

Exploratory Study on Perceived Use of DMB Cellular Phone

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- **HBS Executive Education/CTIA/WTS**
- **Overview of Wireless and Current Issues**
- **Korea's Lead in Cellular Phone Industry**
- **Research Model**
- **Research Methodology**
- **Data Analysis**
- **Conclusion**

Trends – Business Executives, CTIA, WTS

Harvard Business School Executive Education

1. Changing Roles of the CEO and CIO/CTO, and their relationship
2. Business Transformation, Computer Operations, and Internetworking
3. E-commerce, M-commerce, U-commerce, telecommunications
4. The Internet and the Law/Policy

- International Conference on Information Systems (ICIS)
- Americas Conference on Information Systems (AMCIS)
- IEEE Communications Society



Mobile Wireless Services and Business: Current Issues

Evolution of Mobile Wireless Services and Businesses



5 lbs



3.3 oz

Present and Future of Wireless and DMB

What about the present/future?

DMB (Digital Multimedia Broadcasting) - DVB-H of Nokia - FLO technology of Qualcomm

Intel's mobile Centrino for 802.11x; Rosedale for 802.16d



Dr. Gordon Moore
Co-Founder, Intel

In Your Pocket

- Satellite and Land-based TV
- Computer apps
- Mega- Pixel Camera
- GPS
- Multi-user Games
- Security
- Music

QualComm's MSM chipset

QualComm invested \$800M for DMB



Dr. Irwin Jacobs
CEO, Qualcomm

Korea's Lead in Mobile Cellular and DMB Phone Services

Factors affecting Korea's Lead in Cellular Business

J. P. Shim, "Korea's Lead in Mobile Cellular and DMB Phone Services," CAIS, Vol.15, April 2005

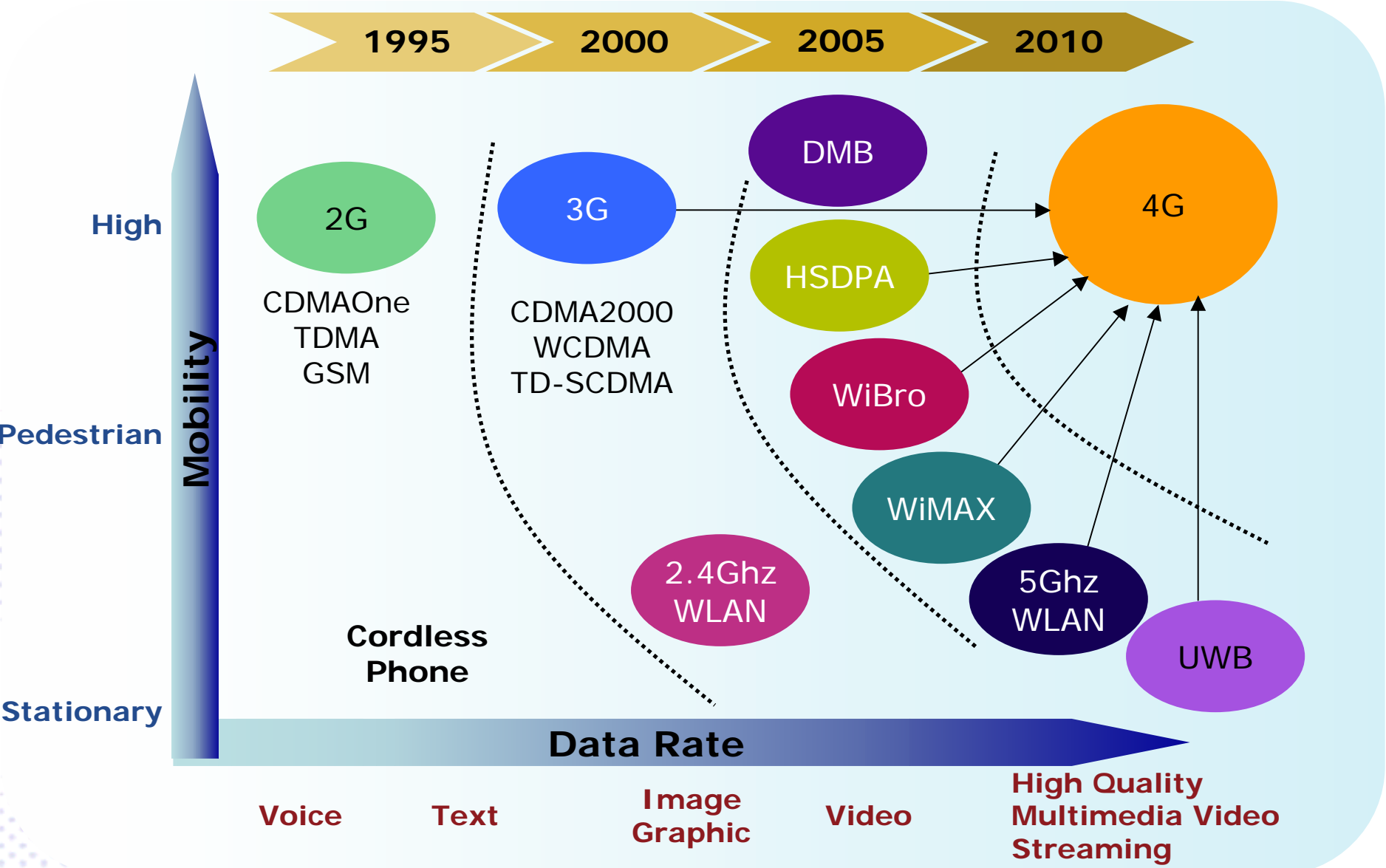
- A "bbali bbali" Culture – acquire the latest model

