

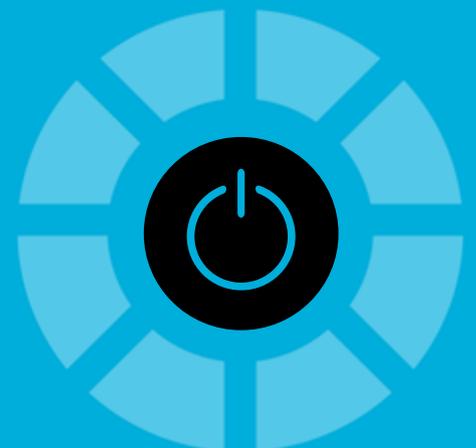
Q1 2015

www.businessmonitor.com

IRAN

CONSUMER ELECTRONICS REPORT

INCLUDES 5-YEAR FORECASTS TO 2018





Iran Consumer Electronics Report Q1 2015

INCLUDES 5-YEAR FORECASTS TO 2018

Part of BMI's Industry Report & Forecasts Series

Published by: **Business Monitor International**

Copy deadline: November 2014

Business Monitor International
Senator House
85 Queen Victoria Street
London
EC4V 4AB
United Kingdom
Tel: +44 (0) 20 7248 0468
Fax: +44 (0) 20 7248 0467
Email: subs@businessmonitor.com
Web: <http://www.businessmonitor.com>

© 2015 **Business Monitor International**
All rights reserved.

All information contained in this publication is copyrighted in the name of **Business Monitor International**, and as such no part of this publication may be reproduced, repackaged, redistributed, resold in whole or in any part, or used in any form or by any means graphic, electronic or mechanical, including photocopying, recording, taping, or by information storage or retrieval, or by any other means, without the express written consent of the publisher.

DISCLAIMER

All information contained in this publication has been researched and compiled from sources believed to be accurate and reliable at the time of publishing. However, in view of the natural scope for human and/or mechanical error, either at source or during production, **Business Monitor International** accepts no liability whatsoever for any loss or damage resulting from errors, inaccuracies or omissions affecting any part of the publication. All information is provided without warranty, and **Business Monitor International** makes no representation of warranty of any kind as to the accuracy or completeness of any information hereto contained.

CONTENTS

BMI Industry View	7
SWOT	8
<i>Political</i>	<i>10</i>
<i>Economic</i>	<i>11</i>
<i>Operational Risk</i>	<i>12</i>
Industry Forecast	14
<i>Table: Consumer Electronics Overview (Iran 2013-2018)</i>	<i>14</i>
Macroeconomic Forecasts	18
<i>Economic Analysis</i>	<i>18</i>
<i>Table: Economic Activity (Iran 2009-2018)</i>	<i>25</i>
Industry Risk Reward Ratings	26
<i>Industry Risk/Reward Index</i>	<i>26</i>
<i>Table: MENA Consumer Electronics RRI - Q115</i>	<i>30</i>
Market Overview	31
<i>Computers</i>	<i>31</i>
<i>Table: Computers - Demand (Iran 2011-2018)</i>	<i>32</i>
<i>AV Devices</i>	<i>35</i>
<i>Table: AV - Demand (Iran 2011-2018)</i>	<i>36</i>
<i>Mobile Handsets</i>	<i>39</i>
<i>Table: Mobile Communications (Iran 2013-2019)</i>	<i>42</i>
Industry Trends And Developments	46
Regulatory Development	55
Competitive Landscape	57
<i>International Company</i>	<i>57</i>
<i>Table: Hyperstar</i>	<i>57</i>
<i>Local Company</i>	<i>58</i>
<i>Table: Refah Chain Stores Co</i>	<i>58</i>
Company Profile	59
<i>Maadiran Group</i>	<i>59</i>
<i>Electronic Industries (IEI)</i>	<i>61</i>
Demographic Forecast	63
<i>Table: Population Headline Indicators (Iran 1990-2025)</i>	<i>64</i>
<i>Table: Key Population Ratios (Iran 1990-2025)</i>	<i>64</i>
<i>Table: Urban/Rural Population And Life Expectancy (Iran 1990-2025)</i>	<i>65</i>

Table: Population By Age Group (Iran 1990-2025) 65
Table: Population By Age Group % (Iran 1990-2025) 66

Methodology 68

Industry Forecast Methodology 68
Sector-Specific Methodology 69
Sources 69
Risk/Reward Index Methodology 70
Sector-Specific Methodology 71
Table: Consumer Electronics Risk/Reward Index Indicators 71
Table: Weighting Of Indicators 72

BMI Industry View

***BMI View:** Homegrown devices have greater potential than international products in Iran, owing to international sanctions that prevent many companies from selling products in the country. We believe the outlook for 2015 will continue to reflect these restrictions although the growing availability of 3G will boost demand for smartphones. Iran's large population offers considerable growth potential and opportunities for companies looking to expand. However, the government's continued interference with internet services and content and its attempt to establish a 'national internet' will limit appetite for computers and broadband services, although many Iranians may well remain unaware of the differences.*

Headline Expenditure Projections

- **Computer sales:** USD5.1bn in 2014 to USD6.7bn by 2018; low PC penetration means significant potential, but the high cost of devices remains a barrier to rapid growth.
- **AV and gaming device sales:** USD2.4bn in 2014 to USD3.0bn in 2018; digital broadcasting offers opportunities, but demand is likely to be weakest in this segment.
- **Handset sales:** USD2.0bn in 2014 to USD2.6bn in 2018; the slow development of 3G services by telecoms operators will limit the potential for smartphones, but increased competition in the 3G market poses upside risks in the long term.

Key Trends And Developments

The 3G market continues to be held back, with the two largest operators having a combined market share of 99%, and they continued to be restricted to EDGE and GPRS services in 2014; however, we expect the smartphone market to begin to gain significant growth momentum from 2015.

Despite the easing of sanctions on communications devices, the tightening of sanctions on Iran's financial sector in early 2013 has made it more challenging for vendors to source internationally branded products directly from East Asia. Many have resorted to importing products via the Middle East and Turkey, with higher customs tariffs.

In the AV market replacement TV set purchases will be driven by the roll out of digital TV broadcasting. Iran launched its first digital TV channel in early 2012 after developments gathered pace in 2011. Larger screen sizes and increased features will encourage consumers to upgrade their existing sets as products become more readily available following the easing of sanctions. The switch to digital TV will provide short-term impetus to market growth.

SWOT

SWOT

Strengths

- Iran's GDP is more than double that of Saudi Arabia, and the country had a population of more than 77.5mn at the end of 2013. It has the potential for it to be the leading consumer electronics market in the Middle East.
- Iran's youthful and tech-literate population is increasingly well informed about the latest technology trends and brands.
- Two-thirds of Iranians live in urban areas, which bodes well for strong retail growth and broadband access.
- The working age population, the major consumer group, is growing at about 3% a year.

Weaknesses

- Slow development of 3G services is impeding the growth of the smartphone market.
- High tariffs on some imported electronics products (eg 60% for mobile handsets).
- Local electronics distribution sector is small-scale and fragmented, making it hard for regional vendors and distributors to build channels to market.
- Large grey market of pirated goods entering the country through Pakistan, Afghanistan and Iraq.
- Political environment creates risk for vendors.

Opportunities

- Lifting of US handset sanctions will boost competition and should accelerate smartphone adoption.
- Mobile handset sales will continue to increase, with subscriber penetration forecast to grow from 120% in 2013 to 142% by 2018.
- Increased competition and coverage in the mobile data market should drive smartphone sales. Individual retailers of international consumer electronics brands, particularly Apple, are increasingly well-organised, offering their own warranties and services tailored to Iranian consumers.

SWOT - Continued

- The election of moderate president Hassan Rouhani in June 2013 may lead to an improvement in trade relations with the West, facilitating the flow of electronic devices into Iran.
- Government drive to encourage local production, particularly of handsets, could help vendors willing to form partnerships.

Threats

- The tightening of sanctions on Iran's financial system since early 2013 has made it more difficult for local retailers to source international brands directly from Hong Kong, Singapore and Malaysia.
 - Failure to control parallel imports and inflow of inferior computer components and accessories.
 - Political tensions between Iran and the West could limit opportunities for multinational corporations and create an element of unpredictability.
-

Political

Political SWOT Analysis

- Strengths**
- Since the overthrow of the Pahlavi family in 1979, there has been some reduction in the level of political corruption, while wealth distribution has improved marginally.
 - The Revolutionary Guard and Basij militia are fiercely loyal to the supreme leader, helping to maintain social stability.
- Weaknesses**
- The country has one of the poorest human rights records in the region, and authorities do not hesitate to quell dissidents. A number of journalists and anti-government protesters are being held in custody.
 - While decision-making ultimately rests with the supreme leader, the regime is heavily fragmented, and consensus is hard to reach.
 - Widespread perceptions of electoral fraud during the course of June 2009's presidential elections have damaged the regime's legitimacy in the eyes of many Iranians.
- Opportunities**
- The Majlis (parliament) is more than just a rubber stamp; the move by 150 parliamentarians (out of 290) to hold former president Mahmoud Ahmadinejad accountable for his handling of the economy in March 2012 is a positive indication that checks exist.
 - The victory of moderate cleric Hassan Rouhani in Presidential elections in June 2013 is leading to a significant improvement in relations with the West.
- Threats**
- Despite progress in nuclear talks, the prospect of further US and EU sanctions and the possibility of a military strike by the US or Israel cannot be dismissed.
 - Youth unemployment is high.
 - The strong influence of the Revolutionary Guards within the political and economic arena may present a challenge to reform over the long term.

