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ABSTRACT

Carsharing organizations (or short-term auto use) provide members access to a fleet of shared vehicles on an hourly basis, reducing the need for private vehicle ownership. This paper reflects a ten-year retrospective of carsharing in Canada and the United States (U.S.), including results from a 2008 operator survey. Since 1994, a total of 50 carsharing programs have been deployed in North America—33 are operational, and 17 are defunct. As of July 1, 2008, there were 14 active programs in Canada and 19 in the U.S., with approximately 319,000 carsharing members sharing over 7,500 vehicles in North America. Another six programs were planned to launch in North America by January 2009. The four largest providers in the U.S. and Canada support 99% and 95.2% of total membership, respectively.

In this ten-year retrospective, the authors examine North America's carsharing evolution from initial market entry and experimentation (1994 to mid-2002) to growth and market diversification (mid-2002 to late-2007) to commercial mainstreaming (late-2007 to present). This evolution includes increased competition, new market entrants, program consolidation, increased market diversification, capital investment, technological advancement, and greater inter-operator collaboration. Ongoing growth and competition are forecasted. Rising fuel costs and increased climate change awareness will likely facilitate this expansion.

KEY WORDS: Carsharing, shared vehicle, North America, market, public policy

WORD COUNT: 7,500 words, including 1 Table and 2 Figures

INTRODUCTION

In the last six years, energy prices have become increasingly more expensive and volatile. In 2002, the per barrel cost of crude oil averaged $24.09 US (*1*). In Summer 2008, crude oil had reached $140 US per barrel, representing a six-fold increase *(2)*. Similarly, the cost of gasoline per gallon increased 300% from 2002 through 2008—from an average of $1.34 US a gallon to $4.07 US by mid-year 2008 *(3)*. This trend has increased vehicle operating costs and uncertainty about future operating expenses. Although the fixed costs of auto ownership remained relatively unchanged between 2005 and 2007, average per-mile operating costs increased considerably in mid-2008 *(4-5)*. This increase was most significant for vehicle owners driving 16,093 kilometers or less annually, representing a per-kilometer increase from 39¢ US a kilometer to 44¢ US over this three-year period *(4-5)*.

Energy cost uncertainty, coupled with pressure to increase energy efficiency and reduce carbon emissions, has encouraged more drivers to seek alternatives to private vehicle use. Carsharing programs or short-term auto use, which started in North America over a decade ago, is one such alternative. The principle of carsharing is simple: individuals gain the benefits of private vehicle use without the costs and responsibilities of ownership. Carsharing is most common in major urban areas where transportation alternatives are easily accessible. Individuals generally access vehicles by joining an organization that maintains a fleet of cars and light trucks in a network of locations; vehicles are most frequently deployed from lots located in neighborhoods, public transit stations, employment centers, and universities (*6-7*). Carsharing members typically pay for use through hourly rates and subscription-access plans. The majority of carsharing operators manage their services with advanced technologies, including automated reservations, smartcard vehicle access, and real-time vehicle tracking (*8*).

Although carsharing dates back to the 1940s in Europe, more successful carsharing programs launched in Germany and Switzerland in the mid-1980s. In the United States (U.S.), carsharing began with two experiments: Purdue University's Mobility Enterprise (1983-86) and a demonstration project, Short-Term Auto Rental (STAR), in San Francisco (1983-85). In 1994, carsharing reemerged with the launch of Auto-Com (later Communauto) in Canada, followed in 1997 by Cooperative Auto Network (CAN) and Victoria Carshare Co-op in Vancouver and Victoria, British Columbia (B.C.). Today, approximately 650,000 individuals are members of carsharing programs worldwide.

This paper provides a ten-year retrospective of carsharing in North America (1998 to 2008), reflecting the time period during which the lead author has been actively monitoring developments in Canada and the U.S. Four main sections follow. First, the authors provide an updated comparison of North American carsharing impacts. Second, growth trends are explored.

Next, three phases in North America's carsharing evolution are provided. Finally, the authors provide a conclusion.

COMPARISON OF NORTH AMERICAN CARSHARING IMPACTS

An increasing body of empirical evidence indicates that carsharing can provide numerous transportation, land use, environmental, and social benefits (*8-10*). Over a dozen North American carsharing studies are summarized in Table 1 below. They include both third party and operator-led evaluations.

TABLE 1 Carsharing Impacts Reported in North American Studies (*11-25*)