- Pervasive Infrastructure - CDMA

- Free Incoming Calls

- Convenience – with social status

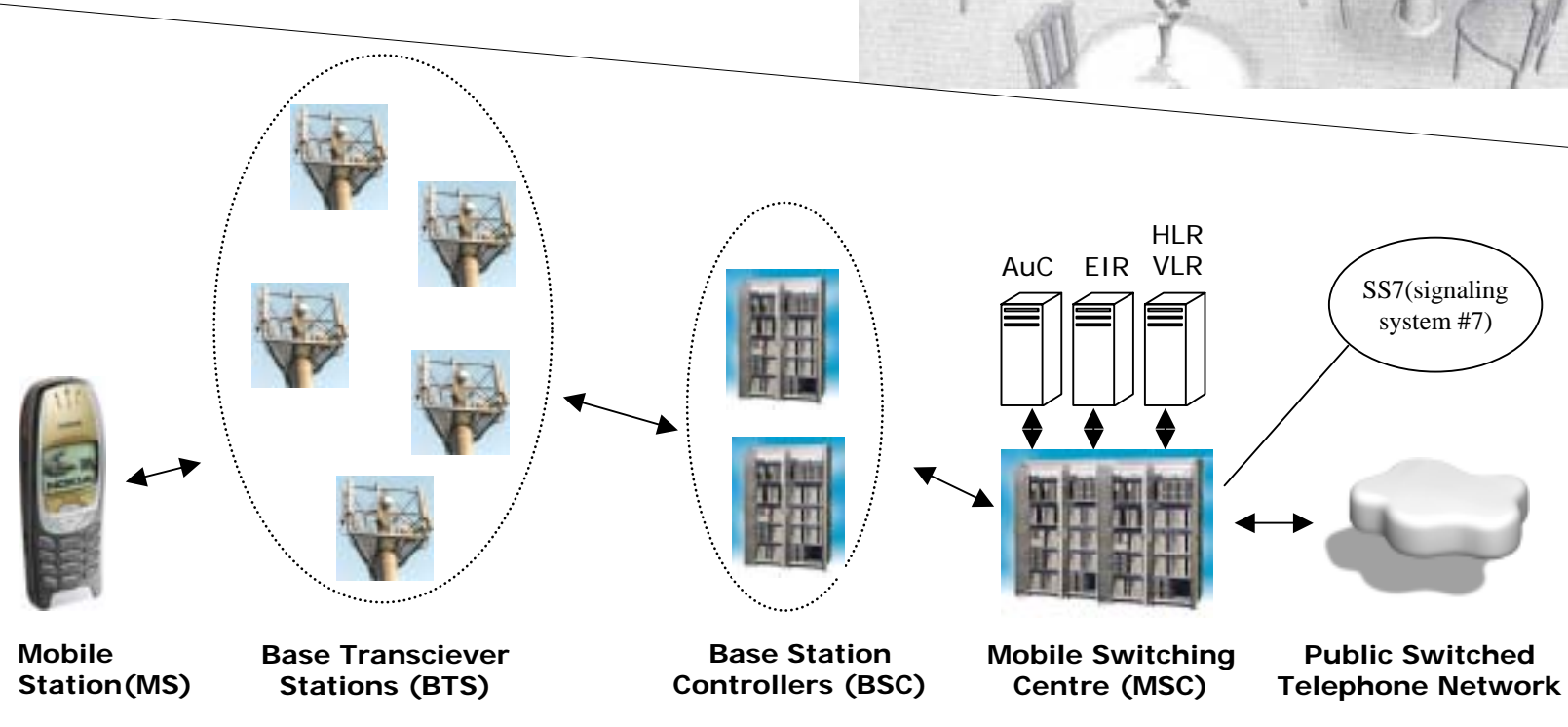
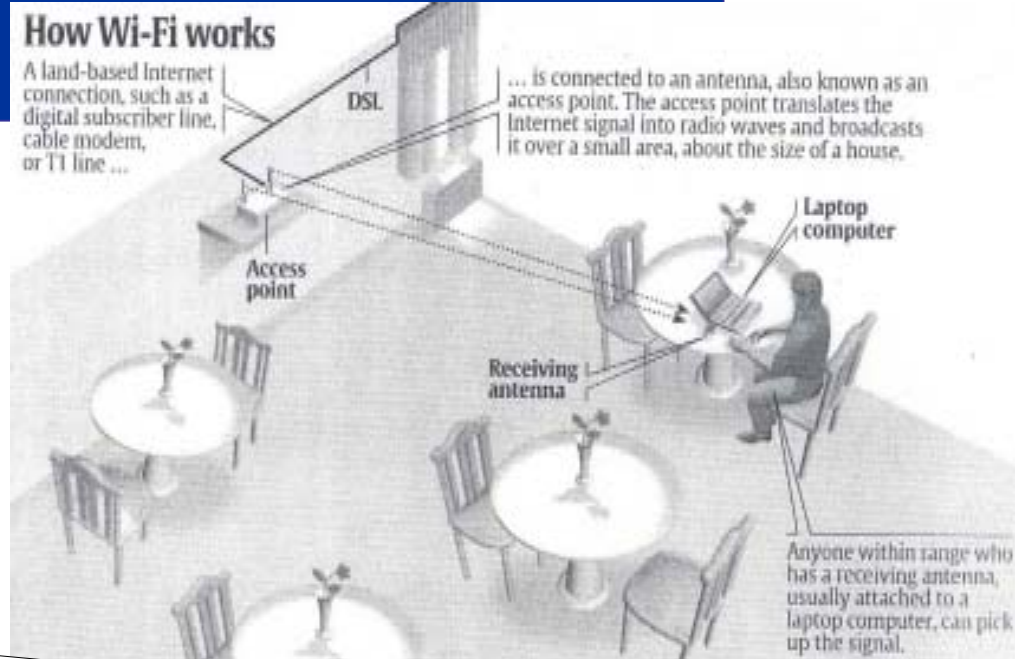
Wireless Network Evolution



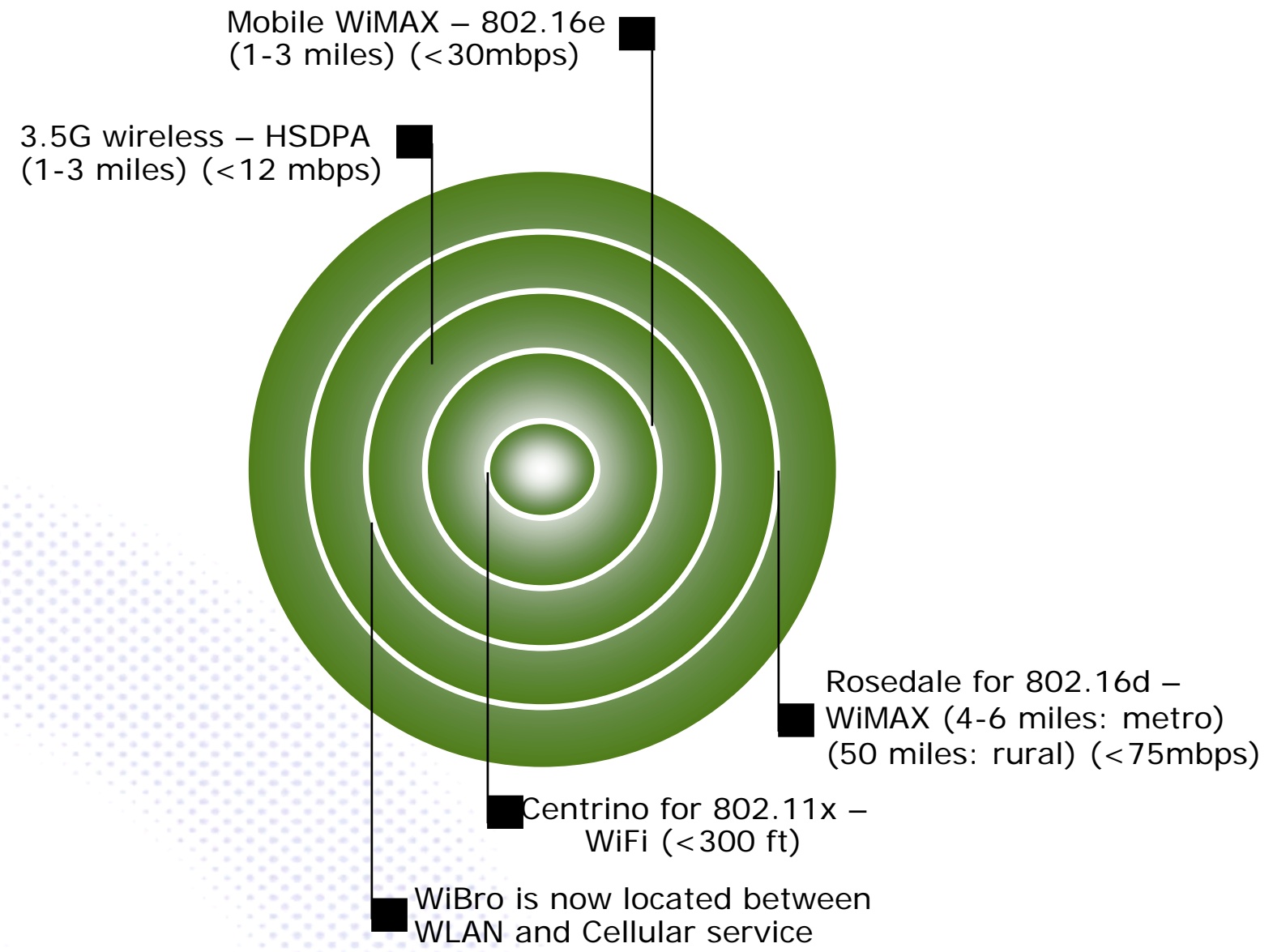
The Network

For Wireless LAN: IEEE 802.11b, 11a, 11g, (11n)