Economic

Economic SWOT Analysis

- Strengths**
- Iran has the world's second largest proven oil reserves after Saudi Arabia, and the world's second largest proven gas reserves after Russia.
 - Oil and gas aside, Iran is rich in other resources and has a strong agricultural sector.
- Weaknesses**
- Local consumption of hydrocarbons is rising rapidly; this, coupled with ageing technology in the sector, will have a negative impact on its oil and gas exporting capacity.
 - International sanctions discourage foreign oil companies from bringing much-needed technical knowledge and equipment to maintain oil output levels.
- Opportunities**
- The gas sector remains underdeveloped, and there is considerable room to maximise this source of revenue.
 - A growing population, combined with a shortage of housing, provides opportunities for investment in residential construction.
- Threats**
- A decline in global oil prices would have a marked impact on the economy. Although an Oil Stabilisation Fund exists to protect the economy at times of weaker oil prices, it has increasingly been used to fund government overspending and could be close to empty.
 - Capital flight could continue, particularly should negotiations on the nuclear programme fail.
-

Operational Risk

SWOT Analysis

Strengths

- Iran boasts high numbers of skilled graduates in technical fields such as engineering, construction and science.
- The transport network offers good internal and cross-border connections, and is currently able to meet the country's supply chain needs.
- The banking sector is relatively well developed, allowing extension of finance and credit to citizens.
- A well established intelligence agency and robust counter-terrorist capabilities deter attacks in most areas of the country.

Weaknesses

- Costs of employment are increases because the Iranian Labour Code affords workers a high level of protection and generous benefits.
- The costs of inland transportation, as well as the risk of congestion and traffic accidents disrupting supply chains, is raised due to reliance on the road network as the dominant freight mode.
- There is widespread corruption and heavy handed censorship, which will pose unforeseeable operational costs and limit business activities.
- The expansion of IS in Iraq poses a significant risk to Iran's security.

Opportunities

- The literacy rate of the labour force is increasing as the benefits of investment in primary school education are filtering through.
- The development of road and rail connections with Iran's neighbours highlights the country's potential to develop into key transit point for East-West trade.
- Lack of external demand means that those who can invest in Iran are rewarded with cheap resources.
- Relaxing of sanctions is resulting in greater foreign direct investment inflows.

SWOT Analysis - Continued

Threats

- There is potential to combat the drug supply into Europe through programmes in Iran.
 - The availability of highly skilled labour is restricted as the brain drain results in an exodus of technically qualified workers.
 - The risk of electricity and water shortages will be enhanced due to growth in energy- and water-intensive agricultural, mining and manufacturing industries.
 - Lax intellectual property protection carries the threat of patent theft, fraud or infringement, leading to profit losses.
 - There is a risk of domestic hostility towards Westerners, triggered by international political events.
-

Industry Forecast

BMI View: We have left our forecasts unchanged (with the exception of an upgraded estimate for 3G handset sales) as the dynamics of the Iranian market play out as expected. We expect the removal of US sanctions begin having an impact in 2015, with an uptick in sales, particularly from vendors that have not previously targeted the market. We expect growth the market to reach a size of USD12.3bn at the end of our forecast period, in 2018.

Table: Consumer Electronics Overview (Iran 2013-2018)

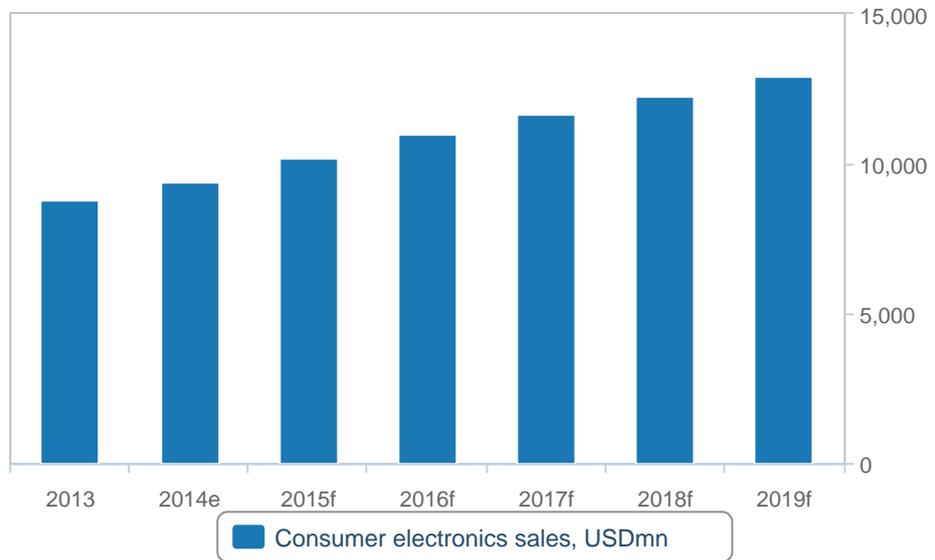
	2013	2014e	2015f	2016f	2017f	2018f
Consumer electronics sales, exports and domestic sales, USDmn	8,829.76	9,428.53	10,189.07	10,978.67	11,633.51	12,288.36
Consumer electronics sales, computers, exports and domestic sales, USDmn	4,738.22	5,069.89	5,475.48	5,858.77	6,268.88	6,678.99
Consumer electronics sales, consumer electronics, exports and domestic sales, USDmn	2,245.55	2,351.69	2,502.74	2,660.56	2,831.51	3,002.46
Consumer electronics sales, communications, exports and domestic sales, USDmn	1,846.00	2,006.94	2,210.85	2,459.35	2,533.13	2,606.91

e/f = estimate/forecast. Source: BMI

BMI expects the consumer electronics market to expand at a compound annual growth rate (CAGR) of 6.8% between 2014 and 2018. We expect strong growth in mobile handsets sales, particularly in terms of smartphones, once the 3G market becomes more competitive. This growth will be sustained by strong ongoing growth in AV devices and computers in the latter years of our forecast. Mobile handsets have the advantage of being sold per mobile connection, and households will likely have several devices. We forecast that market penetration will reach 142% by 2018. Even taking into account the size of the population, the level of GDP and the removal of restrictions on the import of some devices, the market will not reach its full potential in the short to medium term.

Consumer Electronics Demand

(2013-2019)



e/f = estimate/forecast. Source: BMI

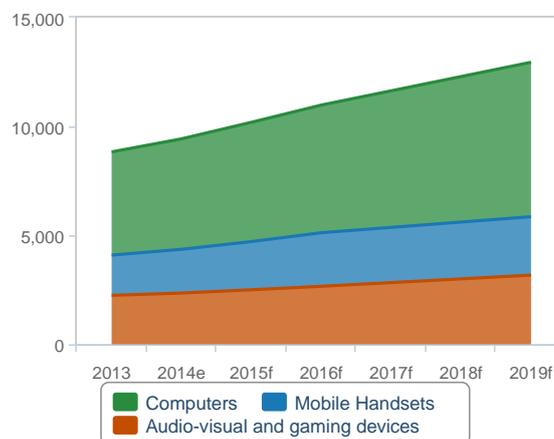
Considering the positive fundamentals in Iran (such as the large population, low penetration of devices and the potential for economic development) we would expect the market to achieve higher than average growth rates. However, the US National Defense Authorisation Act (NDAA), which took effect in January 2012 and was further tightened in 2013, has undoubtedly limited growth. The act imposed sanctions on companies trading with Iran and in 2012-2013 appeared to be having some impact on the market. Vendors such as **Huawei** and **Nokia Systems and Network** announced plans to scale down business in the country. In August 2012 Nokia closed its operations in the country. In April 2013 **Samsung** said it would be closing its app store to Iranian customers in May, in line with sanctions. However, we expect the removal of the sanctions restricting imports of handsets in May 2013 to boost market growth, but the scale of the impact of this is not yet clear.

Sanctions have also hit the wider economy, with knock-on effects for consumers including rampant inflation and the weakening rial. This has impeded the purchase of imported digital lifestyle products. We forecast consumer price inflation (CPI) in Iran to average 34.0% and 27.0% in FY2013/14 and FY2014/15, respectively. Improving macroeconomic conditions and high base effects will contribute to declining price pressures over the coming quarters, while a decision to cut cash subsidies payments will also contribute to lowering price pressures. However, a recent move to slash energy subsidies will result in higher transportation and fuel prices. As we expect price growth to remain high, reducing household income for spending on discretionary purchases.

In the longer term, Iran has a number of positive characteristics that provide consumer electronics opportunities. The steadily growing population will support private consumption growth, while demand for consumer electronics will also be fuelled by new technologies (such as the introduction of digital TV) and expanding internet and mobile telecoms penetration. However, opportunities in the market, for domestic

Consumer Electronics Demand

(2013-2019) (sales, USDmn)



e/f = estimate/forecast. Source: BMI

and foreign vendors alike, remain constrained by the huge size of the 'grey' market, particularly for mobile handsets.

Despite downside risks associated with the current political uncertainty, during **BMI's** 2014-2018 five-year forecast period Iran's market for digital devices should see overall growth. Iran's economy is expected to maintain a marginal upwards trajectory, boosted mainly by high oil prices. However, high inflation will continue to be a burden on consumers, exacerbated by sanctions. Regulatory uncertainty will continue to inhibit the development of market opportunities such as 3G handsets.

Computer hardware is estimated to have been the biggest consumer electronics market category in 2014, and is expected to account for about 54% of spending for the duration of our five-year forecast period. Government spending will help drive the market, while demand will also be strong in the SME and consumer segments. Spending will rise at a CAGR of 7.1% through to 2018, with an emphasis on notebooks and netbooks, which currently account for about 67% of sales.

AV devices are estimated to have been in second place for consumer electronics market spending in 2014, at 25% of the total. The government's campaign to implement digital broadcasting will drive opportunities in the medium term. Video devices such as TV sets, digital cameras and optical disc players account for about 76% of demand. Growth areas will include LCD TV sets and Blu-ray players, with an overall AV spending CAGR of 6.3% projected.

Mobile handsets are estimated to have accounted for about 21% of total spending in 2014, but this area is potentially the most dynamic segment of the market, particularly after the removal of sanctions on US handset imports in May 2013. Mobile penetration is lower than in many other countries in the region, and the development of the 3G market has been constrained by the exclusive 3G rights awarded to the smallest operator, **Tamin Telecom**. This means there is significant and currently untapped growth potential, and once the 3G market becomes more competitive we believe there is scope for rapid proliferation of smartphone ownership. We forecast a CAGR in spending of 6.8% from 2014 to 2018.