	Authors, Year	Number of Vehicles Removed From Transportation Network Per Carsharing Vehicle	Participants Selling A Personal Vehicle	Participants Avoiding A Vehicle Purchase	VMT/VKT Change	Average Monthly Cost Savings	Participants Walking More	Participants Taking Transit More
U.S. Studies								
Short-Term Auto Rental (STAR) (San Francisco, CA) (*11*)	Walb & Loudon, 1986	-	15.4%	43.1%	-	-		
Arlington, Virginia Carsharing Pilot (*12*)	Price & Hamilton, 2005	-	25%	68%	-40%	-	54%	54%
Arlington, Virginia Carsharing (*13*)	Price *et al.*, 2006	-	29%	71%	-43%	-	47%	47%
CarSharing Portland (Portland, OR) (*14*)	Katzev, 1999	-	26%	53%	-	$154 US		
CarSharing Portland (*15*)	Cooper *et al*., 2000	-	23%	25%	-7.6%	-	25.8%	13.5%
City CarShare (Year 1) (San Francisco, CA) (*16*)	Cervero, 2003	-	2.5%	60.0%	-3%[a] / -58%[b]	-		
City CarShare (Year 2) (*17*)	Cervero and Tsai, 2004	6.8	29.1%	67.5%	-47%[a] / -73%[b]	-		
City CarShare (Year 4) (*18*)	Cervero *et al*., 2006	-	-	-	-67%[a]/ 24 %[b]	-		
PhillyCarShare (Philadelphia, PA) (*19*)	Lane, 2005	10.8[c]	24.5%	29.1%	-42%	$172 US		
TCRP Report (National) (*20*)	Millard-Ball *et al*., 2005	-	-	-	-63%	-	37%	40%
Zipcar (National) (*21*)	Zipcar, 2005	20	32%	39%	-79.8%	$435 US	37%	40%
Canadian Studies								
AutoShare (Toronto) (*22*)	AutoShare, 2003	6-8	15%	25%	-	$392 CA		
AutoShare (Toronto) (*23*)	Autoshare, 2005	8-10	-	-	-	-		
CommunAuto (Quebec Province) (*24*)	CommunAuto, 2000	9.1	21-29%	55-61%	-	-		
CommunAuto (*25*)	CommunAuto, 2006	4.6[c]	24%	53%	-	$492 CA	12-13%	26-34%

(-) denotes data unavailable

[a]reflects existing members' reduction in VMT/VKT

[b]reflects only trial members' reduction in VMT/VKT

[c]reflects vehicles removed by members who gave up a car

One of carsharing's most notable impacts on transportation is reduced vehicle ownership. Carsharing removes between 4.6 to 20 cars per shared-use vehicle from the transportation network (*11-25*). Variance reflected in this metric is due largely to methodological differences. For example, Lane's (2005) research on PhillyCarShare (*20*) distinguishes between cars "removed by members who gave up a car" and "cars removed by members who decided not to acquire a vehicle," while others do not (*11-18, 21-24*).

Based on the most current studies and member survey results released by U.S. and Canadian carsharing organizations, 15 to 32% of carsharing members sold their personal vehicles, and between 25 and 71% of members avoided an auto purchase due to carsharing (*11-25*). The considerable variation in forfeited vehicle percentages is likely due to a stated intention bias, location-specific differences, and business model. Due to carsharing membership, average monthly transportation costs also decreased, ranging from $154 to $435 US for American members (*11-21*) and $392 to $492 CA for Canadian members (*22-25*). Furthermore, auto ownership reduction leads to public transit, walking, and bicycling modal shifts and reduced parking demand and vehicle miles or kilometers traveled (VMT/VKT) (*20*). Twelve to 54% of carsharing participants in North America walk more often; 13.5 to 54% take public transit more frequently; and 10.1% bicycle more (*11-25*). In the U.S., the average carsharing member's VMT/VKT is reduced between 7.6 to 79.8% (*11-21*); this wide range is likely due to location-specific variations, as well as differences in member use and survey design. Based upon all member surveys, the authors calculate a 44% average VMT/VKT reduction per carsharing user.

Along with reduced VMT/VKT and vehicle ownership, low-emission fleets also contribute to lower greenhouse gas (GHG) emissions (*8, 19*). AutoShare and U Car Share (as well as Flexcar, prior to its merger with Zipcar in late-2007) offer additional GHG reductions through partnerships with carbon-offset companies (*26-28*). Many members report an increase in environmental awareness after joining a carsharing organization (*19*).

Finally, carsharing provides other beneficial societal impacts. For instance, members have a heightened awareness of travel costs and take fewer spontaneous driving trips. This was the case for CarSharing Portland, where 60% of carsharing reservations were made at least one day in advance (*14*). College/university students and low-income households also benefit from the flexibility and mobility that carsharing offers (*9*).

NORTH AMERICAN CARSHARING GROWTH

In this section, the authors provide a ten-year overview of North American carsharing growth. Key elements of this discussion include: organizational dynamics, member and vehicle growth trends, and business model developments.

Number of Organizations

As of July 1, 2008, a total of 50 carsharing operations have been deployed in North America since 1994—33 are operational, and 17 are defunct. Another two programs planned to launch in Canada and four in the U.S. by January 2009. Although there was a substantial increase in the number of North American operators between 1999 and 2001, the number has remained relatively constant since 2001, only increasing slightly.

As of July 1, 2008, 14 Canadian operators claimed 39,664 members and shared 1,667 vehicles. In the U.S., 279,174 members shared 5,838 vehicles among 19 operators. (Note: Zipcar—which currently operates in the U.S. and Canada—is counted as an operator in each.) Since 1994, there have been 16 program startups and two closures in Canada, yielding a closure rate of 12.5%. In the U.S., there have been 34 program startups and 15 program closures since 1997, yielding a closure rate of 44.1%. Of the 15 U.S. closures, seven (46.7%) were research or pilot programs with an established sunset date; two (13.3%) were program mergers; one (6.7%) service shut down and contracted with a larger operator; and five programs (33.3%) closed due to operational deficits and greater staffing needs.

Since 2001, there have been a number of program mergers and launches that have occurred among North American operators. In 2001, the first program merger occurred between CarSharing Portland and Flexcar (*29*). More recently, there has been increasing growth and competition among organizations in North America, marked by ongoing market penetration. The second major merger, which occurred in October 2007 between the for-profits Flexcar and Zipcar, created the largest U.S. for-profit operator (*30*). Despite this merger, there is ongoing competition in ten major metropolitan markets among carsharing operators and/or hourly car rental. More recently, traditional car rental companies have begun to launch carsharing services, including Enterprise Rent-A-Car's WeCar and U-Haul's U Car Share (*31-32*). In December 2008, Hertz launched its own carsharing service (*33*).