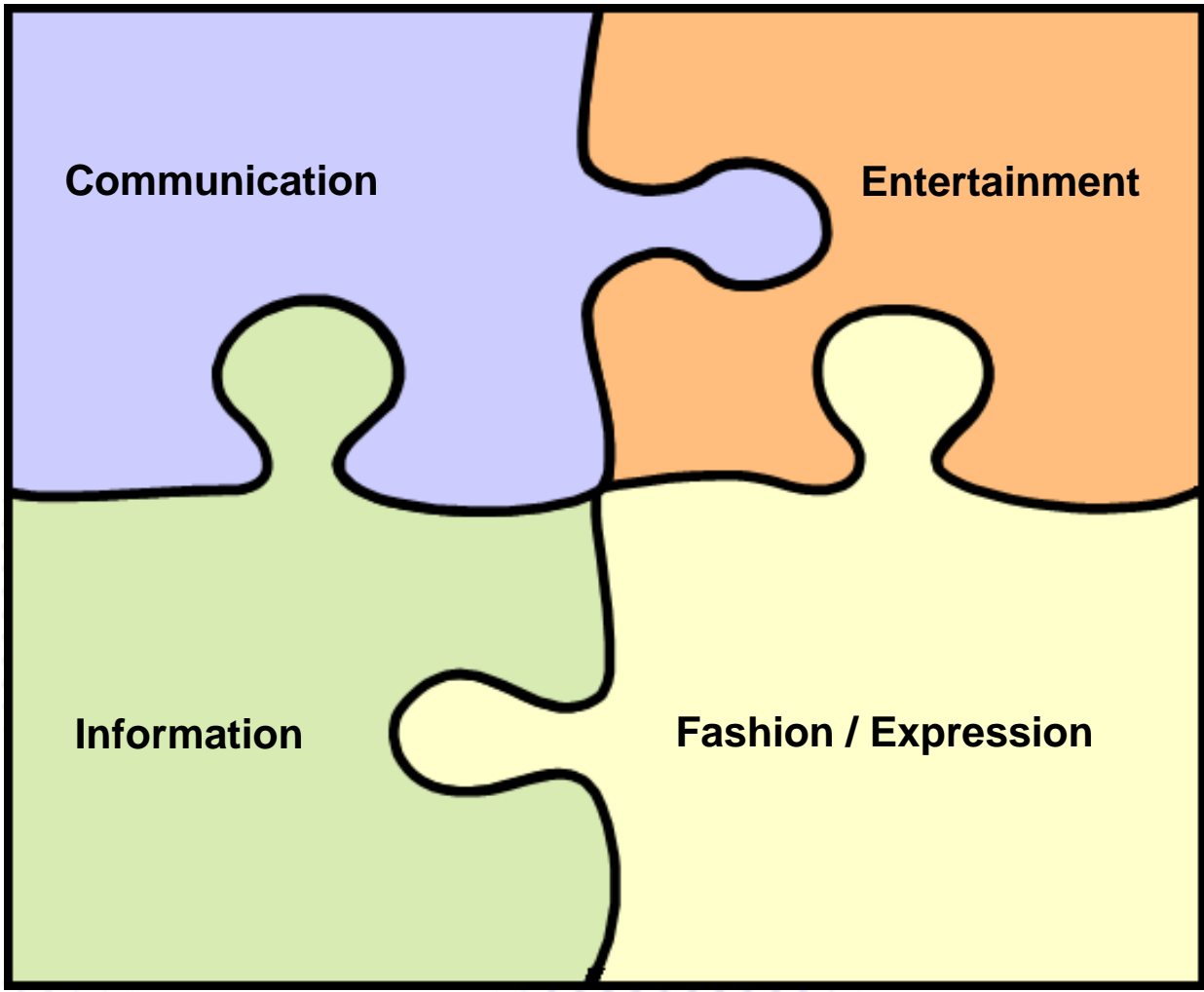
For Wireless Broadband: 802.16d WiMax, WiBro



Wireless Update



Cellular Phone Use



- Communication tool** – enables calling and SMS
- Entertainment tool** – supplies games, pictures, movies, MP3
- Information tool** – provides news, maps, TV programs, and ads (Verizon's service – CNN, ESPN)
- Fashion/ Expression tool** – presented as a similar to brand-name clothes and shoes

Broadcasting? "One-to-many" approach

Cellular systems are on a "one to one" approach

Broadcasting systems are on a "one to many"

- Much lower costs to users vs. high data rates of 3G cell phones
- Attractive to users

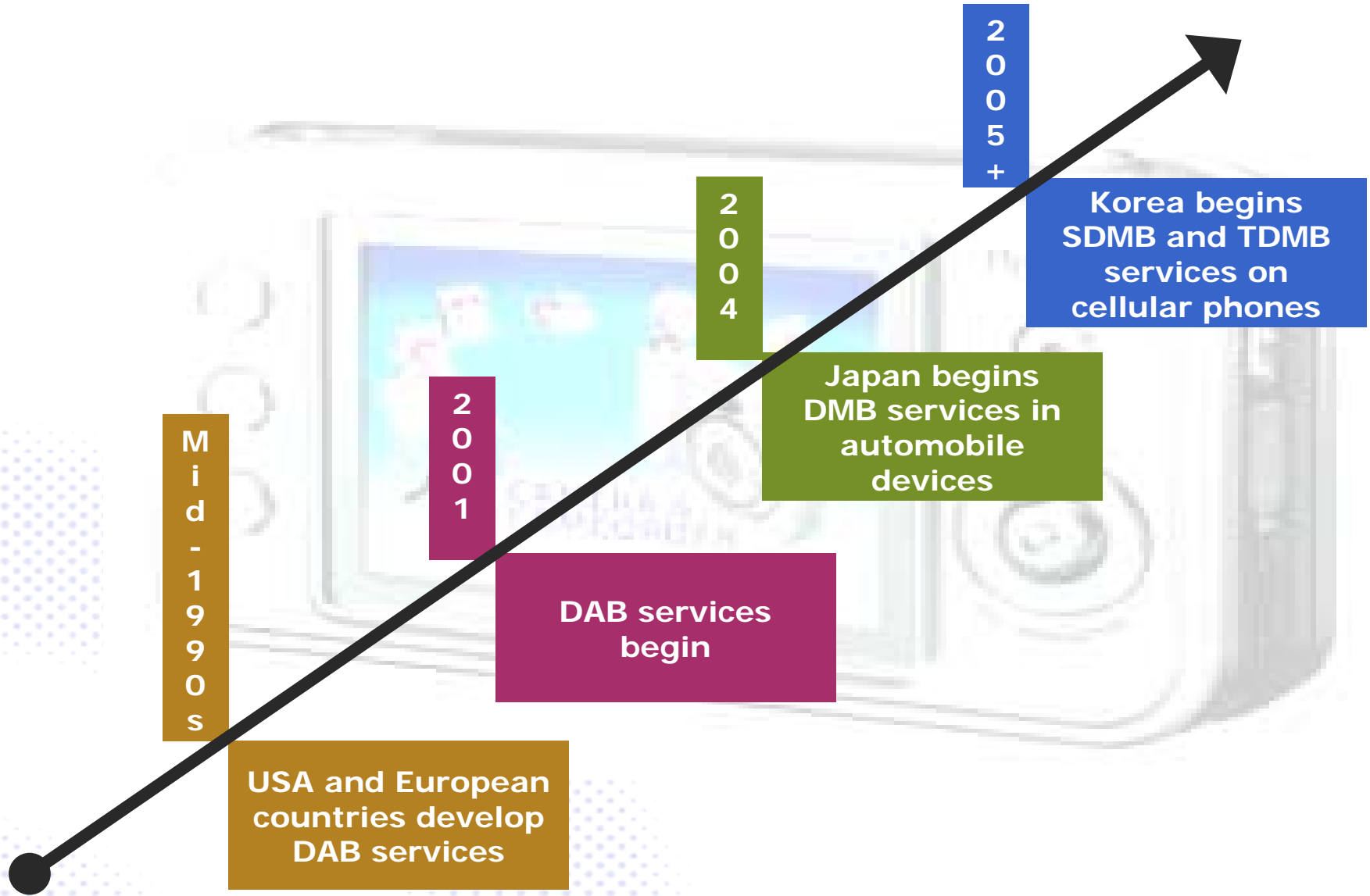
Business models

1) Free services paid by advertising

2) Subscription / Flat fee

3) Combination of the two

History of DAB and DMB



Digital Television Transmission Standards

Qualcomm
MediaFLO

DVB-H

DMB

ISDB-T

DVB-H

Europe

- Trials in UK, France, Finland, Germany, Sweden
- Phones launch date: late 2006

North America

- Qualcomm's MediaFLO
- DVB-H Trial in Pittsburgh, PA
- Phones launch date: 2007

Asia

- Korea and Japan ahead of game
- Korea's launch date: 2005
- Japan launched in 2004

