

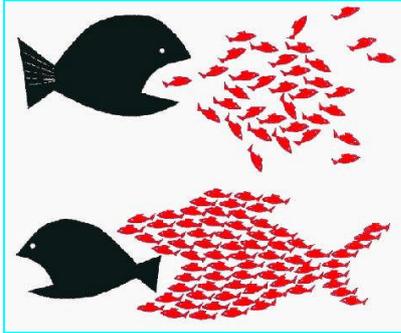
## ELECTRONICS REPORT

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### BUSINESS & MARKET NEWS



**Flextronics (Singapore) plans to acquire Solectron (CA)** - The new EMS provider would be a powerhouse with more than \$30-billion in annual revenue. The combined company would operate in 35 countries, with a combined employee base of about 200,000 people, including about 4,000 design engineers. The merger is expected to close by the end of the year (Source: IDG News Service). *The EMS industry has had margins thinner than supermarkets, so bigger is probably better. Both companies are made up of countless merged companies and the end game is probably one giant never becomes a take-over target. However,*

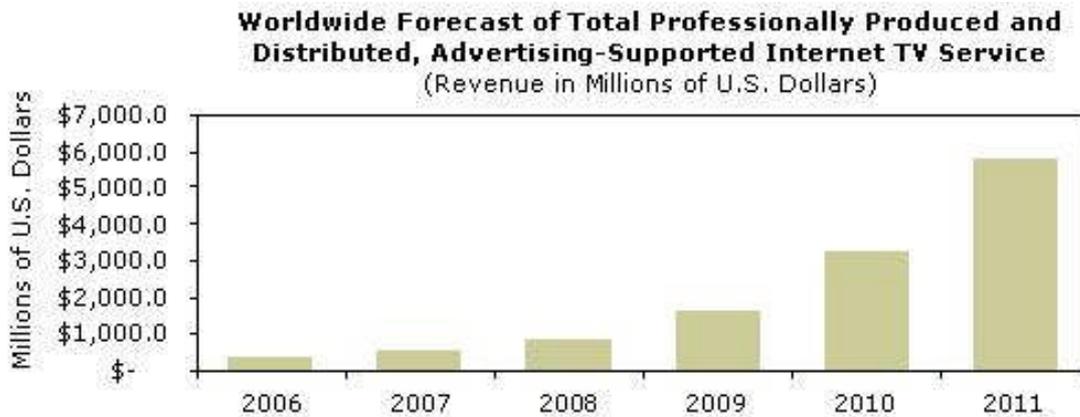
*Flextronics has been moving upstream for many years, adding more design and value-added business. They acquired flexible circuitry and photonics design/assembly in past years. It will be interesting to watch the pending merger and result.*

**GPS is Taking Off** - Car navigation (GPS-based) will continue to show extraordinary growth, possibly tripling between 2006 to 2012 per iSuppli Corp. The technology has moved from built-in systems in cars to Personal Navigation Devices (PND) - handheld and portable units. Latest forecasts are for total market shipments of 65.1-million navigation units by 2012, more than three times previous sales. The rise in popularity of PNDs has been catalyzed by the two leaders in this market, Tom-Tom and Garmin, who continue to expand. They are now two of the fastest-growing semiconductor buyers in the world because demand is so hot, and the navigation market is still at such an early stage of development. Tom-Tom grew to nearly \$1.6-billion in revenue in 2006 from \$10-million in 2002. *[Garmin is had 2006 sales of about \$1.8-billion, so it's a tight race]*. But there are an estimated 100 companies from Taiwan and Korea entering the market to take advantage of the brisk sales growth.



**Internet TV is High Growth** - The market for Internet TV service will rise to \$5.79-billion in 2011, expanding by a factor of 13.7 times, from \$422.7-million in 2006, according to iSuppli. The web is quickly growing into the world's largest on-demand, interactive video library. The Internet also is evolving into the most ubiquitous video distribution platform ever known. While the early market for Internet TV delivered to PCs has created growth and excitement, the real disruptive opportunity is yet to come. As more consumer electronic devices like TVs, DVD players, game consoles, iPods and portable gadgets become web-connected, Internet TV will leap from computer screens into the consumer's primary media environment: the living room TV. Among the most disruptive changes in decades, Internet TV poses both challenges and opportunities for companies involved in the video distribution value chain. Content owners face the trade-off of "reach" versus "control", as they navigate this new distribution channel. Video network operators face the challenge of both a

