cooperation as there should be.
The requirement for cars to be equipped with DAB+.	New car models are required to be equipped with DAB+ (direct effects + psychological impact).	There is no requirement to install DAB+.
Communicating the benefits of DAB+ to the public.	Communication is directed towards both the existing Analog radio user group and new target groups.	There is a lack of appropriate and targeted communication with the intended audience.
Supporting the public in switching to DAB+.	There is a policy in place to minimize the switching costs for the public.	There is no supporting policy.

Let’s talk