Digital Television Transmission Standards

Standards	Region	Characteristics / Features	Modulation
DMB: <i>Based on Eureka 147 DAB</i>	Korea	<ul style="list-style-type: none"> • European broadcasters can add video at little extra cost • Rapid implementation • Will free up telecom pipelines for higher-margin data services (video phone calls) • Consumes too much power 	COFDM
DVB-H: <i>Based on DVB-T</i>	Europe	<ul style="list-style-type: none"> • "Time slicing" technology: short high bandwidth bursts rather than constant low bitrate streaming • Reduces power consumption and saves battery life • Requires allocation of new frequencies and more expensive investment • Dependence on separate networks: over-the-air and 3G 	COFDM
ISDB-T	Japan	<ul style="list-style-type: none"> • Lower power consumption • Operates on unused TV channels • Provides SFN (single frequency network) and on-channel repeater technology 	OFDM

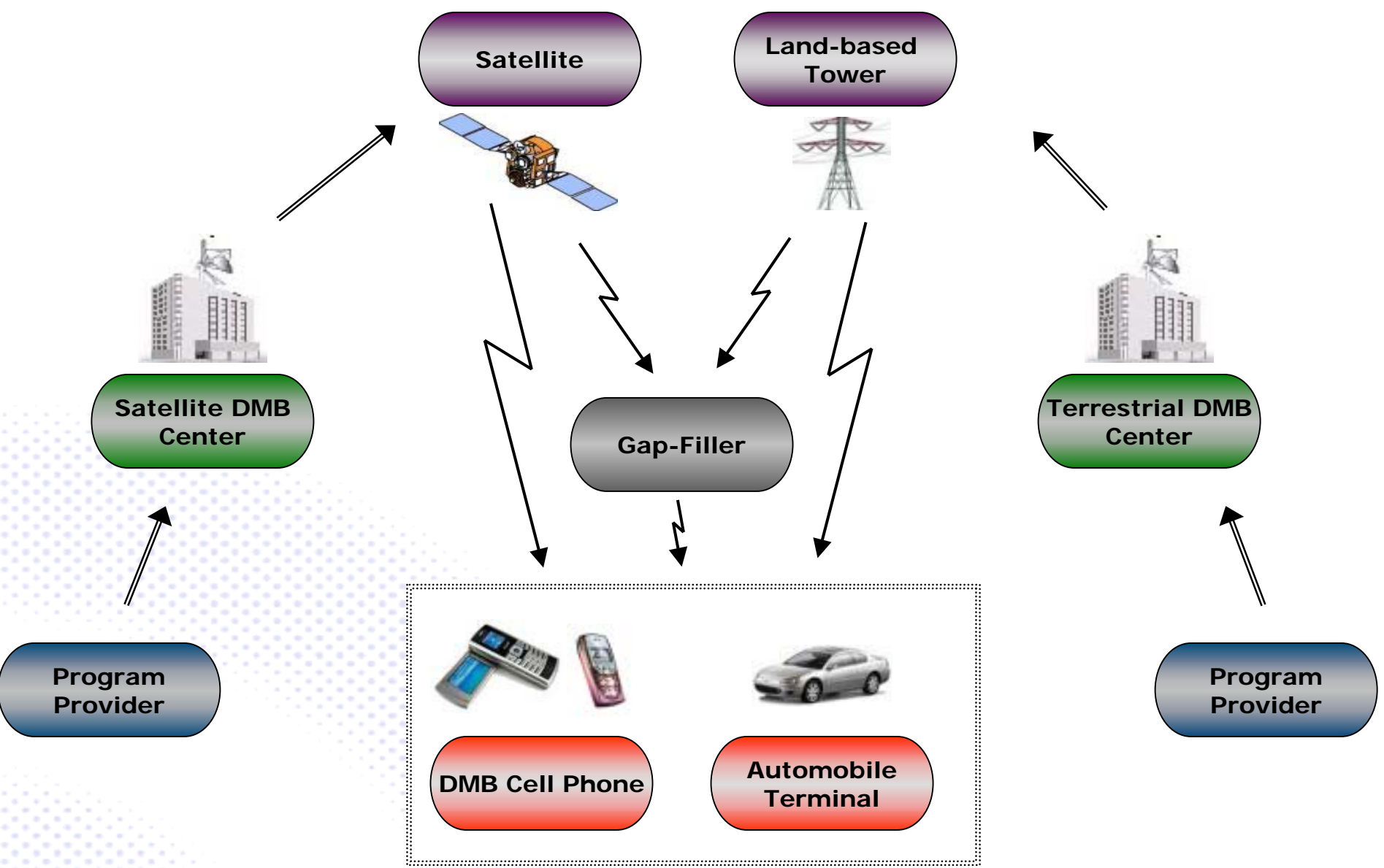
DMB and DAB Services

Country	USA		Europe	Japan	Korea
Service provider	XM	Sirius	Global Radio	MBCO	TU Media (for S-DMB); KBS, MBC, SBS, YTN-DMB, KMMB, Korea-DMB (for T-DMB)
Number of channels	101 (Audio) channels (music, sports, adult)	102 (Audio) channels (music, sports, news)	150 (Audio & Data) channels (In Germany, T-DMB)	Terrestrial 9 Video channels 55 Audio channels 34 Data channels	Satellite DMB 14 video channels 24 audio channels Terrestrial DMB 6 video channels 18 audio channels 3 data channels
Receiving device	In-car terminal	In-car terminal	In-car terminal	In-car terminal	Cellular DMB phone, In-car terminal
Service began	Sep. 2001	Feb. 2002	2005 (expected)	2005(T-DMB) 2004(S-DMB)	Jan 2005 (S-DMB) May 2005 (T-DMB)