new way to reach consumers, as well as a new competitive threat that could threaten their long-term position in the market. Meanwhile, a variety of Internet portal companies, content delivery networks, software platform companies and other technology providers embrace the revenue opportunity. "Internet video is dominated by news content currently as that is easily consumed in a 'snack' format on PC screens. However, as Internet connections find their way to the living room TV and the digital transition drives an installed base of new set-top boxes, sports and entertainment content will populate Internet Protocol (IP) streams. The longer form content will drive bandwidth requirements and revenue, threatening the dominance of "walled gardens." While news is the largest revenue category for advertising supporting professionally generated Internet TV in 2006, it will be number three by 2009, behind sports and entertainment. Although news exceeds sports in the number of video streams, the longer form sports content drives more revenue and bandwidth. The bandwidth required for Internet TV will grow by more than 44 times from 2006 to 2011 to almost 7 million Tebibytes (TiBs). Source: iSuppli.



<b>Worldwide Forecast of Total Professionally Produced and Distributed, Advertising-Supported Internet TV Service</b> (Revenue in Millions of U.S. Dollars)						
	2006	2007	2008	2009	2010	2011
Millions of U.S. Dollars	\$ 422.7	\$ 614.4	\$ 872.8	\$1,704.2	\$3,313.5	\$5,793.3

*Source: iSuppli Corp. June 2007*

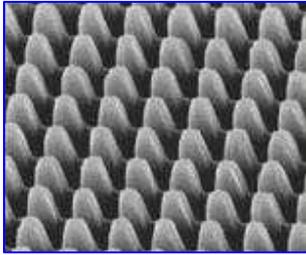
## MATERIALS

**Getting the Lead & Silver Out** - Indium Corporation and Metallic Resources have entered into an agreement allowing Indium to manufacture and globally market Metallic Resources' patent pending **Cobalt995** (99Sn 0.5Cu < 0.05Co) Pb-free alloy that is an alternative to the popular SAC (Sn/Ag/Cu) alloys. They claim lower cost by eliminating silver, but a brighter, shinier, and smoother solder joints in standard wave soldering applications. Metallic Resources has successfully marketing Cobalt995 for Wave, HASL, and SMT applications for over a year and claims a significant installed customer base. Indium Corporation will develop complimentary and compatible Cored Wire and Solder Paste products as well as market it's Bar Solder for wave applications. Indium Corporation's technological development, technical support, and global capability, combined with Metallic Resources' advanced alloy and electrolytic capabilities, make this high performance alloy ideal for solder customers worldwide. Source: Indium's website.



## NANOTECH (ELECTRONIC EMPHASIS)

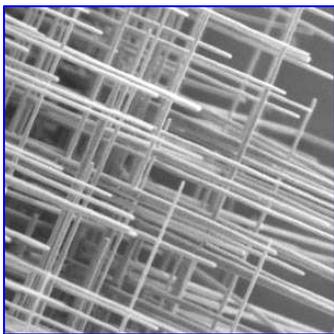
**New “Nanoimprinting” Looks Like Old Plastics Technology** (*my personally opinion*) - HP



announced that it is finally seeing returns from its 10-year investment in nanoscale electronics with the licensing of technology intended for the fabrication of semiconductor chips. The technology covers nanoimprint lithography (NIL), a method for stamping out patterns of conductors less than 50 atoms wide. The HP Lab has created laboratory prototype circuits with conductor widths of 15-nm or about 33% the width of today's most advanced circuits. Once the NIL master tool is created, copies can be stamped out quickly and manufacturing like CDs. The patterns are then