Macroeconomic Forecasts

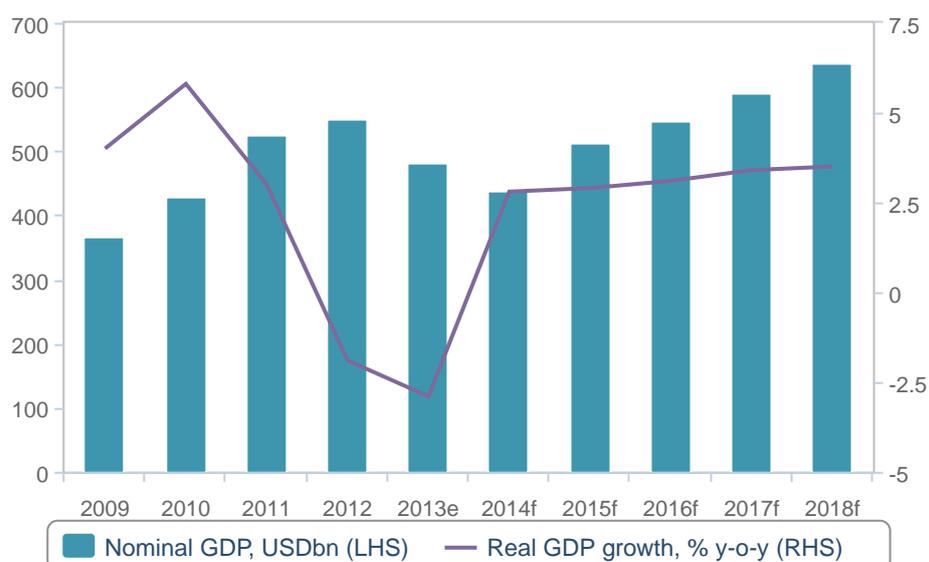
Economic Analysis

BMI View: The Iranian economy will expand modestly over the coming years, and we project real GDP growth of 2.8% and 2.9% in 2014 and 2015, respectively. Foreign direct investment by Western companies will remain minimal next year owing to the failure to reach a breakthrough in talks on the nuclear programme.

The Iranian economy will expand slowly in 2015 as talks on the nuclear programme continue without reaching a breakthrough, and project real GDP growth of 2.8% and 2.9% in 2014 and 2015 respectively, from our estimate of a 2.9% contraction in 2013.

Sanctions Remaining Key Constraint To Growth

Iran - GDP



e/f = BMI estimate/forecast. Source: BMI, UN

International sanctions on the Islamic Republic's nuclear programme will continue to damage the country's economic outlook over the next quarters. We do not foresee a breakthrough in talks between the P5+1 countries (United States, Russia, China, United Kingdom, France and Germany) and Iran in 2015 following

an interim agreement signed in November 2013, and oil and banking sanctions will be only marginally eased. Moreover, while we expect President Hassan Rouhani's administration to undertake significant efforts to reform the economy, the effects will be limited by a persistently opaque business environment, domestic resistance to opening up the economy and the slow political process. We project real GDP growth to average 3.1% over the 2014-18 period, compared to 1.6% over 2009-13.

Private Consumption Outlook: Consumer spending will remain modest over the coming quarters, and we expect expansion of 3.5% and 4.0% in 2014 and 2015 respectively. The inflationary environment will improve, but persistently elevated price pressures will continue to hit purchasing power. We project consumer price index (CPI) inflation to average 23.0% in FY2014/15 (fiscal year running from March 21 2014 to March 20 2015) and 21.0% in FY2015/16, compared with 35.6% in FY2013/14. Moreover, the government will be unable to increase current spending significantly in 2015, as it seeks to improve its fragile fiscal position by cutting subsidies and limiting previously universal cash subsidies to only low-income families (*see 'Inflationary Environment Improving In 2015', September 18*). The failure to reach a breakthrough in nuclear talks will also somewhat temper confidence in the economy among domestic and international investors.

Decline Not Enough To Stimulate Consumption

Iran - Consumer Price Index Inflation, % chg, ave

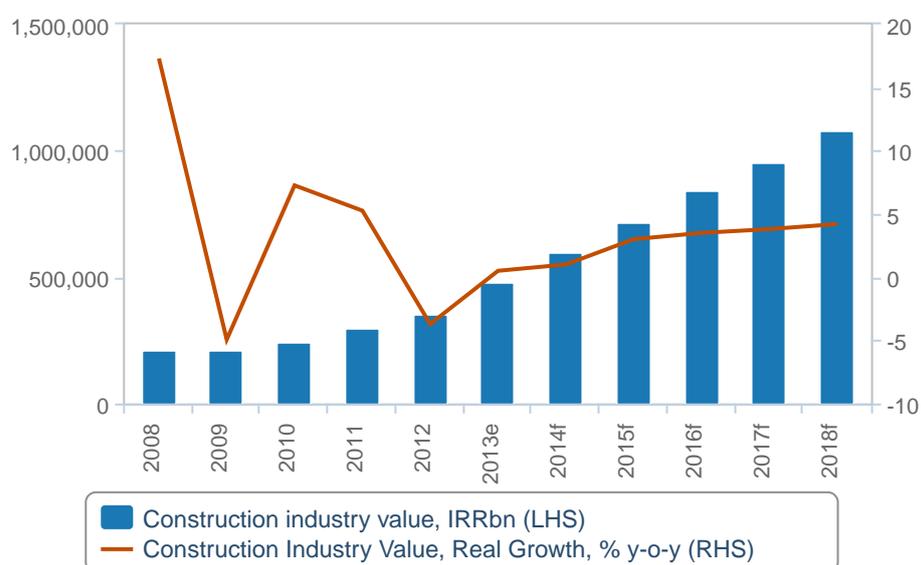


f= BMI forecast. Source: BMI, Central Bank of Iran, Bloomberg

Government Spending Outlook: Spending on the healthcare, education and services sectors will be subdued over the coming quarters owing to the executive's efforts to tighten fiscal spending. This is not to say that the government will cut on spending on public services, as it seeks to maintain popular support to its rule. As an illustration, the Iranian Ministry of Energy signed an agreement with local water and sewage utility **ABFA** at the beginning of September to develop seven water and wastewater management projects for the value of IRR9.5trn (USD310mn). We project government consumption increasing by 0.5% in 2014 and 1.5% in 2015.

High Demand Triggering Expansion

Iran - Construction Industry



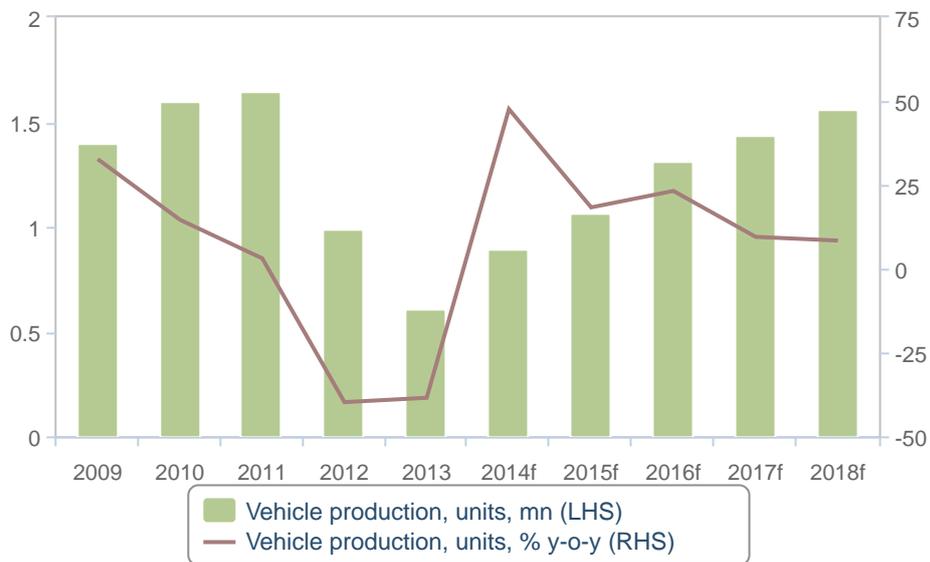
elf = BMI estimate/forecast. Source: BMI, National sources

Fixed Investment Outlook: Capital formation growth will gradually accelerate over the next quarters, which we project to expand by 3.5% in 2014 and 5.0% in 2015. **BMI's** Infrastructure research team holds a relatively positive outlook for the construction sector, which we project to expand by an average of 4.7% over the next five years, from 0.9% growth in 2014. The gradual increase in the expansion of the segment will result from a partial easing of economic sanctions, low base effects, increasing interest from foreign players and a high demand for infrastructure projects.

The automotive sector will remain a key beneficiary of the interim agreement reached in November 2013 between Tehran and the P5+1, when sanctions for the imports of auto parts were eased. Total production by local car manufacturers reached 399,846 units during the first five months of the current calendar year, a 72% y-o-y increase, and our Autos research team expects robust expansion in the industry over the coming quarters.