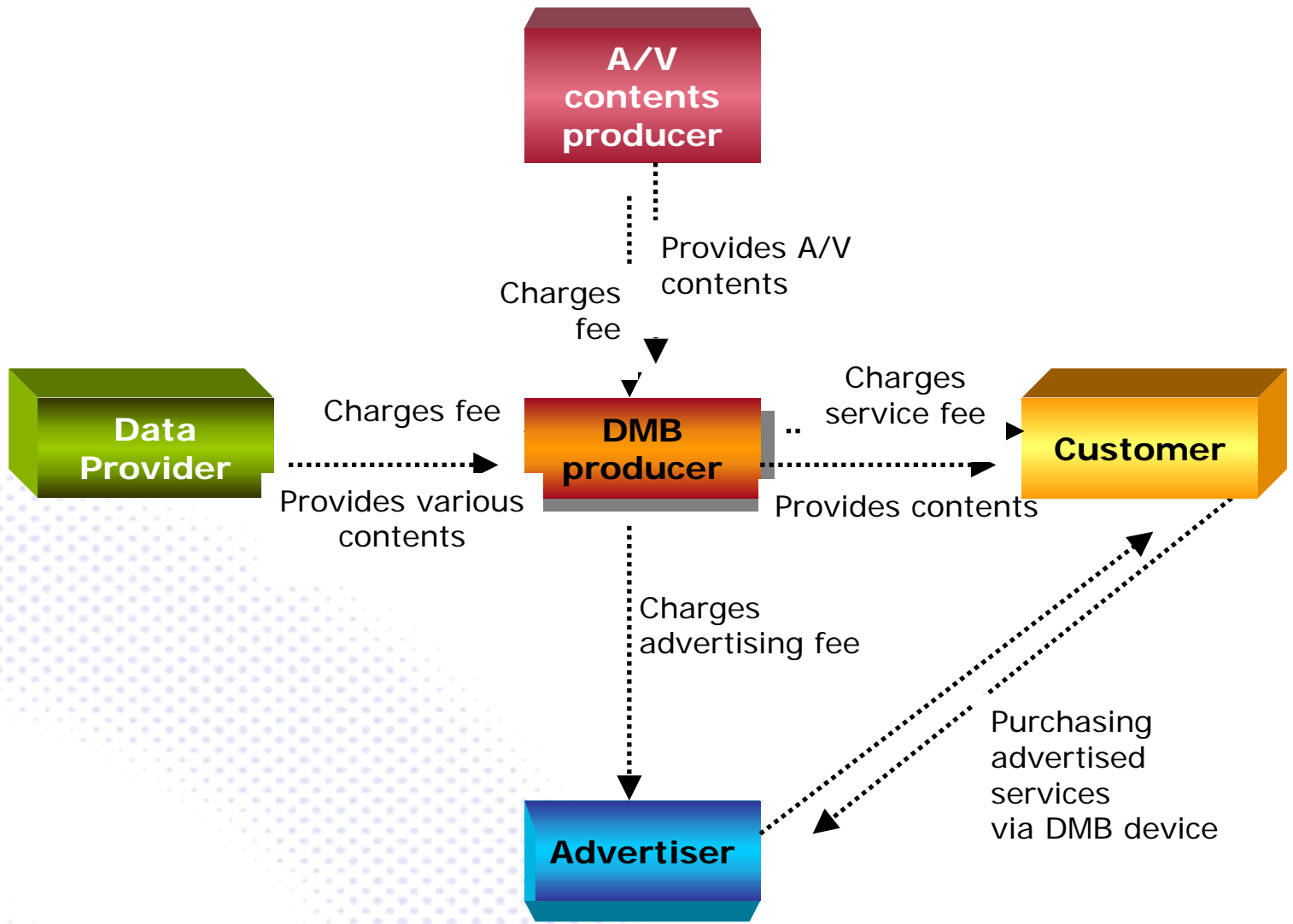


- The world's first portable XM satellite radio
- Received over 130 XM digital channels
- All music channels are 100% commercial-free
- \$299 (\$11.50/month)

How DMB works



A Schematic View of DMB Data Service Business Model



Research Questions

Do users believe that good quality service of DMB program contents will offset DMB phone price/usage the cost?

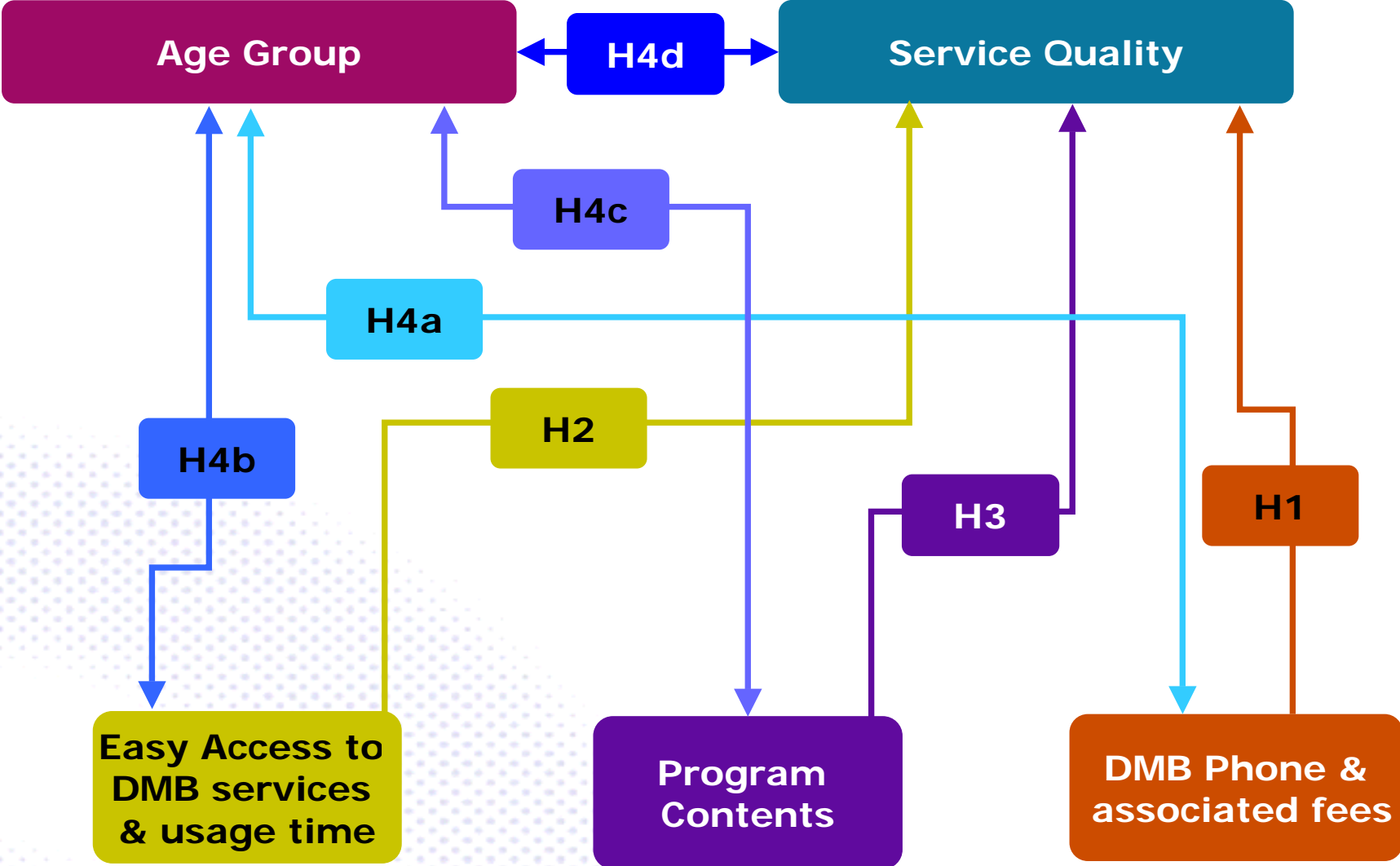
Do users perceive high-quality DMB program contents as satisfactory service offered by the DMB service provider?

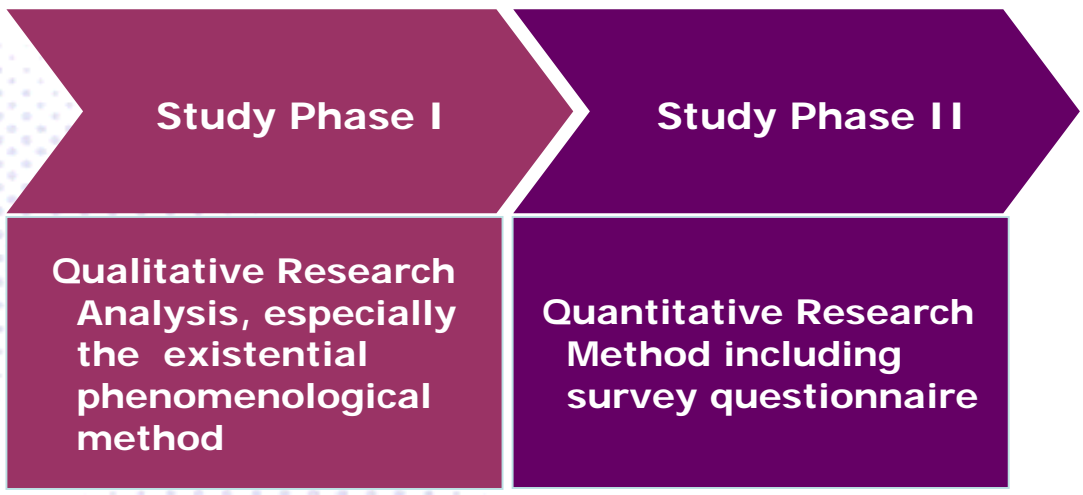
Research Questions

Do users perceive easy access to DMB applications as satisfactory service offered by the DMB service provider?

Are there differences between different age groups in terms of their perception of DMB phone price, phone usage time, program contents, and service?