Member and Vehicle Growth Trends

Between 1998 and 2008, U.S. and Canadian membership has continued to grow. The most dramatic growth for the U.S. and Canada occurred between 2000 and 2001, in which carsharing membership grew 1,174% and 81%, respectively (although its scale at that time is comparatively

small to the current market). In 2001, member-vehicle growth in the U.S. outpaced Canada for the first time.

From the late-1990s to 2003, initial North American carsharing growth was on a near-exponential trajectory (see Figure 1). (Note: Data in Figure 1 reflect July of each year.) U.S. membership growth rates started to slow in 2005 but increased to 79% in 2007. U.S. annual growth rates fell to 51.5% in 2008. Similarly, Canadian membership growth rates have followed a similar trajectory. They reached their highest growth rate in 2001 (81%), but they have since fallen to 47.5% in 2008.

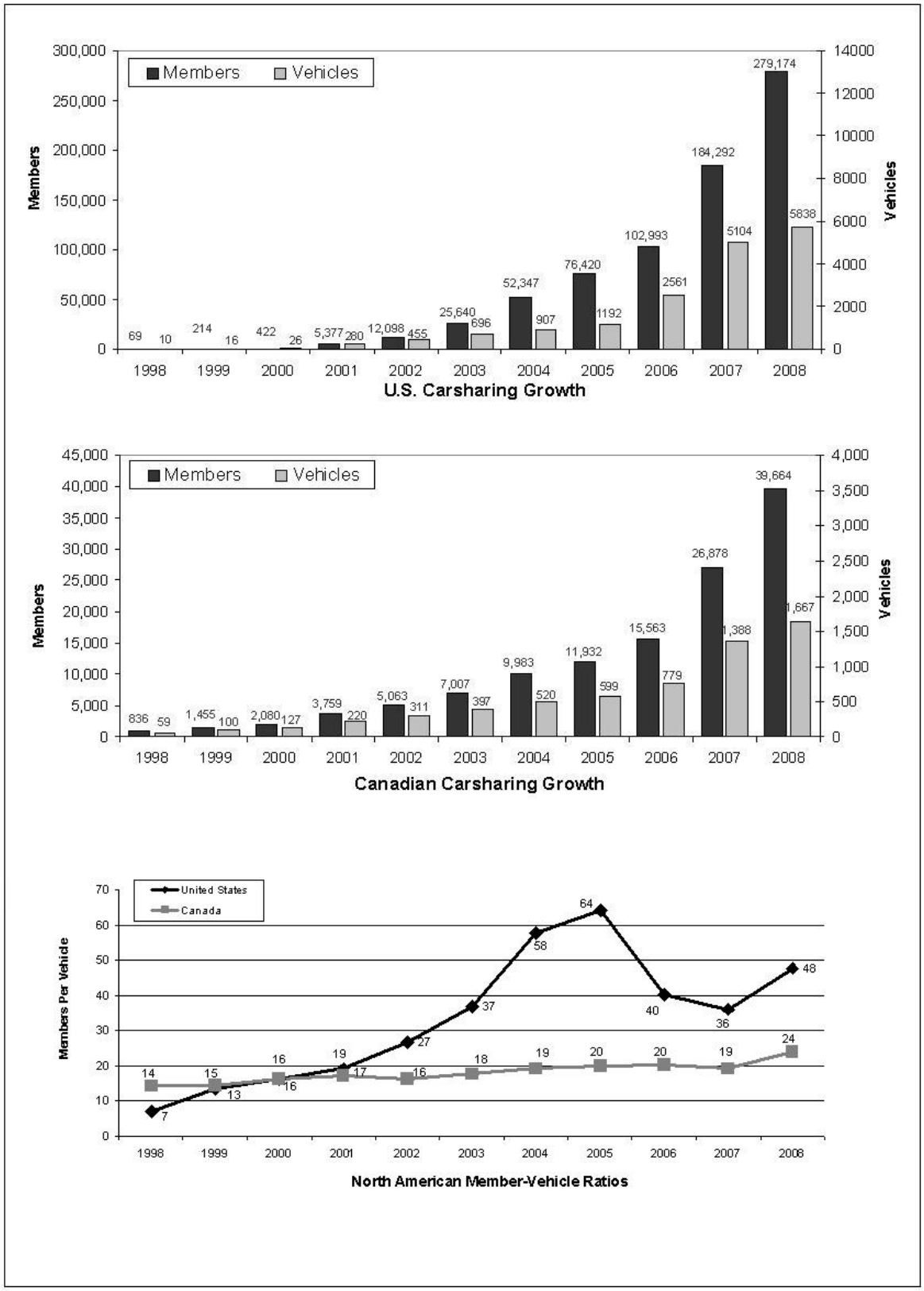


FIGURE 1 North American carsharing growth and member-vehicle ratios — 1998 to 2008.

Member-Vehicle Ratios

Member-vehicle ratios are an important metric, which can be used to assess how many customers are being served per vehicle and the relative usage level of carsharing members (see Figure 1). Between 1998 and 2008, member-vehicle ratios have steadily risen in Canada, except in 2002 and 2007. During this period, Canadian member-vehicle ratios increased 68% from 14:1 in 1998 to 24:1 in 2008. In contrast to Canada, U.S. member-vehicle ratios are larger, have increased more dramatically, and varied more considerably over this period.