Benefitting From Interim Nuclear Agreement

Iran - Automotive Industry

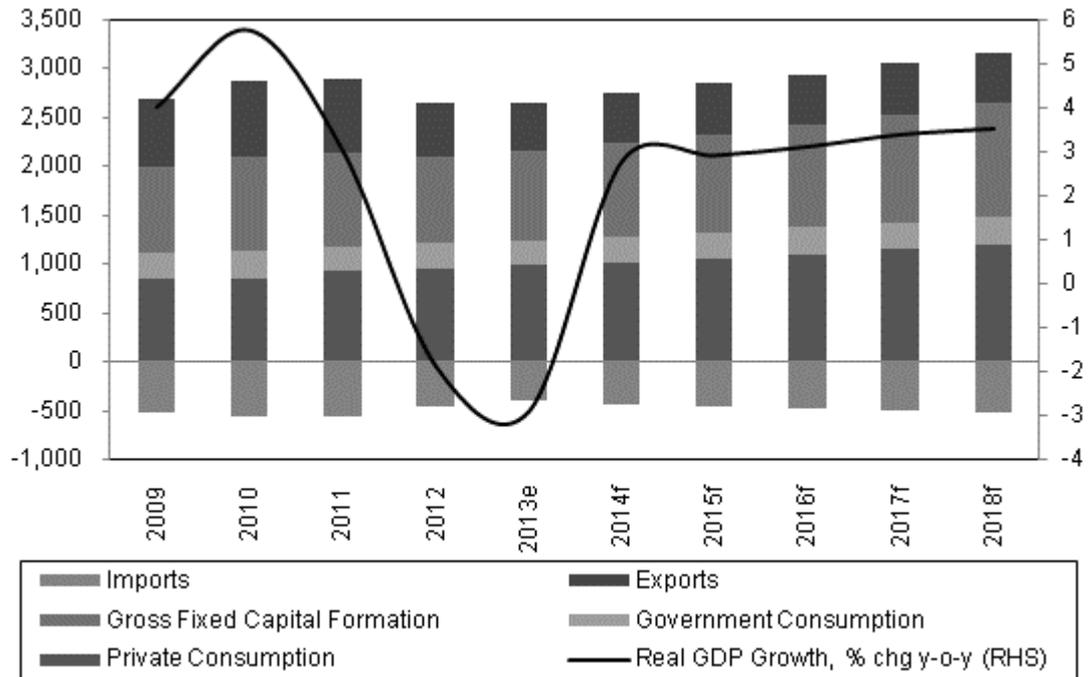


f = BMI forecast. Source: IVMA, BMI

A host of factors will hinder a more rapid expansion of fixed investment. Foreign companies in nearly every sector have recently expressed interest in returning to the Iranian market, but we believe that Western companies will be unable to undertake major investment in the country due to the sanctions regime. Another key impediment will be Iran's difficult operational environment, with high levels of bureaucracy providing a significant barrier to trade and the utilities infrastructure struggling to meet demand. Iran scores poorly overall in the **BMI** Operational Risks Index, with 41.5 out of 100 ranking the country 13th out of 18 states in the MENA region.

Slow Growth In The Coming Five Years

Iran - Components Of GDP (IRRtrn) & Real GDP Growth

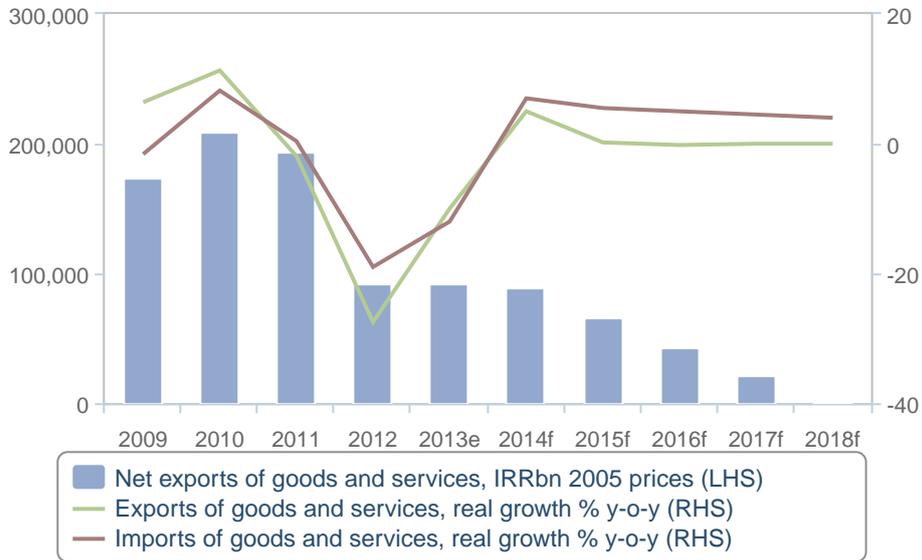


elf = BMI estimate/forecast. Source: United Nations, BMI

Chinese and Russian firms will remain the main contributors to foreign direct investment in 2015. In particular, Russian firms have recently expressed strong interest in the Iranian market, reflecting improving relations between Tehran and Moscow. Russia will become an increasingly important economic partner over the coming years, even as the majority of projects will not come to completion due to technical and logistical challenges. On September 9, Iran and Russia entered an agreement to collaborate in the oil sector; according to Russian Energy Minister Alexander Novak, Moscow is ready to carry out USD90.0bn worth of projects in Iran. In the same month, a memorandum was signed between unspecified Russian and Iranian firms for the construction of a pipeline stretching from Iranshahr to Chabahar in south eastern Iran, for an investment of approximately USD0.7bn.

Surplus Narrowing Steadily

Iran - Net Exports

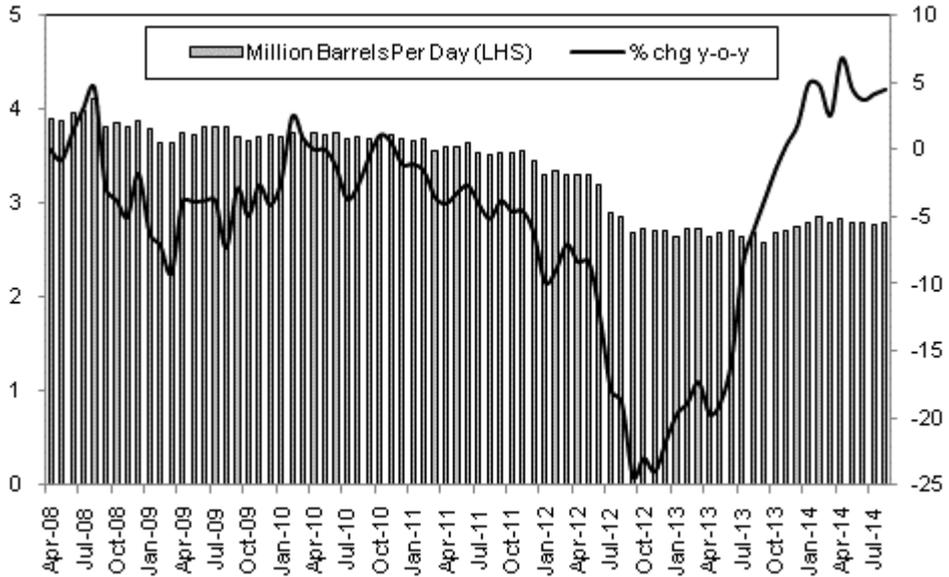


e/f = BMI estimate/forecast. Source: BMI, UN

Net Exports: We project the net exports surplus to narrow significantly over the next five years. Export growth will slow in 2015 owing to a deceleration in energy production - oil exports accounted for 70.0% of total exports in 2012 - and we project total export growth of 5.0% in 2014 and 0.2% in 2015. According to the International Energy Agency, total oil production expanded by 4.5% y-o-y in August, compared with a 10.6% decline in 2013. Low base effects and an uptick in condensates exports - which are not subject to international sanctions - will lead to an acceleration of energy export growth this year. We are pessimistic that large-scale projects which could boost oil and gas supply will come online in 2015, and the sanctions regime will continue to hinder the hydrocarbons industry.

Production On The Mend...

Iran - Oil Production

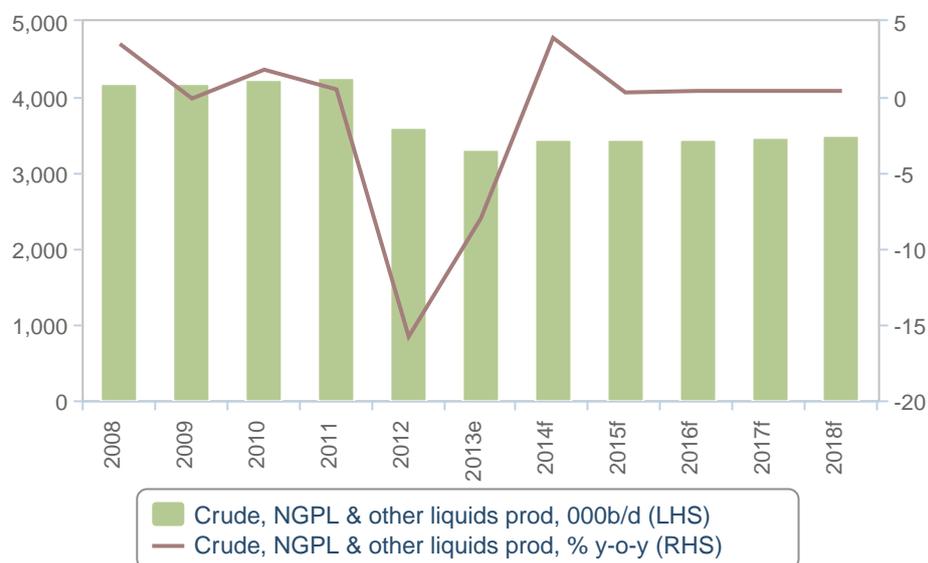


elf = BMI estimate/forecast. Source: EIA, BMI

The medium-term outlook for exports is also uninspiring. We project total exports to remain virtually flat over the 2014-2018 period, as rapidly increasing energy consumption will result in a decline of hydrocarbons export growth.

...But Five-Year Outlook Uninspiring

Iran - Oil Production



e/f = BMI estimate/forecast. Source: EIA, BMI

A weak rial will lead to subdued import growth in 2015. Moreover, the country's dependence on imported fuels has decreased over the past few quarters owing to refining capacity expansions and fuel subsidy cuts implemented in April, and our Oil & Gas research team expects a slight decrease or stagnation in fuel demand over Q414 and early 2015 (see 'On The Cusp Of Refined Fuels Independence' September 11). We forecast total import growth of 7.0% and 5.5% in 2014 and 2015, respectively.