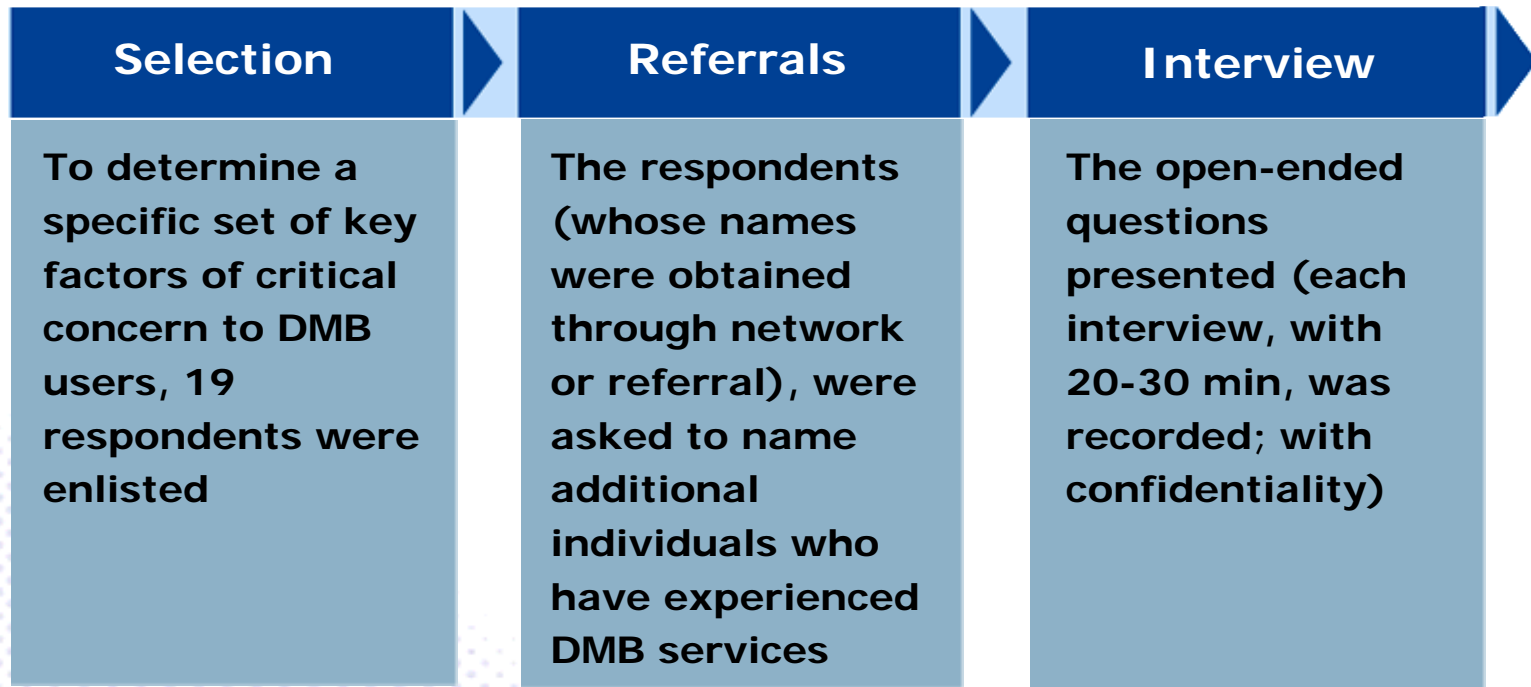
Research Model





*J. P. Shim and KyungMo Ahn, "Empirical Findings on DMB Cellular Phone Services," Working paper, Mississippi State University, 2005.

Study Phase I



DMB Network/Referral Respondents

Respondents	Age	Gender	Main reasons to purchase DMB	Frequency of using DMB	Negative aspects	Positive aspects
Graduate Student	25	M	Fast information Trend spot	Very Often	Poor connection	Mobility High quality
Undergraduate Student	20	F	Entertainment	Often	Limited time	High quality Reliable handset
Undergraduate Student	21	F	Cultural performance	Often	High price of phone device	Mobility High quality
Undergraduate Student	24	M	Information access	Very Often	Low speed	Convenience
High tech manager	29	F	Information search	Very Often	Poor service	New Media
IT employee	29	F	VOD service Information search	Very Often	Poor service	New Culture
Business manager	32	M	Movie, drama, and shopping	Very Often	Reception	High quality
IT employee	24	F	Convenience	Very Often	High price of phone device	Convenience
IT employee	27	F	Time management during rush hours	Very Often	Underutilize	Information High quality
IT employee	28	F	TV broadcasting	Often	High price	Time management
Media manager	32	M	Watching TV	Very Often	Battery hours	Using inside subway
Media employee	30	F	TV broadcasting	Very Often	Reception problem	Good quality

Study Phase I - Responses

Respondents' main reasons for purchasing DMB cell phones

- **Search for information access**
- **Spot the latest trends**
- **For education-related purposes**
- **Watch TV during commute**
- **For entertainment – movies and shopping**

Positive Responses

- ▲ Accessible anytime / anywhere
- ▲ Personalized
- ▲ Mobility Factor (not shared / fixed)
- ▲ Good for managing time