In the U.S., vehicle growth rates have increased more slowly over time than membership, resulting in higher member-vehicle ratios. U.S. member-vehicle ratios rose until 2005, reaching a peak of 64:1. This appeared to result from a business strategy of the largest U.S. operators to increase vehicle use, improve profitability, and attract outside investment *(8)*. In 2006, U.S. member-vehicle ratios fell to 40:1, as operators attracted members for new vehicle placements. In 2007, member-vehicle ratios fell to 36:1, reflecting a substantial decrease since their peak in 2005. Nevertheless, between July 2007 and July 2008, U.S. member-vehicle ratios have increased to 49:1, likely due in part to college/university and government fleet market growth.

The U.S. continues to have some of the highest member-vehicle ratios in the world (*34*). The authors attribute higher U.S. member-vehicle ratios to less frequent use by neighborhood residential users (many of whom use carsharing as a form of "mobility insurance" to supplement existing modes) and greater market diversification, resulting in large groups of members having less-frequent/periodic vehicle access (e.g., business, college, government fleets) *(8)*. It could also reflect double counting of members (e.g., those that are enrolled in both business and residential use).

Business Models

In North America, five business models have emerged: 1) for-profit, 2) non-profit, 3) cooperative (owned by its members), 4) public transit (carsharing operated by a public transit agency), and 5) university research programs (operations run by universities for research purposes). In 2001, although U.S. for-profit organizations (four of 14) represented 28.6% of total operators, they accounted for 78% of members and 64% of the vehicles deployed (*35*). By 2005, the market share of U.S. for-profit operators (five of 17) increased to 90% of members and 83% of the total fleet (*8*).

As of July 1, 2008, 26.3% of the operators are for-profit (five of 19) in the U.S.; they account for 74.1% and 83% of the members and vehicles, respectively. Since 2005, there has also been a substantial increase in membership among non-profit carsharing organizations, predominantly in three metropolitan markets. Over this period, the three largest non-profit

operators increased their membership from approximately 6,600 members in 2005 (*8*) to more than 71,000 in 2008.

In 2001, Canadian for-profit organizations (four of ten) represented 40% of the operators and accounted for 76% of members and 79% of vehicles (*35*). By 2005, market share among Canadian for-profit operators (two of 11) was quite similar: 78% and 76% of members and vehicles, respectively (*8*). In July 2008, 35.7% of Canadian carsharing operators were for-profit (five of 14) and represented 86.6% of members and 83.5% of the total fleet. Between 2005 and 2008, Canadian for-profit operators also increased their member-vehicle market share. While non-profit organizations have undergone dramatic growth between 2005 and 2008, for-profit operators still account for the majority of members and fleets deployed in North America.

EVOLUTION OF CARSHARING IN NORTH AMERICA

The authors have identified three phases in North America's carsharing evolution: initial market entry and experimentation (1994 to Mid-2002), growth and market diversification (Mid-2002 to Late-2007), and commercial mainstreaming (Late-2007 to Present). The phases are summarized in Figure 2.