Table: Economic Activity (Iran 2009-2018)

	2009	2010	2011e	2012e	2013e	2014f	2015f	2016f	2017f	2018f
Nominal GDP, USDbn	365.7	429.4	527.3	550.6	481.6	428.7	477.4	515.7	541.0	571.0
Real GDP growth, % y-o-y	4.0	5.8	3.0	-1.9	-2.9	2.8	2.9	3.1	3.4	3.5
GDP per capita, USD	4,972	5,766	6,991	7,204	6,217	5,462	6,006	6,409	6,644	6,933
Population, mn	73.5	74.5	75.4	76.4	77.4	78.5	79.5	80.5	81.4	82.4
Unemployment, % of labour force, eop	12.0	13.5	13.3	13.1	13.0	11.0	10.0	10.0	10.0	10.0

e/f = BMI estimate/forecast. Source: UN, BMI

Industry Risk Reward Ratings

Industry Risk/Reward Index

BMI View: *Mobile handsets is the fastest growing segment of the consumer electronics market in the Middle East and Africa (MEA), driven by the rapid expansion of mobile networks, the over-reliance on mobile data networks for internet connectivity and the lower price points for devices in that segment, relative to the computer hardware and audio/visual (AV) devices segments. These factors increase the vulnerability of mobile devices to counterfeiting, limiting the overall market potential for investors.*

AV devices are also recording strong volume and value growth in the region, albeit from low bases, but demand for computer hardware, particularly desktop PCs, is constrained by a relatively higher average selling price (ASP) and a shift in consumer preference towards more mobile form factors. Market opportunities for consumer electronics investors and vendors vary widely in the 10 countries in our coverage, with Israel and the GCC states offering opportunities for high-end products, while Egypt and South Africa are well suited for high volume sales, especially for mass market products.

BMI's Q115 Risk/Reward Index for the MEA region ranks the 10 countries in our coverage based on an aggregate score of risks and rewards divided into four categories - Industry Rewards, Country Rewards, Industry Risks and Country Risks. There is no change in terms of rankings in this quarter's update, with Qatar, the UAE and Israel retaining the top three positions in that order, and Oman, Iran and Egypt taking the last three positions. However, there were minor changes to the score of some countries across different categories, leading to a 0.1ppt increase in the average aggregate score to 52.6.

Industry Rewards

BMI's Industry Rewards category assesses the size of the domestic consumer electronics market, the level of ICT development and the five-year growth outlook for the market. The regional average score in this category increased to 46.7 this quarter, from 46.6. We upgraded the Industry Rewards scores of Israel, South Africa, Iran and Egypt to reflect recent ICT development, especially in the area of broadband infrastructure, strong demand for consumer electronics products.

The upgrades were partially offset by decreases in the scores of Kuwait, Bahrain and Oman on the back of sluggish market growth. These three countries are characterised by a small domestic consumer market, compared to their regional peers, while the clampdown on expatriate workers in Kuwait in the last two years is starting to weigh on demand for consumer-centric products. That said, we note that vendors and

suppliers of low- to mid-end products are hardest hit by this development considering that the majority of high income consumers are local citizens.

Qatar, the UAE, Israel, Saudi Arabia and South Africa have the joint highest score of 53.3 in the Industry Rewards category. The first three mainly due to high sales per capita and the last two due to market size. We also forecast strong market value over the five years to 2018 for all five countries. Strong visitor numbers to the UAE and Saudi Arabia will drive growth in those markets, while the influx of expatriate construction workers into Qatar as the country builds out new infrastructure to facilitate its hosting of the FIFA 2022 World Cup will support demand in that country. We expect the launch of 4G network services in Israel to boost demand for 4G-enabled devices, while growth in South Africa will mainly be driven by low base effects.

Country Rewards

In this category, we assess the potential demand for consumer electronics products in a market based on accessibility and affordability. According to our assessment, the proportion of consumers in a country that can afford high-value devices is correlated to the key macroeconomic factors, such as urbanisation, GDP per capita, demographics and income distribution. Qatar, Kuwait, the UAE and Israel had the highest GDP per capita in the region at the end of 2013, at approximately USD84,000, USD54,000, USD45,000 and USD35,000 respectively, according to **BMI** data. In addition to the factors mentioned above, these countries also have well developed fixed and mobile broadband network infrastructures covering large proportions of their respective countries and, therefore, driving demand for data-enabled CE products, including smartphones, tablet computers, smart TV sets and laptops.

Although the GCC states, particularly Qatar, the UAE and Kuwait, perform strongly in this category owing to high levels of urbanisation and high GDP per capita, investors must factor in the wealth gap between local citizens and migrant workers, which make up a significant proportion of their respective populations. This is exemplified by Saudi Arabia's score, which is constrained by the challenge of internal distribution across the country's vast land mass as well as the wide income disparity among consumers.

Egypt has the lowest scores in the Country Rewards category, reflecting low GDP per capita and relatively low urbanisation. Although Egypt's population means that it is a much bigger market than many of its peers, the fact that a significant proportion of the population are unable to access or afford modern devices underscores the country's underperformance in this category.

Industry Risks

Product smuggling and counterfeiting are major risk factors for consumer vendors in the MEA region. There are two prevalent forms of grey market activities in the region. The first is outright counterfeiting of consumer electronics products, particularly consumables, such as printer ink cartridges, and devices and accessories, including handsets. The second form of grey market activities involves the sale of authentic products that have not been officially launched in the local market. CE products such as high-end smartphones, games consoles and cameras often fall into this category. Some device manufacturers are tackling this problem by reducing the time lag between releasing new products in developed and in emerging markets.

Many governments in the region have shown little political will to stop smuggling and grey market activities, partly due to strong opposition from major beneficiaries, including consumers. The relatively low income level in some countries is a major factor driving the high demand for low-cost products, which, in most cases, are counterfeited or smuggled. However, this appears to be changing in the wealthier markets, with the Dubai Police's Criminal Investigations Department (CID) confiscating 60,000 fake mobile phones valued at AED48mn (USD13.07mn) during August 2014.

The wealthier markets are less susceptible to counterfeiting owing to generally high income levels and the existence of well developed distribution channels. The major risk to vendors is from the sale via grey market channels of products that have not been formally launched in the local market. However, the UAE's large reseller market and status as a transport and distribution hub in the Middle East region makes it susceptible to counterfeiting and grey market activities. Iran, with the lowest score of 30, is particularly vulnerable to counterfeiting as grey market activities have flourished on the back of international trade sanctions while the country's economic challenges, including the sharp depreciation of the local currency, in the last three years are driving demand for cheaper but, oftentimes, counterfeited products.

Country Risks

The ongoing conflict in parts of Iraq and Syria remains a major barrier to regional security and economic growth, especially with the active participation of some countries in the region in the US-led airstrikes against the Islamic state militants. The wave of subsidy reforms in the region could also weigh on disposable income levels and private consumption. In October 2014, the Kuwaiti government tripled the prices of diesel and kerosene from KWD0.055 (USc19) to KWD0.170 (USc59) per litre as part of an effort

to phase out subsidies, while the Omani government plans to cut some state subsidies in 2015 as declines in global oil prices increase pressure on the country's finances.

On a bright note, Egypt's growth outlook is the most positive it has been since the onset of the Arab Spring in January 2011. After three years of political turmoil and a rapid evaporation in investor confidence, the country is on a sound trajectory and laying the foundations for sustained growth over the coming years. Further improvements in political stability and policy continuity will occur with parliamentary elections due in the coming months. Several forward-looking indicators and high-frequency data series underscore our view that the Egyptian economy is turning a corner.

In Israel, we expect consumer confidence will pick up gradually in 2015, in line with our view that an improved macroeconomic environment will lead to increased consumer spending. We project private consumption growth of 3.5% in 2015, from 3.0% in 2014. In the six GCC economies, we forecast growth to average 4.0% and 4.1% in 2014 and 2015 respectively, largely driven by gains in the non-hydrocarbons sector. Latest purchasing managers' index readings for Saudi Arabia and the UAE continue to show evidence of buoyant private sector conditions, as do other high frequency indicators such as credit growth and point-of-sale transactions data.

Table: MENA Consumer Electronics RRI - Q115

Country	Rewards		Risks		CE Rating	Rank	Previous Rank
	Industry Rewards	Country Rewards	Industry Risks	Country Risks			
Qatar	53.3	80.0	70.0	61.3	63.3	1	1
UAE	53.3	80.0	65.0	54.1	61.4	2	2
Israel	53.3	65.0	65.0	78.3	62.1	3	3
Kuwait	44.2	77.5	55.0	55.1	55.6	4	4
Saudi Arabia	53.3	45.0	55.0	71.6	54.8	5	5
South Africa	53.3	50.0	57.5	68.2	55.7	6	6
Bahrain	39.2	52.5	50.0	54.6	46.5	7	7
Oman	34.2	40.0	57.5	69.5	44.8	8	8
Iran	46.7	47.5	30.0	38.1	43.3	9	9
Egypt	36.7	22.5	52.5	56.4	38.6	10	10
Average	46.7	56.0	55.8	60.7	52.6	-	-

Scores out of 100, with 100 the best. The Consumer Electronics (CE) Rating is the principal rating. It comprises two sub-ratings, Rewards and Risks, which have a 70% and 30% weighting respectively. In turn, the Rewards rating comprises Industry Rewards and Country Rewards, which have a 65% and 35% weighting and are based on growth/size of the consumer electronics industry (Industry) and the broader economic/socio-demographic environment (Country). The Risks rating comprises Industry Risks and Country Risks, which have a 40% and 60% weighting and are based on a subjective evaluation of barriers to entry and the regulatory environment (Industry) and the industry's broader country risk exposure (Country), which is based on BMI's Country Risk Ratings. The ratings structure is aligned across all industries for which BMI provides Risk/Reward Ratings. Source: BMI.

Market Overview

***BMI View:** BMI forecasts PC market sales of USD4.4bn in 2014, rising to USD5.8bn by 2018. Despite limited broadband access, we believe the market has strong growth potential as the government rolls out its own internet network and household computer penetration increases. Notebooks will drive the market, and tablets will be increasingly important, although the current lack of widespread 3G services will limit the potential of these devices for mobile internet demand.*

Computers

Asian vendors have taken advantage of the gap left by US companies not allowed to sell directly to Iran. Compared with many markets there is a much stronger presence of companies such as **LG**, **Samsung**, **Acer**, **Sony** and **Toshiba**. However, there are changes to the market after an August 2013 decision to lift restrictions on selling consumer electronics to Iran. **Apple** lifted restrictions on those consumers buying devices with the intention of taking them to Iran.