filled in with metals for the wires. HP has licensed the technology to Nanolithosolutions, Inc., of Carlsbad, CO who developed a tool based on HP's technology. The tool consists of a module that fits into a mask aligner. The module is used to create the patterns for conductors and transistors on a substrate. The tool is simple and inexpensive to use and turns commonly available mask aligners into high-resolution NIL machines. The technology is also being offered to others through HP's Intellectual Property Licensing organization. Nanolithosolutions was created by Pi and Yong Chen, a UCLA professor and former member of HP Labs. HP also has an equity stake in the company. Source: Business Wire. *[NIL is conceptually similar to "groove" or "channel circuit" concept that has appeared in the PCB patent field since about the 1970's, but there are some much earlier examples. I wrote an article on grooved circuits for PCFab some time ago. I worked on embossed circuits in the 1980's at Sheldahl. Poly-Flex Circuits made "Channel Circuits" in the 1990's using conductive adhesives so that a single material served as conductor and bonding agent. Embossing is the easy part, but adding the metal is the bigger challenge. The plastics industry has also used embossing and calendaring methods for many decades. One commercial process that I helped set up in the 1970's, involved the use of UV to harden coatings applied to photoengraved rotating cylinder for continue micro-patterned film production. While NIL, and related "nano" embossing may be new to semiconductors, the concepts are well known in other industries suggesting that IP in this area can be successfully challenged.]*

**Nano for Transparent Displays?** - *[Transparent displays have been around well before "nano" became the buzz. Just think about how long the military has used HUD (Heads Up Displays) and test gear has used touch screens. Transparent conductors and transistors are not that hard to make, but perhaps nano can offer help].*



Researchers reported the use of nanotechnology to create transparent transistors and circuits that might someday be used for e-paper *[The screen is made of clear plastic containing microcapsules and the system is reflective so transparent electronics doesn't make sense here - see this month's FPD report for diagram.]*, flexible color screens, "smart cards" and heads-up displays.

The transistors are made of single "nanowires," or tiny cylindrical structures that were assembled on glass or thin films of flexible plastic. Purdue University's Birck Nanotechnology Center has made transparent nanowires while others have previously created nanowire transistors that were non-transparent. But Purdue nanowire electronics can be fully transparent, as well as flexible, while maintaining high performance levels and this opens the door to entirely new technologies for high-performance transparent flexible displays, according to Purdue. The advancement has three broad areas of potential applications: (1) transparent displays for uses such as heads-up displays on windshields and information displays on eyeglasses and

visors [*these products exist now*]. Flexible displays for future "e-paper," promising to allow full-motion video. E-paper is a technology designed to mimic regular ink on paper. [*I can't see any fit here - and Printed Electronics is gearing up to supply flexible roll-to-roll driver circuitry in 2008*]. Transparent and flexible electronics for RFID tags, electronic bar codes and smart credit cards [*they don't need to be transparent - in fact, ISO requires a specific level of opacity so you can read the printed nomenclature*]. The nanowires were made of zinc oxide or indium oxide [Indium Tin Oxide has been used for decades on transparent screens]. Research has been funded by NASA through the Institute for Nanoelectronics and Computing, based at Purdue's Discovery Park, and at Northwestern University. Source: Purdue University.

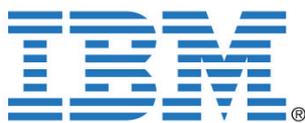
## MEMS

**Energy Extractors** - IMEC (Leuven, Belgium) reported 40-microwatt from MEMS piezoelectric device. [*MIT probably fabricated the first MEMS energy extractor a decade ago, but used capacitor plates as the "generator". Work was sponsored by DARPA with the idea of powering the half-million sensors that would be required on a Navy ship by using the background engine vibrations.*] Input vibration frequency of 1.8-kHz gave a maximum experimental output power of 40 $\mu$ W. This comes well in range of the amounts of power needed by wireless sensor applications, such as the pulse-oximeters developed earlier by IMEC. The device consists of a piezoelectric capacitor formed by a Pt electrode, a PZT layer and a top Al electrode. This capacitor is fabricated on a cantilever that supports a mass on its tip. As the harvester is subjected to oscillations, the mass causes the piezoelectric layer to be stretched. By doing so, it induces an electrical power when an electrical load is connected to the device. Source: IMEC