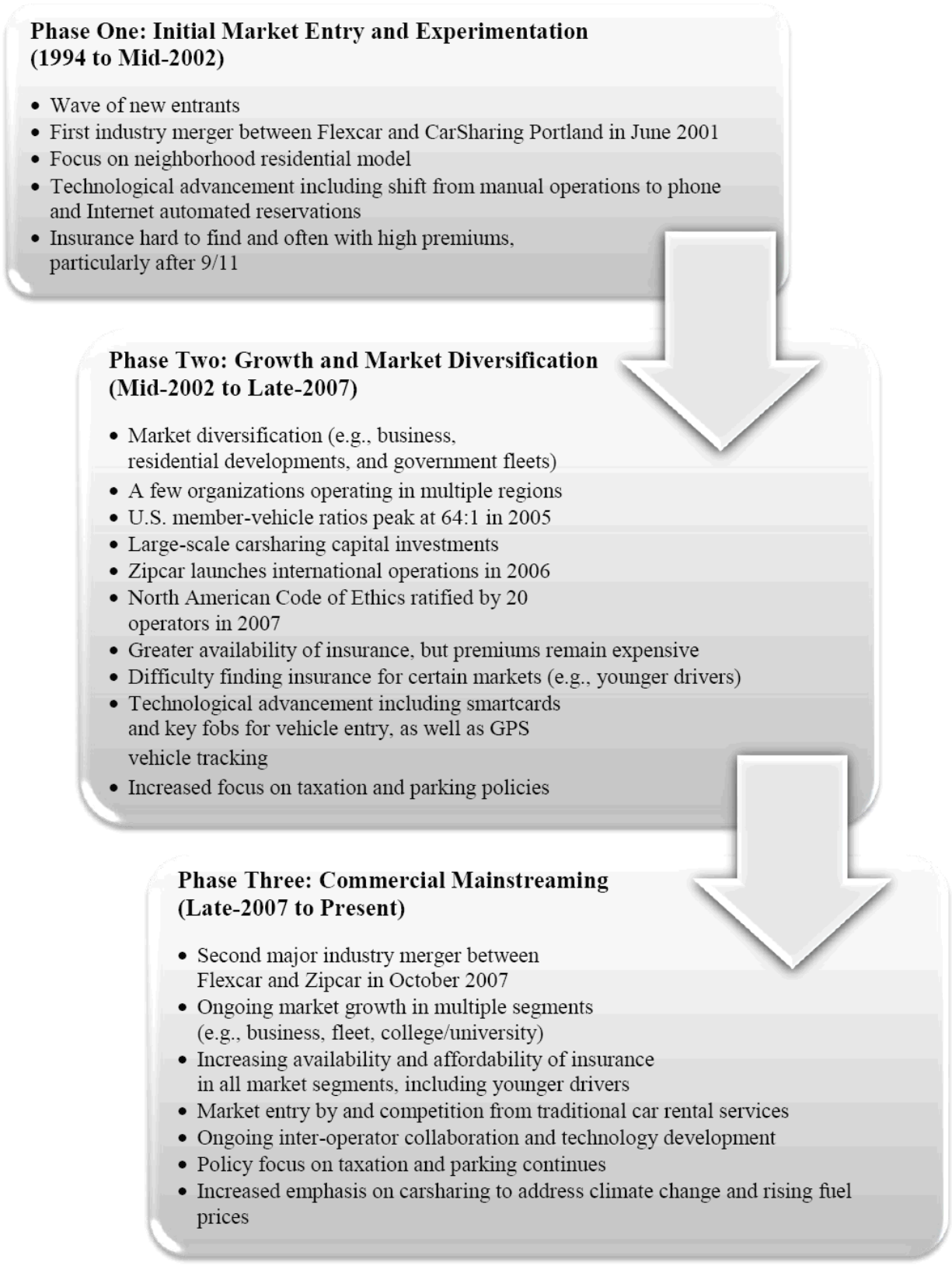

Phase One: Initial Market Entry and Experimentation (1994 to Mid-2002)
• Wave of new entrants
• First industry merger between Flexcar and CarSharing Portland in June 2001
• Focus on neighborhood residential model
• Technological advancement including shift from manual operations to phone and Internet automated reservations
• Insurance hard to find and often with high premiums, particularly after 9/11
Phase Two: Growth and Market Diversification (Mid-2002 to Late-2007)
• Market diversification (e.g., business, residential developments, and government fleets)
• A few organizations operating in multiple regions
• U.S. member-vehicle ratios peak at 64:1 in 2005
• Large-scale carsharing capital investments
• Zipcar launches international operations in 2006
• North American Code of Ethics ratified by 20 operators in 2007
• Greater availability of insurance, but premiums remain expensive
• Difficulty finding insurance for certain markets (e.g., younger drivers)
• Technological advancement including smartcards and key fobs for vehicle entry, as well as GPS vehicle tracking
• Increased focus on taxation and parking policies
Phase Three: Commercial Mainstreaming (Late-2007 to Present)
• Second major industry merger between Flexcar and Zipcar in October 2007
• Ongoing market growth in multiple segments (e.g., business, fleet, college/university)
• Increasing availability and affordability of insurance in all market segments, including younger drivers
• Market entry by and competition from traditional car rental services
• Ongoing inter-operator collaboration and technology development
• Policy focus on taxation and parking continues
• Increased emphasis on carsharing to address climate change and rising fuel prices

FIGURE 2 Three phases of North American carsharing.

Phase One: Initial Market Entry and Experimentation (1994 to Mid-2002)

The first carsharing operators in North America modeled themselves after the successful carsharing efforts of Europe during the late-1980s and early-1990s, focusing mainly on the neighborhood model. Indeed, several European operators and carsharing experts encouraged the launch of carsharing in North America in the 1990s. The earliest Canadian operator, Auto-Com (now Communauto) was established in 1994. In 1998, CarSharing Portland began, becoming the first U.S. organization. Four main business models emerged early on: for-profit, non-profit, cooperative, and university research programs.

During this timeframe, U.S. and Canadian carsharing operators promoted a culture of sharing through Internet mailing lists, telephone conversations, and carsharing conferences, the first of which was held in Seattle, Washington in May 1998. The second was hosted in Atlanta, Georgia in April 2001. The first carsharing merger between CarSharing Portland and Flexcar occurred in June 2001.

In Canada, carsharing did not receive much governmental support in its early years, as many politicians neither understood nor had examples of any existing North American carsharing systems to reference. Thus, the policy approach of Canadian operators was to first spread the word about carsharing's benefits prior to seeking public assistance to support expansion. In contrast, governmental support existed for carsharing development in the U.S. from its start (e.g., grants, parking spaces, joint marketing support). During this phase, it was not uncommon for public transit operators to question whether carsharing might detract rather than attract riders. Furthermore, many North American operators did not actively pursue governmental assistance to secure carsharing parking early on, as they had relatively small vehicle fleets.

Early Carsharing Market Segments

From 1998 to mid-2002, almost all North American carsharing programs focused on the neighborhood residential model (shared-use vehicles parked in designated areas throughout a neighborhood or municipality) *(9)*. In the late-1990s, business carsharing (shared vehicles for employee use during the work week for business and personal tripmaking) began to emerge in Canada. In the U.S., this market started as a result of businesses approaching carsharing operators to request their service. Operators launched a more targeted focus upon business customers (typically in dense employment areas), public transit, and residential developments after 2000. For example, City CarShare first placed vehicles in the Gaia apartment complex in downtown Berkeley in 2002 (*36*).

Carsharing Technology Gets Started

While carsharing touts technology as a major factor in its success today, it began in the mid-1990s with manual processes. Out of necessity, CarSharing Portland developed an automated phone reservation system, which was adapted from a plane scheduling service. At this time, in-vehicle carsharing technology was limited to Europe. Overall, Internet use was growing, yet dial-up based, in North America. Thus, Internet reservations were not considered essential or convenient early on. Similarly, mobile phone use was growing but far from ubiquitous and not essential to communications. With the dotcom bubble of the late-1990s came more widespread Internet access and increased mobile phone use. Not surprisingly, more operators started looking to the Internet for automated reservations. In a 2001-2002 operator survey, Shaheen *et al.* (*35*) found that only half of U.S. carsharing operators were using advanced technologies (automated reservations with integrated billing and smartcard vehicle access), and the remainder were using either partially automated services (automated reservations via touch-tone telephone or Internet or both) or manual services. In contrast, in 2001-2002, none of the Canadian operators were using advanced technologies, and the majority was still using manual services (*35*).