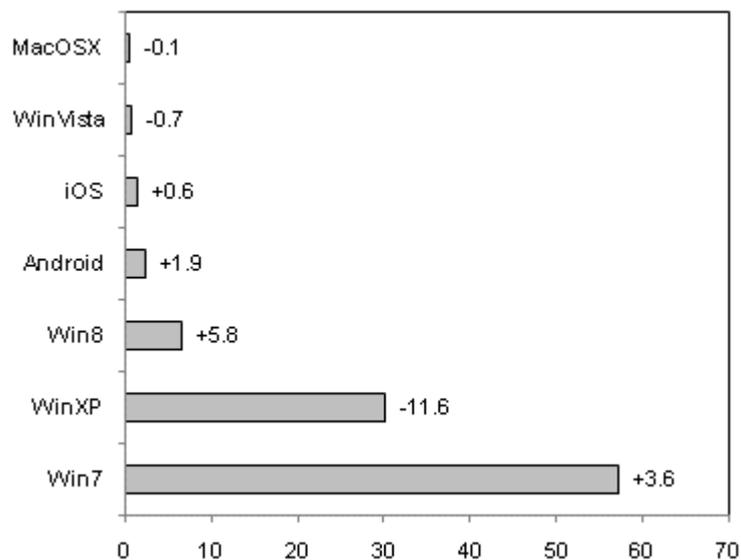
The lack of international production and import has led to growth in the manufacture of locally made computers. Until recently, barring a few high-end brands, most computers in Iran were assembled locally. Customers can purchase computer parts from specialists markets or malls where customised computers are assembled. Assembly is a major feature of the market and a large portion of the computer hardware market is concerned with parts, particularly monitors, and accessories such as printers.

In contrast to the more diverse landscape in most Middle Eastern markets, Iran is dominated by just two vendors, LG and Samsung. Local electronics firm **Maadiran Group** began to manufacture LG monitors in Iran over a decade ago and LG has a premium position in the market, while Samsung has a smaller but significant market share. Recently, Maadiran plans to produce AOC monitors from **TVP** in Iran, on a semi-knocked down (SKD) basis, positioning the brand between LG and Samsung.

Despite the US trade embargo on Iran, printers from global leading vendor **HP** are readily available in Iran, as was revealed by the recent controversy surrounding HP's distributor **Redington**. Stung by the bad publicity, HP said that it would tighten sales restrictions on Redington to prevent it from selling printers to retailers in Iran. However, it is doubtful whether HP can do much to prevent its printers from selling there. Redington laid the foundation for the popularity of HP printers brand a decade ago, famously decorating its offices in Tehran with giant colourful maps created by HP printers. Meanwhile, there is fierce competition for Iran's buoyant computer accessories market.

PC Browsing Traffic By OS

2012-2013 (% and percentage point change y-o-y)



Source: Statcounter, BMI

Table: Computers - Demand (Iran 2011-2018)

	2011	2012	2013e	2014f	2015f	2016f	2017f	2018f
Computer hardware sales, USDmn	4,424	4,513	4,738	5,070	5,475	5,859	6,269	6,679
PC sales, USDmn	3,847	3,924	4,120	4,409	4,761	5,095	5,451	5,808
PC sales, '000	3,477	3,721	4,055	4,542	5,133	5,748	6,438	7,128
- Notebooks, '000	2,504	2,790	3,123	3,588	4,157	4,656	5,215	5,774

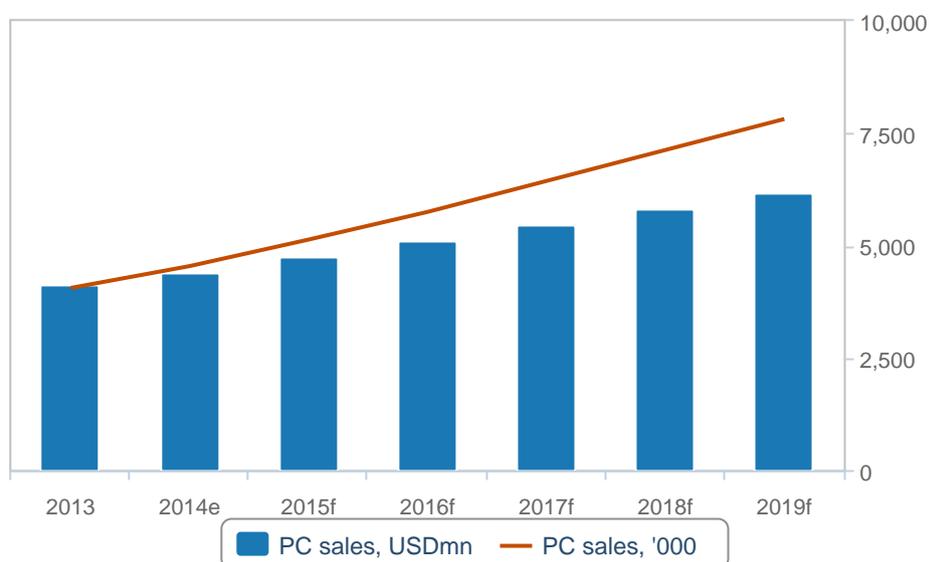
e/f = estimate/forecast. Source: BMI

BMI forecasts that the computer and accessories market will continue to account for the largest proportion of Iran's consumer electronics market, at more than 50% of total sales, right through our five-year forecast period to 2018. We estimate that total computer hardware sales reached USD5.1bn in 2014, rising to USD6.7bn in 2018. However, the market will continue to underperform as a result of the implications of sanctions for imported hardware and the economic environment overall.

PC penetration remains low, lower than other markets in the region, with a slow growth trajectory in recent years as a result of more stringent sanctions affecting the market directly and via the impact on the wider economic environment. There is untapped potential for growth, but the outlook is challenging so long as sanctions remain in place and political tensions are unresolved. Continued economic and political uncertainty, closely related to the threat of international sanctions, and instability in local channels make Iran a challenging market. We forecast single-digit revenue growth in 2014, and expect revenue growth to remain modest, with a compound annual growth rate (CAGR) of 6.8% in US dollar terms for our forecast period.

Computers: Demand

(2013-2019)



e/f = estimate/forecast. Source: BMI

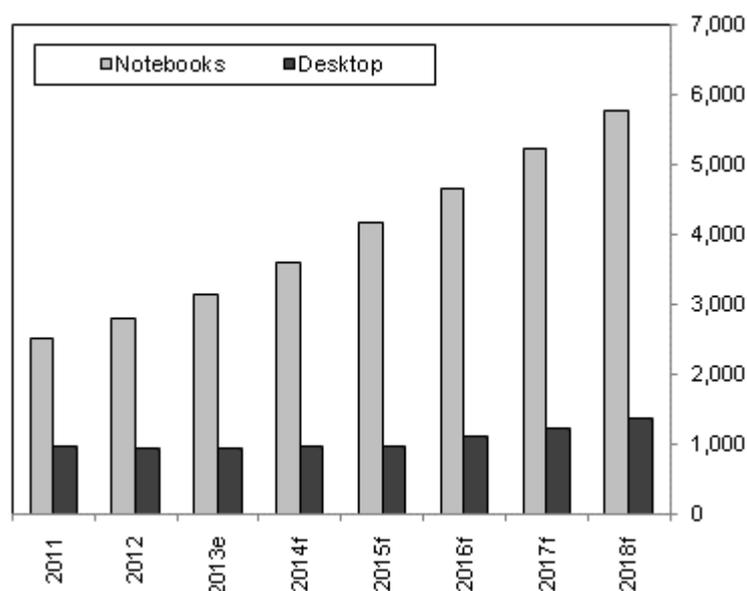
While shipments growth is underperforming compared to many other regional markets, Iran is seeing a number of trends in common with its regional peers. There is a shift to greater use of mobile computing devices including notebooks and netbooks, and potentially of tablets in future. As a result, desktops now account for only around one-third of sales and this share is expected to fall further over the forecast period, while PC unit sales will grow in absolute terms to 7.1mn units by 2018.

BMI expects notebook shipments (including tablets) to increase to 5.8mn units in 2018, from 4.4mn in 2014, with a CAGR of 7.1%. The popularity of netbooks echoes trends in other emerging markets, but with more limited competition from tablets volumes have been sustained for longer. However, there is a threat to the netbooks from new form factors, including tablets and hybrids. This trend should be considered in the context of local specifics. For instance, with imported products more expensive and at times difficult to obtain, the extent to which Iranian consumers can shift to tablets and hybrids is subject to uncertainty. Given the dominance of local assembly, we expect the decline in desktop sales to be less pronounced than in other regional markets.

The government and commercial segment dominates computer purchases, with more than 50% of the total market. Over the next few years computer sales should be boosted by government procurement for education projects and other uses, with e-government initiatives helping to fuel spending, along with privatisations. There should also be growing investment by private companies, particularly in modernising sectors such as telecoms and banking. Despite its huge potential, the small to medium-sized enterprise (SME) market will be relatively constrained by its lack of access to investment compared with other countries in the region.

Computers - Segmental Demand

2011-2018 ('000)



e/f = estimate/forecast. Source: BMI

BMI expects the market to remain on a low growth path as a result of sanctions and political and economic uncertainty. Several other factors will have a bearing on whether the computer market achieves its potential. High tariffs and the government trade embargo have a significant impact on the market, which remains dominated, in the desktop segment, by local assembly, with monitors procured from warehouses and computer parts malls. Trade sanctions could have an impact on the volume of imports from the UAE, although it is reported that higher income consumers have found ways to acquire desirable hardware internationally.

AV Devices

Iran's AV devices market is dominated by multinational brands such as Sony, Samsung, **Sharp**, LG and Toshiba. Maadiran is becoming an important player via its expanded manufacturing facilities 80km outside Tehran. High tariffs on some products and the trade embargo have allowed local manufacturers to gain a foothold in the market. The regional competitive landscape has evolved over the last two years, with Samsung moving into a strong position across a range of product groups including plasma and LCD TV sets, LCD monitors, micro hi-fi and DVD recorders.

The leading local TV set manufacturer is Maadiran Group, which in 2006 launched its X-Vision brand. The company claims it is now the third-largest LCD TV brand in Iran. Samsung was understood to have claimed top spot in the LCD TV set market ahead of main multinational rivals Sony, LG, **Philips** and Sharp. In Iran Samsung has built success on localisation of production, marketing and sales activities, as well as brand building, such as its 'silk carpet' campaign, which emphasises the slim size of its LED TV set.

In the Middle East Sony is estimated to have a 15-20% share, while LG and Sharp have around 10%. Samsung and LG placed a lot of expectation on LED TVs, although demand was limited to high-end consumers initially. The launch of local digital TV should benefit sales.