## GENERAL TECHNOLOGY

**The New Challenge Goes Back to Basics** - IBM has changed the way it does microprocessor research by creating working chips very early in the process to determine what technologies work and what is likely to cause yield problems. There is now the possibility of making mistakes that can cost \$1-billion or more. Picking the wrong technology wastes development capability that has become progressively more expensive. Previously, the risk was mostly between development and manufacturing, but the steps between research and development have greatly increased. One reason is that orders for the manufacturing equipment begin at around the 25% timeline of development. New CPUs are less about scaling and Moore's Law and more about innovation and new materials. In a way, it's back to the future when semiconductors were all about chemistry (material science) and physics. [*We need to be wary that much of the chem & physics semiconductor work based on the old rules of these grand sciences will be spun as nanotechnology. Both of these sciences have operated in the sub-nano zone for nearly a century*]. New materials are being integrated into chips, some [like IBM's vac-gap/airgap] have unusual micro/nano/molecular structures, and there is a real possibility that critical errors will show up only in finished product. While silicon is still the basic CPU constituent, the addition of new materials makes it imperative to look at all of the properties including chemical reactions and thermomechanical differences. Fortunately, the rules of science are well-known and easily applied. The new challenge is the old challenge and its more about conductors and dielectrics - wires & insulators. Source: IBM.



**Jobs with the Right Touch** - *I'm always amazed how Apple can take off-the-shelf technology and*



*weave it into a hot "new" product. They've done it again with the iPhone. The center point is the touch screen, a fairly old concept that was advanced by membrane switch technology in the 1980's. I recall working on gold and ITO coated clear plastic films while at Sheldahl. But Apple has adopted multi-touch technology and owns some key patents in that IP space.* The market for multi-touch touch screens will probably hit \$112.9-million in 2007 according to iSuppli. But Apple could make the touch screen a "must-have" input device that most other competitors will add, or reconfigure. PDAs have used precise touch screens for a

long time, but phones have centered around keys. *In fact, Smart Phones seem to be waging a "most keys contest" as the selling point and that seems like a poor use of real estate when it's the display that needs expansion. The obvious solution was to merge the display and keyboard and that's what Apple did in their typical user-friendly fashion.* And if everyone follows Apple, global shipment revenue for the leading touch screen technologies will be worth \$4.4-billion by 2012 per iSuppli. The main users will be mobile phone, consumer-electronics; portable game consoles, PDAs, Navigation Devices and high tech watches. *If anyone ever get's the e-book form factor right, they can be added to the list. Apple i-e-book next?* The leading enabling technologies include: resistive (membrane switch), surface capacitive, projected capacitive, infrared, Surface Acoustic Wave (SAW), optical, bending wave, and active digitizer. Other emerging touch-screen technologies, including photo sensor in pixel, polymer waveguide, distributed light, strain gauge, multi-touch, dual-force touch, laser-point activated touch and 3D touch which are beginning to emerge.

**Optical Glucometer** - OrSense (Israel) announced the NBM-200G non-invasive continuous monitor of blood glucose for diabetics. The product has been granted the CE Mark of approval in the EU. *[The device may be a little bulky at this stage, but likely will be miniaturized in the future.]* The unit is based on technology that allows non-invasive measurement of analytes including



glucose, hemoglobin, and oxygen saturation with very high sensitivity. The unit is operated by placing a ring-shaped probe around the patient's finger that applies a gentle pressure to the finger and temporarily occludes the blood flow. During the occlusion, optical elements in the sensor perform a sensitive measurement of the light transmitted through the finger. This method, called Occlusion Spectroscopy, provides a quick, accurate and painless measurement of the patient's blood glucose. The method was tested on over 400 subjects, exhibiting comparable accuracy to invasive solutions. The unit tracks glucose trends and then identifies hypo- and hyperglycemia events. Source: Engadget.

## TELECOM

WiMAX Forum First North American Certification Lab - WiMAX Forum will use AT4 Wireless, located in Virginia, for equipment certification; opens in October. This lab will be one of the 5 test labs for WiMAX Forum Certified products worldwide. The lab has plans to quickly set up the lab in

the United States to support global certification testing for both Fixed and Mobile WiMAX devices. The lab will initially be staffed by up to 25-30 employees and will conduct WiMAX Forum certification testing and radiated performance testing. WiMAX Forum members in the Americas can submit devices for certification at the Virginia facility in October. A US-based lab is critical as the demand for mobile certification testing increases in the US market. In the future, the North America lab may provide capabilities to support the convergence of emerging wireless technologies such as Wi-Fi with WiMAX and Bluetooth with WiMAX. The WiMAX Forum plans to have five certification test labs located in the US, Europe, China, Korea and Taiwan by end of 2007. Source: DigiTimes.