Insurance: The Early Years

Over the past ten years, the cost and availability of insurance has had a substantial impact on carsharing, particularly in the U.S. After a carsharing feasibility study was completed in Portland in 1998, Van Pool Services Incorporated (or VPSI) emerged as an early provider (charging approximately $4,200 US/year per vehicle at that time). Insurance premiums varied from province to province in Canada, though it was comparatively easy to identify and cost about $2,700 CA/year per vehicle, in contrast.

Although operators did not initially identify it as a major cost consideration prior to 2001, high insurance premiums were a notable barrier to many North American organizations by 2002, particularly in the U.S. In July 2002, U.S. shared-vehicle operators reported premiums ranging from $1,200 to $6,000 US per vehicle/year, which accounted for 20 to 48% of operating costs (*9*). The chief reason for service termination between 2001-2002 was attributed to a substantial increase in premiums following the 9/11 terrorist attacks (*35*).

Summary

The final years of Phase One proved to be a notable time for carsharing. By June 30, 2002, there were 24 operators in North America, serving a total of 17,161 members with a collective fleet of 766 vehicles. To summarize, this phase was largely characterized by early entrants learning how to run a neighborhood carsharing service, lower operational costs, and understand how to best structure rates to attract customers. This phase ends in June 2002, prior to the launch of a targeted strategy aimed at business carsharing by a bi-coastal U.S. operator.

Phase Two: Growth and Market Diversification (Mid-2002 to Late-2007)

The second phase of North American carsharing reflects growing memberships; fleets; market diversification (e.g., businesses, government fleets, and residential partnerships); capital investment; and multi-national market entry. By 2003, a handful of carsharing organizations were operating in multiple regions, leading to economy-of-scale advantages and greater market penetration.

In 2003, independent carsharing organizations, comprised of co-operatives, non-profits and for-profit operators, formed an informal association to build relationships and support start-ups. The group continues to meet annually. Since 2003, there have been several efforts aimed at developing inter-operator collaboration including: the North American Code of Ethics for the Carsharing Industry (ratified by 20 operators in 2007; the majority are non-profit), public policy collaboration, roaming memberships (members of one organization can submit their driving records to another organization to access their service), and technology development (*37*). In June 2005, Kitsap Transit in Bremerton, Washington launched SCOOT, the first carsharing service managed by a public transit operator (Cyndi Griffy, unpublished data, February 2009).

The second phase is also marked by higher member-vehicle ratios in the U.S., as operators sought to increase vehicle use and profitability to attract investors. In 2005, the overall average U.S. member-vehicle ratio peaked at 64:1 compared to 20:1 in Canada (*8*). Between August and September 2005, Flexcar and Zipcar made announcements regarding large-scale investments by Steve Case's Revolution LLC (a 60% holding interest in Flexcar) and

Benchmark Capital ($10 million US), respectively. Subsequently, Zipcar launched international operations outside the U.S., entering Canada (Toronto) and London (United Kingdom) in May and November 2006, respectively, alongside ongoing capitalization (*38*).

Market Diversification Continues

While the neighborhood residential model continued to dominate carsharing in North America, programs increasingly targeted other market segments including: businesses, residential developments, government fleets, low-income, and college/university markets. Entry into some of these niches was enabled through risk-sharing partnerships (i.e., the partner to a carsharing organization guarantees revenue and/or operational support in exchange for shared-vehicle services) (*8*).

Interestingly, a few U.S. carsharing entrants began operations with corporate members in mind. By July 2002, Flexcar officially established a business membership program, and one of its first corporate members was the Seattle-based Starbucks Coffee Company (*39*). Zipcar followed and began their corporate program, called "Z2B," in February 2004. Within three months, the program had enrolled more than 50 companies (*40*). Similarly, Canada's Co-operative Auto Network (CAN) established The Company Car—a subsidiary to attract business clients and developers (*41*).

During this phase, operators increasingly formed new partnerships with residential communities (existing and new) to incorporate carsharing into properties. In addition, a few cities, such as Vancouver, British Columbia, provided assistance to operators and developers by downgrading the minimum number of required parking spaces for new construction with carsharing inclusion.

Starting in 2004, carsharing operators began providing city fleet services (shared vehicles for local government employees to use throughout the workday) in Berkeley and Philadelphia (*42-43*). The City of Philadelphia was able to reduce its municipal fleet by more than 400 vehicles, saving approximately $1.8 million US annually (*43*).

Low-income carsharing offers shared-vehicle services to lower-income households and neighborhoods. Cities, including Chicago, Philadelphia, San Francisco, and Seattle, were among the first to pioneer this market. In several instances, U.S. governmental entities provided subsidies for low-income members, mainly through waived memberships for those participating in welfare-to-work programs or those living in affordable housing (*20*).

Using Shaheen *et al.'s* 2005 carsharing operator survey data and program websites, researchers estimated that colleges/universities represented 4.6% of the U.S. market (17 operators) and 0.4% of the Canadian market (11 programs) (*8*). At that time, carsharing was available on about a dozen campuses and was typically only accessible by faculty and staff. By

2006, several operators began expanding carsharing to include students and more campuses throughout the U.S. Many colleges/universities agreed to guarantee carsharing revenue and share management responsibilities. In some cases, expansion into the student market was feasible earlier on, as some campuses provided insurance to student drivers through their liability policies *(8)*. At this time, Canadian operators also offered services to campuses but to a lesser degree than the U.S. Some Canadian operators have higher minimum age requirements; this is frequently related to insurance and less demand among the student population.