The emergence of the LCD TV market opportunity has prompted a range of consumer electronics vendors, including Sony, Sharp, BenQ, **Nikai**, LG and **JVC**, to negotiate new, or strengthen existing, distribution deals to expand their presence in Iran. In 2010 Sharp launched an LCD TV assembly plant in Iran, in partnership with Maadiran Group. The new facility marked a new stage in cooperation between Sharp and Maadiran that dates back to 1964. The plant will make digital TV sets with sizes of between 32 and 55 inches. Sony was launching its Bravia range of LCD TV sets, after negotiating a distortion agreement with a new channel partner. Sony has already established a service centre in Iran. JVC established a liaison office in Tehran to provide marketing support to local partners and planned to further boost its presence through

establishing its own network of retail outlets. According to the company, Iran was already its most significant single market in the Middle East.

Vendors and distributors were continuing to invest in retail expansion. **Panasonic** said that it would provide strong support for branding in the region despite the economic downturn. Panasonic was aiming for a 25% share in the 37-inch-plus flat panels television market, with its Viera LCD range with energy saving features leading the campaign. Among other challengers is Asian consumer electronics leader BenQ, which has said that Iran is its third largest market in the Middle East, generating 15-20% of annual revenue. The company manages the market from Dubai, and has considered investing in assembly plants in Iran in the past, only to be deterred by the security risks.

In the digital camera segment, Samsung has also made regional advances, due to the popularity of its multimedia compact cameras. New models such as the i8 support functions such as PMP, MP3 playback, travel information and text viewers

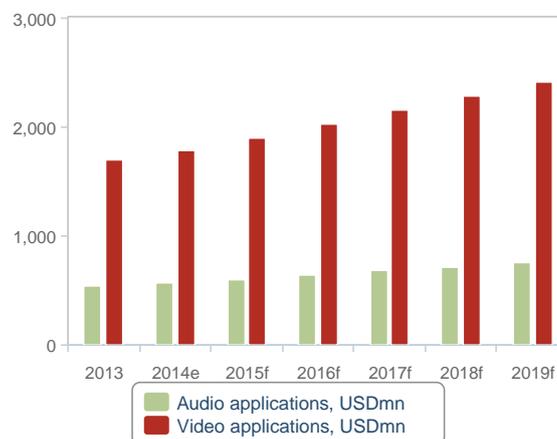
Table: AV - Demand (Iran 2011-2018)

	2011	2012	2013e	2014f	2015f	2016f	2017f	2018f
AV and gaming device sales, USDmn	2,180	2,182	2,246	2,352	2,503	2,661	2,832	3,002
- Video applications, USDmn	1,657	1,658	1,707	1,787	1,902	2,022	2,152	2,282
- Audio applications, USDmn	523	524	539	564	601	639	680	721
LCD TV set sales, '000 units	509	631	757	893	1,072	1,286	1,543	1,801
Digital camera sales, '000 units	326	317	320	326	339	356	374	392

e/f = estimate/forecast. Source: BMI

BMI expects the AV market will underperform over the medium term due to similar constraints to those affecting the computer hardware market. Sanctions and the wider business environment make operations in the country difficult. Despite these challenges, the market's size is sufficient to attract interest from regional and global vendors. Newer products such as LCD TVs continue to gain in popularity, but demand is limited by affordability, while supply chain hurdles remain an issue. Nevertheless, consumers are keen to get their hands on the latest products, with flat screen TVs bolstering demand. A more open market would see faster growth, particularly if accompanied by improved economic performance with an easing of sanctions. However, under our existing forecast the market is still expected to see a CAGR of 6.3%, reaching USD3.0bn by 2018.

AV: Demand (2013-2019)



e/f = estimate/forecast. Source: BMI

The market will be constrained for the foreseeable future by international sanctions, indirectly via their impact on the purchasing power of ordinary Iranians rather than on direct restrictions on device imports. EU and US banking sanctions have fuelled Iran's runaway inflation and led to a collapse in the value of the rial, which has caused 20% to 50% rises in the cost of foreign-made products.

The extent to which a lack of affordability for imported hardware will be compensated by boosts in domestic production are uncertain. The sector remains restricted by the small scale and fragmented nature of the retail channel, but there is progress. For instance, Maadiran Group has made significant investment in domestic production facilities and it claims to have the largest single consumer electronics manufacturing facility in the region.

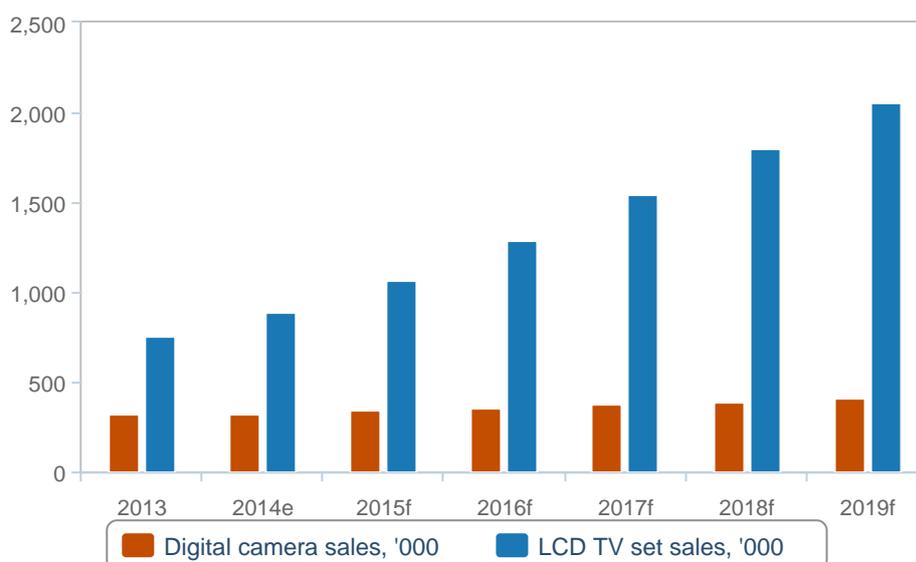
Another boost to growth could come from a decision by the government to launch a process of migration from analogue to digital broadcasting. This should stimulate a rise in TV set purchase rates as well as boost demand for set-top boxes. TV sets will be the main driver of AV category sales growth over the forecast period as consumers upgrade and trade their old models for digital. The potential TV set market was estimated at around 757,000 LCD TV set units in 2013, while total TV set sales were projected at around

5.3mn units. Demand for video applications is forecast to continue to rise, with revenue projected to rise to around USD2.28bn by 2018.

Sales of LCD and plasma sets have increased as prices have fallen substantially. The demand for higher quality TV viewing experiences has seen demand for 42-inch and 50-inch plasma TV sets increase substantially. There is reportedly particularly strong demand in Iran for screens of 46-inches or more, rather than the 32-inch set which dominates elsewhere, which only accounts for around one-third of demand. At the same time, vendors are aware that TV sets are no longer purchased simply for watching broadcasts, and newer models from **Samsung** and other vendors include 'smart' capability allowing people to enjoy downloaded content.

AV: Demand Key Products

(2013-2019)



e/f = estimate/forecast. Source: BMI

In January 2012 Iran opened 'N (Display), which was claimed to be the first digital TV-channel in the country. The broadcasting is in Farsi and the channel broadcasts local and foreign movies and TV series.

To try and maintain sales volumes, TV set vendors will also focus on product innovation, with drivers including improved display quality and wider screens, as well as design and features such as wireless

technology. Regional vendors placed a lot of expectation on LED TVs to drive revenue, as LCD TV prices declined, although demand for LED sets has thus far been limited to high-end consumers.

Elsewhere in the AV market, digital cameras are forecast to sell at around 28,250 units a month in 2015. Consumers are becoming more ready to upgrade their cameras to digital, or to buy a better digital camera when new features become available, especially as average selling prices decline. Seven- and eight-megapixel models remain the most popular in the compact segment regionally but demand for 12-megapixel models is growing. However, over the medium term sales of digital cameras faces the downside risk of consumers choosing to settle for the camera on their smartphone.

Revenue from audio devices was estimated at around USD564mn in 2014 and is expected to rise to USD721mn within the forecast period, with home theatre systems accounting for the largest share of revenue.

With 59% of sales, the Sony PlayStation3 is currently the number one gaming console in the region, with **Nintendo** Wii and **Microsoft** Xbox the other major players. The release of next generation games consoles from Sony and Microsoft in late 2013 could have been expected to boost the market; however the availability in Iran is uncertain and, as such, the release is not a factor we are including in our forecast for the time being.

Mobile Handsets

Mobile handsets have the greatest potential for volume growth, as the form factor has the greatest potential to reach a wide range of consumers. The launch of 3G services has kickstarted real demand for smartphones. **BMI** believes that many Iranians have smart devices but do not make use of their mobile data potential as access to the network is still limited to certain areas of the country. As US sanctions on consumer electronics were lifted in May 2013, there is some potential for an uptick in growth, but we do not expect the impact to be felt until 2015.

On May 30 2013 the US lifted sanctions on the sale of mobile phones and other communications devices, software and services in Iran. It is not yet clear what impact this will have on the local handset market, with devices still available under previous sanctions via back channels. Further, **BMI** believes the slow development of the local 3G market means demand for high-end devices from the likes of Apple are not likely to have wide appeal, but will remain restricted to a wealthy urban group, many of which have already acquired devices by circumventing sanctions. Nonetheless, the lifting of sanctions is expected to boost competition and push down prices.

Nokia has traditionally been the top selling brand in Iran, with a share estimated as high as 60%. However, accurate estimates are all but impossible to obtain, not least because of the large grey market. In recent years, as is the case in most of the markets in which it operates, Nokia has faced a strong challenge from its main rivals, particularly Samsung, but also emerging leaders of the smartphone market such as LG, **HTC** and most recently **Huawei**, as well as local producers.