**Taiwan WiMAX Licenses** - Taiwan's National Communications Commission announced that there are 13 applicants competing for six WiMAX operating licenses. There will be an auction type open bid by qualified candidates in late July or early August of 2007. An applicant can apply for licenses in both the northern and southern regions, but can obtain only one license, the NCC indicated. Though applications are open to any type of wireless broadband access technology, the type of wireless broadband technology the NCC seeks to promote is WiMAX. Source DigiTimes.

## IP

**Fluid Jetting Lawsuit** - Nordson filed a patent infringement action against Musashi who makes Jetmaster and Jetmaster2. The suit was filed in Tokyo District Court in Japan on April 27, 2007. Asymtek (Nordson subsidiary) sells non-contact fluid jet dispensers under the names DispenseJet® DJ-2100 Series and DJ-9000 Series in Japan. Nordson owns three Japanese patents that relate to the DJ-2100 and DJ-9000 jet dispensers. These patents were obtained on the dates of 26 December 2003, 12 November 2004 and 20 January 2006. The complaint alleges that two Musashi products, the Jetmaster and the Jetmaster 2 dispensing products, infringe two of these Japanese patents and that the operation of the Jetmaster and Jetmaster 2 infringes the third Japanese patent.



**Harvard IP** - Harvard has licensed a broad portfolio of more than 50 issued and pending patents of nano- and micro-scale molecular fabrication methods to Nano-Terra (Cambridge, MA; newly formed and privately held). Nano-Terra focuses on developing and commercializing industrial applications of these technologies with corporate and government partners. The agreement spans the life of the patents. Harvard will receive royalties from products developed from these licensed technologies and will receive equity in Nano-Terra. The licenses give Nano-Terra exclusive rights in non-biomedical field such as electronics, aerospace, energy, industrial products, military uses, environmental testing, and consumer goods. The IP involves molecular self-assembly, rapid prototyping, electrical/optical systems, soft lithography, and microfluidics. The company has already agreements with 3M, Merck KGaA, and the DoD. The patents cover a number of basic technologies for controlling the structure and chemistry of surfaces and interfaces and incorporating nanoparticles into functional systems and devices. Source: Nanotechnology News.



## PCBs

**PCB Business is Tough Everywhere** - Wus Printed Circuit will see a \$ 4.27-million loss for the first half of 2007 from two subsidiaries, Wus Microelectronics and Wus Printed Circuit (China).

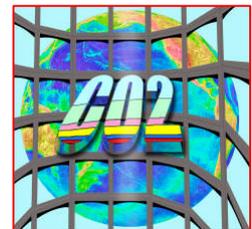
The parent company will have to recognize losses in inventory from the Kunshan, China subsidiary, which supplied printed circuit boards (PCBs) for the Sony PlayStation 3 (PS3), Lin said. The weaker-than-expected sales of the Sony game consoles resulted in returned shipments of PS3-use PCBs. The China subsidiary at the end of last year submitted a plan to list on the Shanghai stock market but the recent losses have prompted it to withdraw the initial public offering (IPO) plan; the IPO plan will not be revived in 2007. Wus Microelectronics, a TAB supplier, spun off from the parent company in 2001, suffered losses because of falling TAB prices. The parent company, in order to restructure its operations, has already announced that it will merge with the TAB supplier. The company is eyeing the high-end market, gearing up the development of rigid-flex PCBs for the handset segment. By the end of this year, the proportion of rigid-flex PCBs in the company's overall revenues will increase to 30% from the current 10%. Source: DigiTimes.

## **INTERNATIONAL NEWS**

*China is making most of the news this month, both good and bad. India seems to be settling into a steady progress mode as they try to better define national goals. Vietnam is moving along nicely and getting support for expansion and that includes closer ties (pun intended) from their old ally, and next-door neighbor - China.*

**China Phone Production** - Mobile phone output for China reached 455-million units in 2006, or 43.75% of world total output of 1.04-billion per Research and Markets. Most, 385-million units, were for exported. Mobile phone exports drove cell-phone production capacity not the domestic market. The cell-phone giants are continuing to transfer their global mobile phone manufacturing centers to China, a trend that began in 2002. Exports increased last year by 69.1% with a total value of \$31.2-billion. The export market was only 510,000 units in 2002.