Insurance: An Ongoing Challenge in the U.S.

Insurance still posed a problem for U.S. carsharing from 2003 to 2007. In Shaheen *et al.*'s 2005 operator survey, North American organizations were asked if finding insurance was an ongoing problem (*8*). Over 50% of U.S. respondents (eight of 15 responding to the question) indicated that finding insurance was a concern, compared to just 22% (two of nine respondents) in Canada. Although insurance availability increased due to wider carsharing acceptance, insurance premiums continued to remain high, especially in the U.S. This was partially due to carsharing's expansion to individuals under age 21 on college/university campuses (*8*).

Rapid Technological Advance

Technology continued to advance during this phase. Several U.S. operators incorporated smartcards and key fobs for vehicle entry. Canadian operators focused more on Internet reservations and less on vehicle access technologies. Additionally, the larger, more established organizations developed technologies and start-up kits to assist smaller operators in North America (*8*). As of Spring 2005, 73% of 11 Canadian operators were using partially automated systems, and 70% of 17 U.S. operators employed advanced technologies *(8)*.

Public Policy: Taxation and Parking

As carsharing became more popular in this phase, it started to receive more government attention. While officials offered supportive partnerships, they also began to examine and apply taxation policies in 2005, in many cases categorizing carsharing and car rental in the same tax classification (e.g., applying a rental car excise tax to both). Many North American carsharing operators have argued that carsharing and car rental are not the same as they do not yield similar social and environmental benefits, such as reduced vehicle ownership and vehicle miles/kilometers traveled, along with increased public transit ridership. These developments coincided with the provision of hourly car rental in several U.S. cities by Enterprise and Hertz.

Increasingly, operators sought to develop supportive parking partnerships and policies during this period. Most fell into one of six categories: 1) parking reduction (downgrading the required number of spaces in a new development); 2) parking substitution (substituting general use parking for carsharing stalls); 3) allowing greater floor area ratios (FARs) (developers can build more densely on a site); 4) provisions for on-street and off-street parking; 5) exemption from parking limits; and 6) creation of carsharing parking zones and/or universal parking permits (carsharing vehicles can be returned to any location).

Summary

By the end of Phase Two, there were 18 operators in the U.S. and 13 in Canada. These organizations operated a collective fleet of 5,883 vehicles and served approximately 200,000 members. This phase reflects growing memberships, market diversification, capital investment, technology developments, greater insurance availability, supportive and unsupportive policy developments, and multi-national expansion. Starting in Summer 2005, carsharing organizations began to report increases in membership due to rising fuel prices. This phase ends just prior to the Flexcar and Zipcar merger in October 2007.

Phase Three: Commercial Mainstreaming (Late-2007 to Present)

The merger of North America's two largest for-profit operators, Zipcar and Flexcar (into Zipcar), marks the beginning of the most recent phase of carsharing: commercial mainstreaming. In this phase, carsharing begins receiving greater attention as a sustainable/viable transportation alternative. Moreover, U-Haul's U Car Share launched in May 2007, followed by Enterprise's WeCar carsharing service in February 2008. In December 2008, Hertz launched its own brand of carsharing, Connect by Hertz (*44*).

From January to May 2008, the authors collected survey data from 27 North American carsharing operators: 15 (of 18) in the U.S and 13 (of 13) in Canada. Zipcar, with service in both the U.S. and Canada, completed survey responses for each region. Organizations were surveyed by a combination of mail, facsimile, e-mail, and telephone questionnaires. Many did not complete all questions due to proprietary issues.

In this survey, 13 U.S. operators expressed interest in collaboration with other providers. Sixty percent of U.S. organizations (nine of 15) indicated interest in collaborating on roaming memberships and 53.3% on technology development (eight of 15 respondents). Nearly 70% of Canadian operators (nine of 1 3) expressed an interest in roaming memberships and 69.2% in technology collaboration (nine of 13 respondents). As of July 2008, eight U.S. and three Canadian operators allowed roaming memberships (*45-46*). A few U.S. and Canadian operators

surveyed expressed interest in cooperating on back-office operations (e.g., accounting), insurance, marketing, and training.

Carsharing Market Continues to Diversify and Evolve

While the neighborhood model still remains the predominant market for carsharing operators in North America, larger U.S. organizations have increasingly focused their attention on college/university campuses, businesses, and municipal government fleets.

As of July 2008, 11 U.S. operators were providing services at more than 130 college/university campuses. Of these, multiple operators served 11 campuses. The authors estimate that approximately 300 vehicles are stationed at campuses through an official partnership or agreement with a college/university. An additional 220 vehicles (approximately) are parked within a four-block radius of these campuses. In Canada, nine operators have vehicles placed either on or within very close proximity of 19 college/university campuses. Six carsharing operators have official partnerships with eight Canadian universities, offering student and faculty discounts. An advantage of this market is that it allows operators to gain a foothold into new local markets. After these programs are established, organizations can more easily implement more traditional carsharing services (e.g., neighborhood residential model).

Not surprisingly, more city governments are examining carsharing as a means to provide city fleet services. In June 2008, the City of Vancouver, British Columbia entered into a fleet agreement with CAN to reduce the number of city-owned fleet vehicles (*47*). In October 2008, San Francisco issued a request for qualifications for a shared-use government fleet operator to maximize efficiency and minimize costs, fuel consumption, and emissions *(48*).