Negative Responses

- ▼ Expensive price factor
- ▼ Reception Problem
- ▼ Low battery usage

Authors develop questionnaire

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graph TD; A[Authors develop questionnaire] --> B["The research instrument (5-point Likert scale): 2 pretests"]; B --> C["1st Pretest"]; B --> D["2nd Pretest"]; C --> E["Administered the questionnaire to 25 graduate/ undergrad students in Seoul"]; D --> F["Conducted at a DMB phone service provider to ensure the content validity"];
```

**The research instrument
(5-point Likert scale):
2 pretests**

1st Pretest

**Administered the
questionnaire to 25
graduate/ undergrad
students in Seoul**

2nd Pretest

**Conducted at a DMB
phone service
provider to ensure
the content validity**

Study Phase II Process

Distribution of questionnaire

Distributed the questionnaire to 300 randomly selected individuals who were inside / outside COEX and Korea Trade Center during a 5 week period of Jan. and Feb. 2005

** with collaborator - Professor Ahn, Kyungmo who was a visiting professor at Mississippi State U and is currently a faculty at Kyunghee University

Usable Responses

264 usable responses

Layout of questionnaire

2 page questionnaire:
3 sections and 32 questions

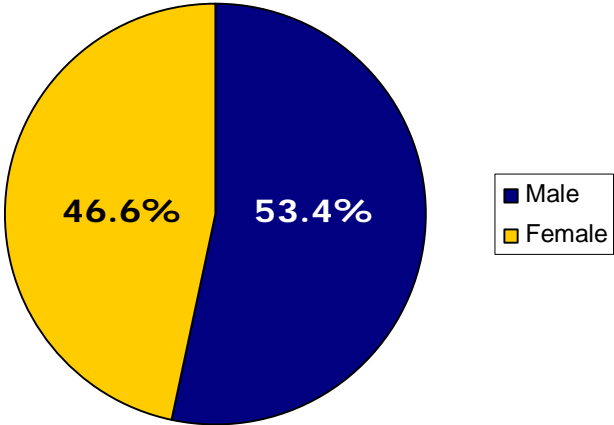
Section 1: DMB Services

Section 2: Participants' perceived values of DMB application services

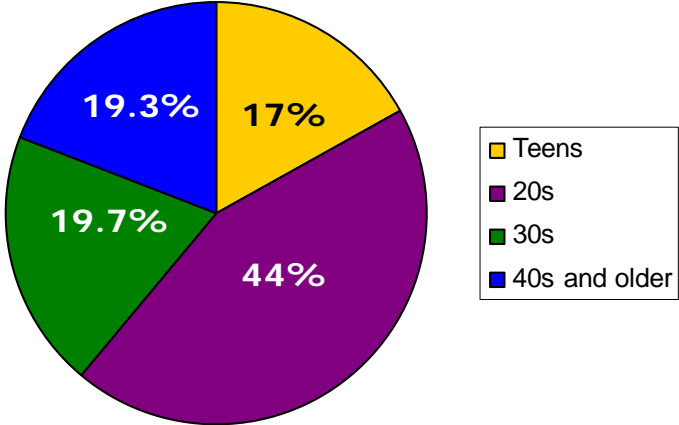
Section 3: Demographics

DMB Survey Participants

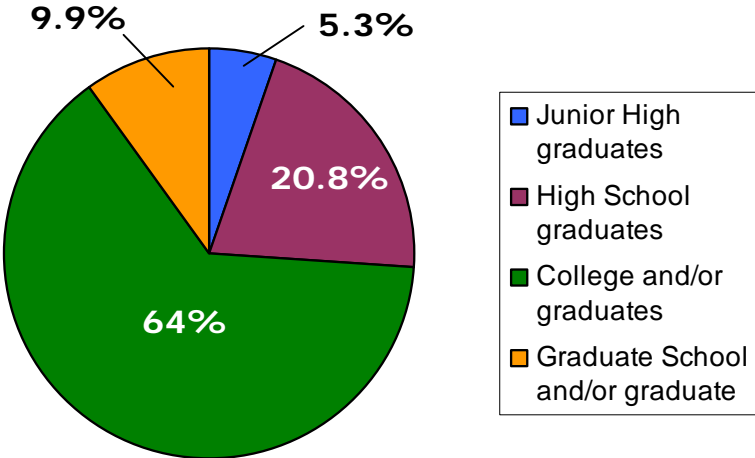
Gender



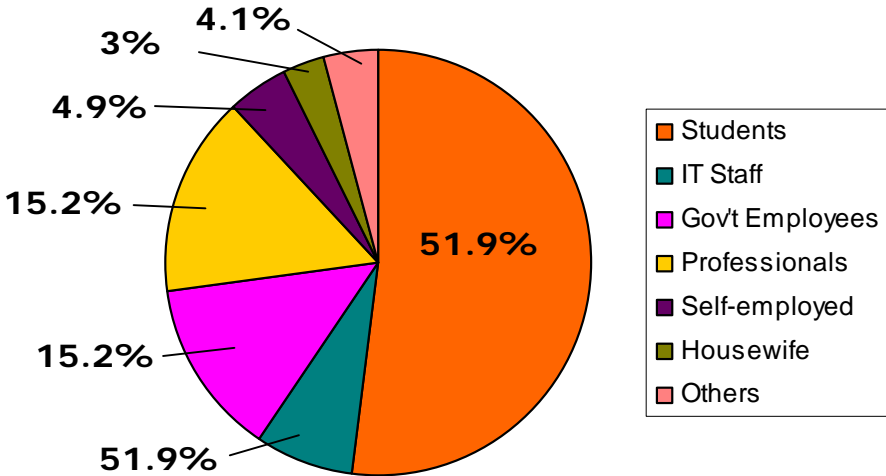
Age



Education



Occupation



Current DMB Cellular Phone Use in Korea As of January/February 2005 (n=264)

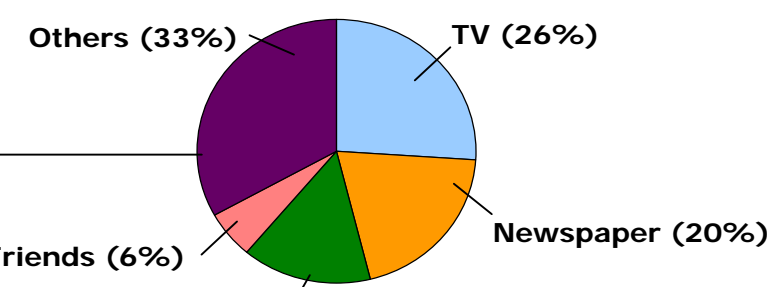
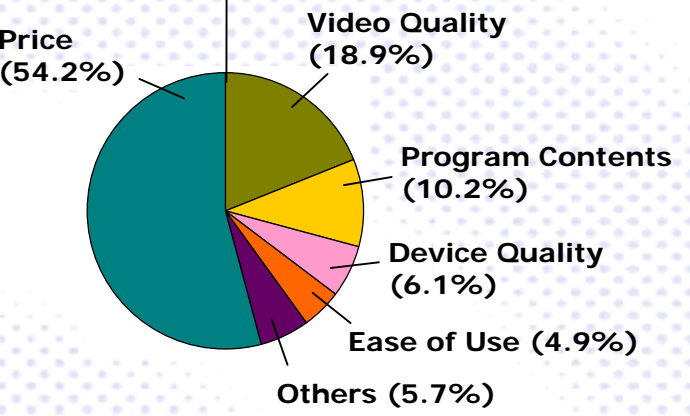
Heard of DMB?

Yes (69.7%)

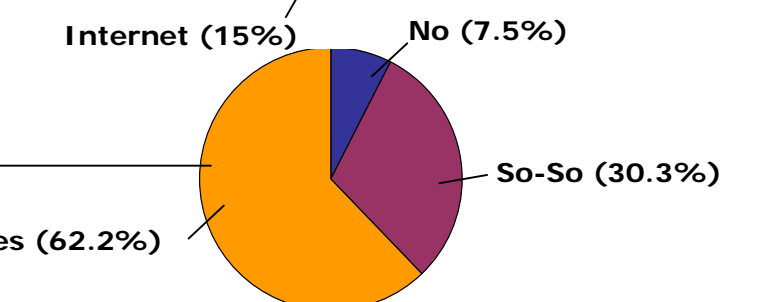
Use DMB?

Yes (20.1%)

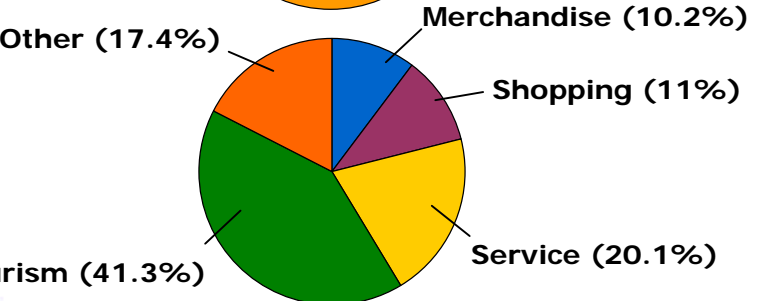
Important factors for choosing DMB



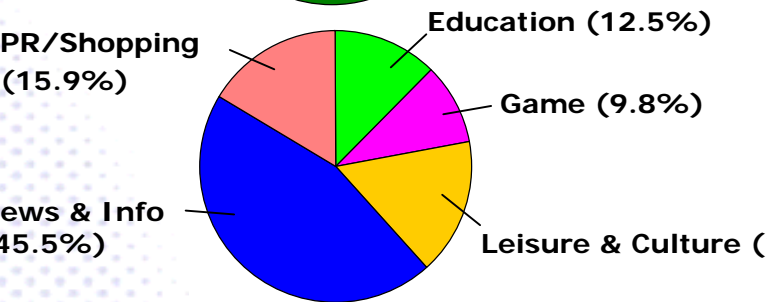
DMB Info Source



Satisfaction



Affected Industries



Perceived Applications

Model Constructs

Construct	Variables	Definition
Price	PR1	• Price per program content
	PR2	• Price per usage time
	PR3	• Price of DMB phone
Access/Usage time	TM1	• Access time
	TM2	• Air time
	TM3	• How to use
Program contents	CO1	• Video quality of contents
	CO2	• Audio quality of contents
	CO3	• Variety of contents
Service	SE1	• After service of DMB equipment maker or service provider
	SE2	• Performance of DMB phone device
	SE3	• Credibility of DMB equipment maker or service provider

Coefficient Alpha for Construct

Construct	Variables	Cronbach's alpha
Price	PR1, PR2, PR3	.7970
Access/Usage time	TM1, TM2, TM3	.6218
Program contents	CO1, CO2, CO3	.8104
Service	SE1, SE2, SE3	.7081

Correlation Matrix for the Constructs

	Price	Usage time	Program contents	Service
Price	1.000			
Access/Usage time	.296**	1.000		
Program contents	.454**	.497**	1.000	
Service	.266**	.481**	.511**	1.000

**p<.01

The inter-construct correlation coefficients were all positive and significant at less than .01

Analysis of Service Performance (using t-Test)