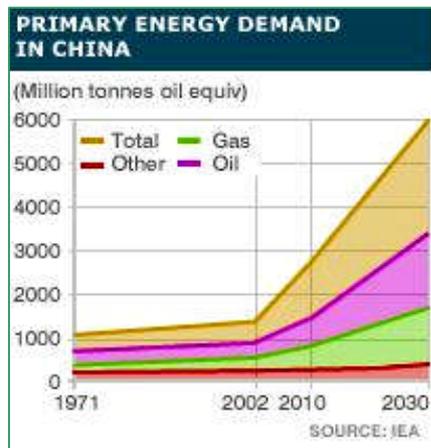
**China #1 CO<sub>2</sub> Exporter** - The United States is no longer the biggest air polluter in the world. According to the Netherlands Environmental Assessment Agency, China surpassed U.S. carbon-dioxide emissions by 8% in 2006. Other top emitters are the European Union, India, and Russia. The growth of China's manufacturing sector, driven by increasing demand for Chinese goods globally, is one cause of this surge in emissions. In 2005, China became the world's leading producer of another pollutant, sulfur dioxide, prompting the government to take actions to address its growing pollution problems. Sources: Netherlands Environmental Assessment Agency.



**China-Vietnam Express** - Two Chinese firms have submitted a feasibility study on constructing a rail route linking Ho Chi Minh City and Binh Phuoc province in Vietnam, part of the Trans-Asia railway. The China Railway Construction Corporation and the China Machinery Import and Export Corporation have submitted Vietnam's Transport Ministry the study on building the 128.5-km route running from the edge of southern Ho Chi Minh City to the Vietnam-Cambodia border with estimated investment of \$438-million. The future route will allow passenger trains and cargo trains to run at a maximum speed of 120 km/hr. (80 km/hr. for freight). Construction of the route is scheduled to start in 2010 or earlier if funds are

allotted. The route is part of the 5,500-km Trans-Asia railway, which is to begin in Kunming, Chinese Yunnan province, and travel through Laos, Myanmar, Thailand, Vietnam, Cambodia and Malaysia before terminating in Singapore. The Trans-Asia railway, initiated by Malaysia in 1995, is expected to be completed in 2015. Source: Xinhua

### China's Energy Appetite



China's energy consumption rose by 8.4% in 2006 - more than 6% faster than global consumption. The world consumption rose 2.4% last year, slowing from 3.2% in 2005. China consumed 1.7-billion tons of oil equivalent in 2006; 15.6% of the world. But CO2 emission is rising faster than global energy consumption due to the sharp rise in coal use in the world. China consumed 350-million tons of crude oil, up 6.7% from 2005, while its oil output rose by 1.6% to 183.7 million tons in 2006. China's dependency on oil imports stood at 47% in 2006. The global oil consumption grew by 0.7% in 2006, the weakest growth since 2001 due to soaring oil price. World total oil output reached 3.9-billion tons, up 0.4% from a year ago. China is increasing natural gas consumption and used 55.6-billion cubic meters, up 21.6 percent from 2005. The global natural gas

consumption grew by 2.5% and gas output rose by 3% in 2006. World coal consumption rose 4.5% in 2006, but China increased by 8.7% and now accounts for more than 70% of the global coal consumption increase. China's coal consumption was 1.19 billion tons of oil equivalent in 2006, and remained self-sufficient in coal consumption with coal output reaching 1.21 billion tons of oil equivalent. China's nuclear power output rose by 2.3% in 2006, and hydropower output by 5% both higher than the world average growth of 1.4% and 3.2% respectively. Source: Xinhua

**More Oil for China** - China will use about 350-million tons of oil this year, 10-million tons more than last year. Domestic oil production was increasing at around 1.5% a year, but oil consumption had jumped by about 8% a year since 2002, meaning more import. Just 10-years ago, China was an oil exporter but imports about half. China likes to blame high oil prices on "The unrest in the Middle East adds to oil price uncertainties in the global market," not their increasing appetite. Source: Xinhua



### India's Unusual Consumer Electronics Market



The consumer electronics market is one of the largest segments in the electronics industry in India with a market size of \$3.89-billion in 2006. With more than 1-billion people, the consumer electronics industry in India is poised for strong growth in the years to come. The Indian audio/video consumer electronics industry will grow to \$6.59-billion by 2011; CAGR is 10% from \$4.5 billion in 2007. The growth will be aided by a multitude of factors, including:

- Increasing consumer confidence
- Rising disposable incomes
- Easy financing
- Increased local manufacturing