Not surprisingly, organizations will continue to partner with businesses and public transit agencies to provide access to carsharing vehicles. In January 2009, the Chicago Transit Authority (CTA) joined forces with I-GO (carsharing service) to offer an unprecedented carsharing development—a joint "smart card," enabling users to pay for both public transit and carsharing (*49*).

Ongoing Technology Development

Carsharing's future continues to evolve along with technological innovation. Global positioning systems now help carsharing providers and customers dynamically locate vehicles. For instance, Zipcar members who are iPhone users can use an application to identify available vehicles real time. Furthermore, in October 2008, Daimler AG announced its plans to launch an open-ended, one-way carsharing system in Ulm, Germany, called "Car2Go." This approach could expand into North America in the future.

In July 2008, the majority of North American operators were using either advanced or partially automated technologies. Only four operators in the U.S. and two in Canada continued to use manual operations. Most were using partially automated or advanced technologies. North

American carsharing hardware and software systems are primarily being supported by Eileo, Invers, Metavera, and Open Car Networks. ETL and Vetronix, which previously supplied carsharing hardware and software, are no longer active providers.

Insurance Reflects Market Risk and Business Model

In this phase, higher U.S. carsharing insurance premiums appear to be associated with college/university services. In the authors' 2008 operator survey, 11 of 15 U.S. organizations provided their insurance premiums, six of which served the college/university market. These six had a higher average annual premium ($2,459 US/vehicle) compared to an annual average of $1,480 US/vehicle for the other five. In contrast, the range in Canadian premiums is more closely associated with differences between public and private sector insurance. In Canada, half of the four operators with the lowest premiums, ranging from $600 to $1,300 CA/vehicle annually, are located in British Columbia and receive their insurance from the Insurance Corporation of British Columbia. Canadian insurance carriers include: the Co-operators, the Insurance Corporation of British Columbia, and ING. U.S. operators identified the following providers in the 2008 survey: the Association of Non-profit Insurers, Britton & Britton Insurance, Liberty Mutual, National Fire and Liability, National Indemnity, Neil Garing Insurance, Nonprofits' Insurance Alliance of California, and Progressive.

As carsharing is commercially mainstreamed, insurance carriers will have more experience in pricing premiums and are more likely to charge rates that are more reflective of costs and risks. Over time, insurance rates should decrease, although insurance in college/university markets may be higher due to younger-driver risk. In addition, pay-as-you-drive (PAYD) insurance (i.e., charging organizations by mileage and customer profile) may be an option in the future.

Public Policy Increasingly Important

During this phase, carsharing organizations and advocates will increasingly focus on policy considerations relevant to the carsharing industry, particularly taxation and parking. As of July 2008, just nine North American cities (out of over 70 municipalities with carsharing) provided on-street parking to operators. As organizations expand their fleets, both on-street and off-street parking locations will be needed to house vehicles. In the future, municipalities may be able to alleviate operator costs by providing lower cost or free public spaces. These spots can also provide free marketing. Policy initiatives will likely focus on tax credits, subsidies, rental car excise taxes, smart growth (anti-sprawl initiatives), and carsharing as a climate change mitigation strategy.

Summary
As of July 2008, the North American carsharing market had grown to 33 operators with 318,838 members and 7,505 vehicles collectively. New entrants and program mergers, market diversification, and policy developments will continue to characterize the commercial mainstreaming phase. In addition, carsharing will likely receive more attention as a sustainable transportation alternative in light of rising fuel prices, smart growth initiatives, and climate change concerns.

CONCLUSION

Since carsharing first appeared in North America in 1994, a total of 50 carsharing operations have been deployed—33 are operational, and 17 are defunct. From the late-1990s to 2004, North American carsharing growth was on a near-exponential trajectory. Since 2004, U.S. and Canadian membership has continued to grow. While non-profit organizations have undergone dramatic growth between 2005 and 2008, for-profit operators still account for the majority of membership and fleets deployed. Since 2001, there have been a number of program mergers and launches that have occurred among North American operators. More recently, traditional car rental companies have begun to implement hourly pricing options and launch carsharing services, including Enterprise Rent-A-Car's WeCar, Hertz's Connect By Hertz, U-Haul's U Car Share.

North America's carsharing evolution can be classified into three main phases: initial market entry and experimentation (1994 to mid-2002); growth and market diversification (mid-2002 to late-2007); and commercial mainstreaming (late-2007 to present). In the first phase, early entrants learned how to deploy neighborhood carsharing services, reduce operational costs, and structure rates to attract customers. This phase was also characterized by minimal technology use, high insurance rates, and limited insurance availability. The growth and market diversification phase reflects growing memberships, market diversification, capital investment, technological advancement, greater insurance availability, multi-national expansion, and supportive and unsupportive policy developments.

The October 2007 merger between Flexcar and Zipcar, which created the world's largest multi-national carsharing operator, marked the start of the commercial mainstreaming phase. In this phase, new entrants, program mergers, and market diversification will continue to characterize the North American market. A handful of organizations in the U.S. and Canada will continue to account for the majority of members and fleets deployed in the future. Carsharing will likely receive greater attention as a sustainable transportation alternative in an era of uncertain fuel prices, smart growth initiatives, and heightened climate change awareness.

Increased public policy development will also be indicative of this phase. Not surprisingly, supportive and unsupportive policy approaches will be key in guiding carsharing's growth and location decisions.

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