The price factor is not an issue, if the user perceives the the DMB program contents to be valuable. DMB service was affected by program contents(beta .358, t-value=5.689). **H3** (and **H2**) were supported. **H1 was not supported.**

Independent Variable	Dependent Variable	
	Service	
	Beta	t-value
Price	0.008	0.141 (sig = .888)
Access / Usage Time	0.300	5.104 (sig = .000)
Program Contents	0.358	5.689 (sig = .000)
R ²	0.330	
F	42.602	
sig.	.000	

DMB Phone Price and Associated Costs

	Sum of Squares	df	Mean of Square	F	Sig.
Between Groups	11.161	3	3.720	12.583	.000
Within Groups	76.879	260	.296		
Total	88.040	263			

Age	N	Subset for alpha = .05		
		1	2	3
40s and older	51	4.0261		
20s	116		4.2328	
30s	52		4.3269	
Teens	45			4.6889
Sig.		1.000	.354	1.000

- The difference is statistically significant
- Significant differences among teens and the other age groups (20s, 30s, 40s and older)

H4a was supported

Access/Usage Time

	Sum of Squares	df	Mean of Square	F	Sig.
Between Groups	2.943	3	.981	2.502	.060
Within Groups	101.935	260	.392		
Total	104.878	263			

Age	N	Subset for alpha = .05	
		1	2
20s	116	3.7328	
30s	52	3.8269	3.8269
40s and older	51	3.8627	3.8627
Teens	45		4.0296
Sig.		.298	.102

- No difference between age groups and their perceptions of the DMB
- A slight discrepancy between teens and those in their 20s, but no significant divergences among other age groups

H4b was not supported

Program contents

	Sum of Squares	df	Mean of Square	F	Sig.
Between Groups	5.870	3	.1.957	6.304	.000
Within Groups	80.689	260	.310		
Total	86.559	263			

Age	N	Subset for alpha = .05	
		1	2
20s	116	4.2902	
30s	52	4.3013	
40s and older	51	4.3268	
Teens	45		4.6963
Sig.		.743	1.000

- There was a difference between various DMB program contents and age groups

- Significant deviation between 10s and the other age groups (20s, 30s, and 40s and older)

H4c was supported

	Sum of Squares	df	Mean of Square	F	Sig.
Between Groups	3.428	3	1.143	3.355	.019
Within Groups	88.557	260	.341		
Total	91.985	263			

Age	N	Subset for alpha = .05	
		1	2
20s	116	4.2241	
40s and older	51	4.3137	
30s	52	4.3782	4.3782
Teens	45		4.5407
Sig.		.185	.137

- There was a difference between the age groups and their approach to the importance of DMB services

- Significant differences among teens and other age groups

H4d was supported

- The major players in the DMB market should focus their strategy towards the young generation, as they will develop great demand as the latest trendsetters
- High-quality and valuable DMB program Contents will offset the highly priced DMB Phone price/usage cost

Fundamental Competitive Strategies

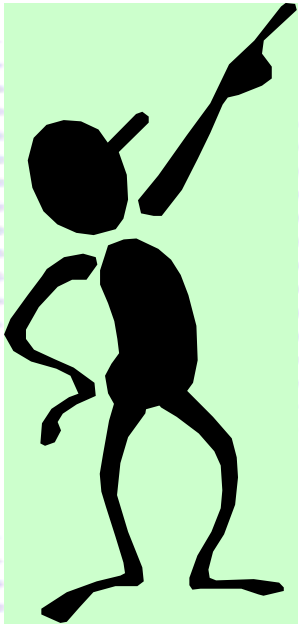
Cost Leadership Strategies

Differentiation Strategies

Innovation Strategies

Growth Strategies

Alliance Strategies



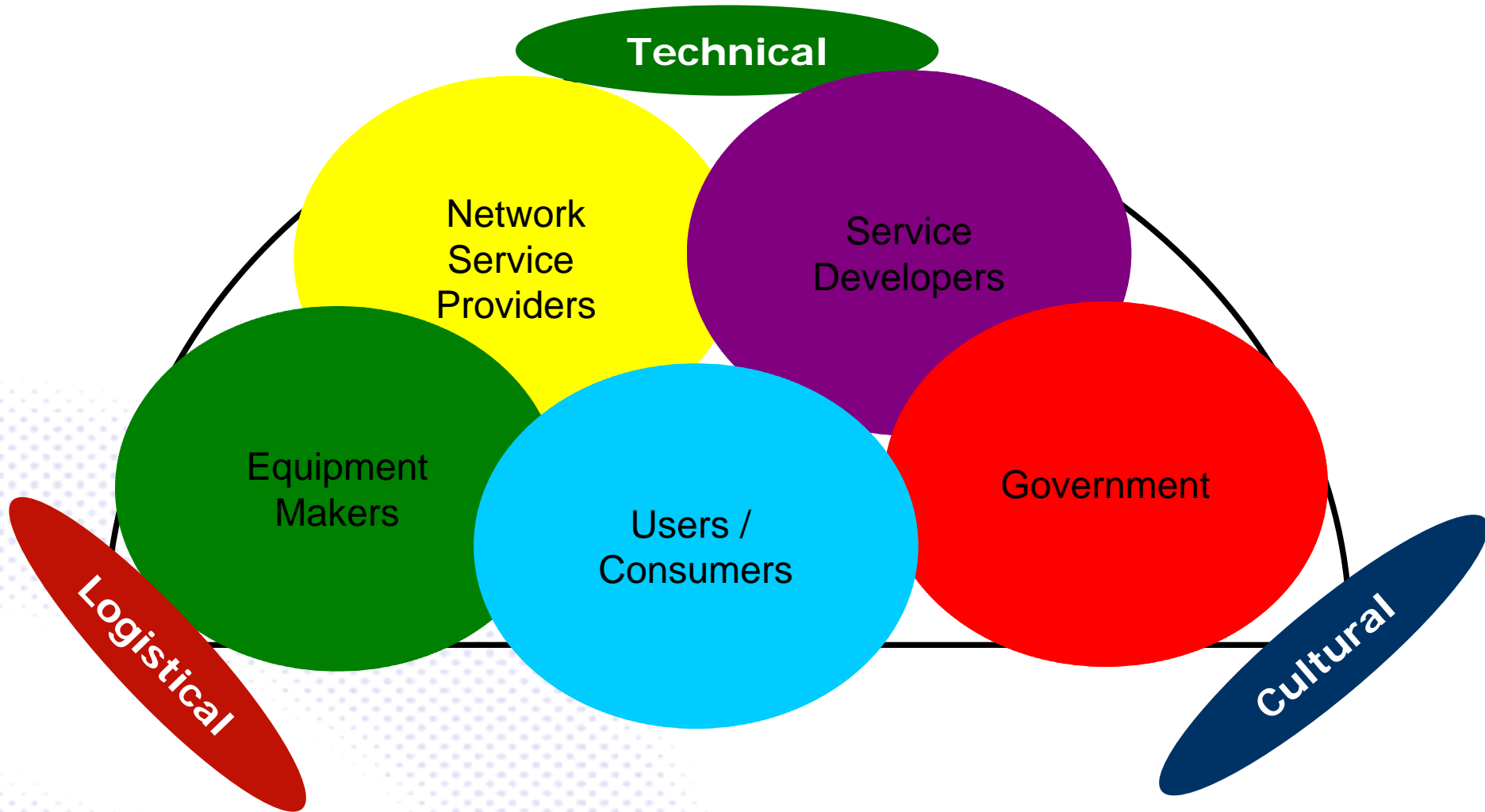
Listen –
what customers
want/need

(e.g., CRM –complaints,
battery life, reception/
quality)

Invent - for customers

Personalize – making it
easier and pleasant

Future Success of Cellular Phone Business





Thanks!

Any questions or
comments?