Browsing traffic data by vendor from Statcounter illustrate the threat to Nokia, at least in the 3G enabled/smartphone market. Nokia handsets accounted for nearly 37% of mobile browsing traffic in October 2012, falling to 19% by October 2013. Samsung handsets' share of browsing traffic increased from around 19.6% to 23.8% over the same period. Between April and June 2013, around the time when the US eased sanctions on consumer electronics exports to Iran, Apple's share of mobile traffic browsing rose from under 6% to more than 10%, but then gradually dropped to 6.2% by October 2013. Statcounter's data do not reveal which vendors are benefiting the most from Nokia's decline, as by far the biggest winner was the 'unknown' category, which increased its share from 15.4% to 27% in the 12 months to October 2013. However, of the Chinese vendors, Huawei performed the best, bringing its share of browsing traffic up from 0.1% in October 2012 to nearly 3% a year later. **BMI** expects this is related to the company's increased focus on the Middle Eastern market. Huawei opened a regional distribution hub in Dubai in October 2013.

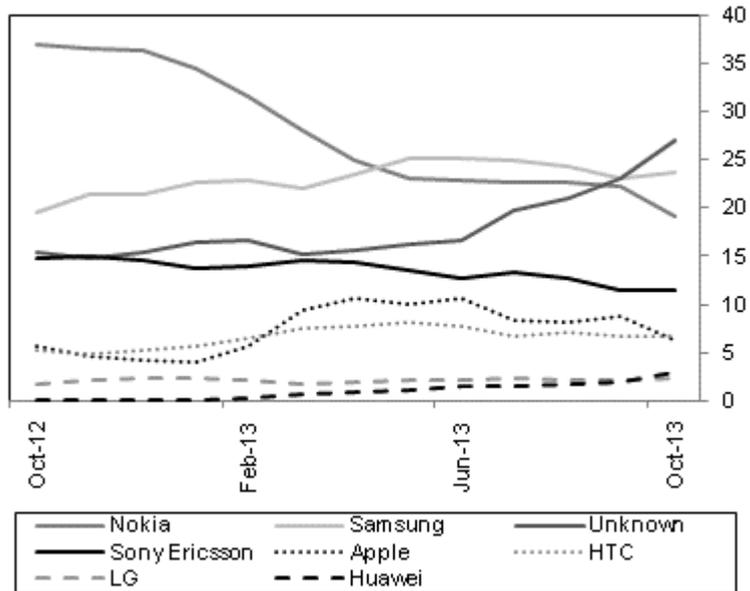
As shown by Statcounter data, there has been a clear trend away from Symbian, with users switching to Android devices, benefiting Samsung, HTC, LG, Huawei and Sony Ericsson. Symbian and Android accounted for 24.5% and 27.8% of mobile browsing traffic, respectively, in October 2012. By October 2013 Symbian's share had dropped to 12% while Android's had risen to more than 52%. Nokia's Series40 OS, used on its Asha featurephones, saw its share of browsing traffic decline slightly from 11.3% in October 2012 to nearly 8.7% by October 2013. From this data **BMI** believes Nokia is losing its competitive edge in the mid-range featurephone market as well as in the high-end smartphone market, following the trend in other markets where Samsung's mid-range devices have made a major dent in Nokia's market share.

In the face of sanctions on consumer electronics imports, Iran sought to make up the deficit by increasing local production. In the year to March 2012, Iran was expected to manufacture around 5mn handsets, according to local industry estimates, equivalent to around a quarter of the estimated local market. **Hamrah Gooya Aryand Communication Company**, which sells handsets under the GLX brand, currently has an annual production capability of 1.8m units. In 2007 LG started producing handsets in Iran in partnership with the Maadiran Group. The agreement was shrouded in secrecy, but Maadiran said it had begun producing five models of handsets under licence from LG. Maadiran had been a long-term distributor for LG. LG's motives for entering the market likely included avoiding the steep tax on imported handsets and

the opportunity presented by the Iranian market as relatively un-penetrated by the major rival brands. LG said that it planned to produce 2mn handsets a year, with some exported to other markets in the Middle East.

Iran's Mobile Browsing Traffic By Vendor

October 2012-October 2013 (%)



Source: Statcounter, BMI

Table: Mobile Communications (Iran 2013-2019)

	2013e	2014e	2015f	2016f	2017f	2018f	2019f
Cellular mobile phone subscribers, '000	93,236.4	98,271.2	103,184.7	107,931.2	112,464.3	116,738.0	120,707.1
Mobile phone subscribers/100 inhabitants	120.4	125.2	129.8	134.1	138.1	141.7	145.0
3G & 4G phone subscribers, '000	1,600.0	9,920.0	18,947.2	27,473.4	34,067.1	39,177.1	41,527.8
Domestic mobile handset sales, USDmn	1,845.65	2,006.94	2,210.85	2,459.35	2,533.13	2,606.91	2,680.69
Domestic mobile handset sales, '000	21,102.57	22,790.77	24,614.03	26,583.16	28,338.89	30,165.39	31,991.89
Domestic smartphone sales, '000	456.00	525.00	644.00	763.00	882.00	1,001.00	1,120.00

e/f = BMI estimate/forecast. Source: National sources, BMI

We raised our forecasts for handset sales as we expect wider 3G network availability, stimulated by the lifting of US sanctions on consumer electronics exports to Iran. The decision, made in May 2013, was widely seen as a goodwill gesture ahead of the June 2013 Iranian elections. We now estimate handset sales of USD2.007bn in 2014, an increase of 8.7% from 2013.

BMI expects volume growth to remain strong over the duration of our forecast period, reaching 30.2mn devices sold in 2018 as consumers upgrade to gain access to some of the latest devices. In addition to increasing volumes, wireless data services will increasingly be used as mobile infrastructure is put in place, encouraging demand for feature phones in the mass market and demand for smartphones from higher income consumers.

Although the mobile handset market trails behind the computer market in Iran in terms of value, in volume terms mobile handsets are the largest market in Iran. Lower prices make mobile handsets affordable to a wider share of the country's population. Mobile penetration rates suggest there is still growth potential for devices, but the grey market factor makes the true market size very difficult to estimate. Mobile handsets are also the most dynamic market, with the arrival of 3G services catalysing sales of smartphones and featurephones. However, with 3G services a monopoly for smallest operator **Tamin Telecom**, the market is failing to fulfil its potential. **MCI** and **MTN Irancell**, the country's two major operators with a combined market share of more than 95%, are still operating on 2G EDGE and GPRS networks with maximum download speeds of 60Kbps. Most high end smartphones use nano-SIMs and we believe MCI and Irancell will probably not adopt nano-SIM technology on their networks until they can launch 3G services, meaning

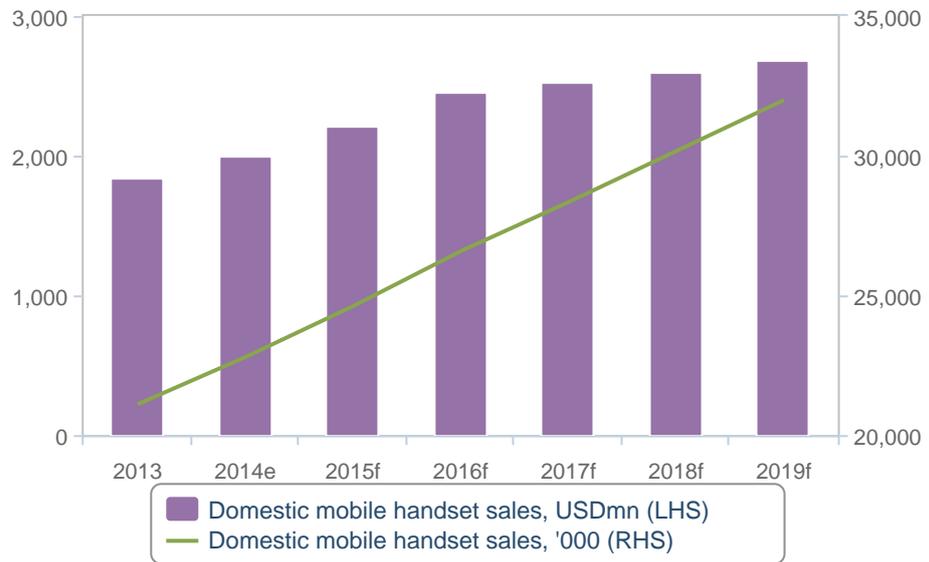
there will likely be very limited scope for use of high-end smartphones until 2015. Growing economic difficulties, including inflation and cuts in subsidies, as well as the impact of sanctions, have constrained demand for high-end phones in recent years.

In November 2011 the third Iranian mobile phone operator, **RITEL**, was launched in Tehran, boosting growth by intensifying the competition between operators. We believe there is scope for further growth despite the high penetration rate, with the number of inactive SIMs and instances of people owning multiple SIM cards responsible for the inflated penetration rates. The bulk of mobile subscriptions in Iran are made up of prepaid users. Strong prepaid growth will continue as operators introduce special promotions and campaigns and as operators expand their networks into rural areas, where service coverage remains limited. The strength of the prepaid segment has created a group of inactive subscribers, meaning penetration rates may be somewhat lower than forecast.

Mobile handset revenue is expected to grow to USD2.6bn by 2018, driven by the replacement market and the shift to higher value featurephones and smartphones. A key aspect to keeping the market growing will be improving mobile network coverage. Mobile penetration rates in urban centres are much higher than for the country as a whole, and therefore the biggest growth opportunity for handset vendors will be driven by the expansion of mobile networks into rural areas. A sizeable portion of Iran's population remain without reliable communication services, particularly outside the major cities.

Mobile Handsets: Demand

(2013-2019)



e/f = estimate/forecast. Source: BMI

The weighting of new users towards lower income rural areas will mean a continuation of the downward trend in handset prices. Mobile handsets are readily available from city kiosks at prices of USD20-50. Many of these models come with an equivalent value of call credits, meaning they are in effect free to consumers. Moreover, in rural areas, around 10,000 rural communication centres have been set up, offering local people inexpensive or free access to communications.

In urban areas, many subscribers have sophisticated demands in terms of design and functions. There is demand for music phones, particularly given the youthful make up of the market and for functions such as MP3/MP4 support, high-resolution cameras and camcorders. With over 50% of Iranians under the age of 24, the country is expected to become an important market for value-added and data services. This is despite continued government control over the use of multimedia messaging services (MMS).

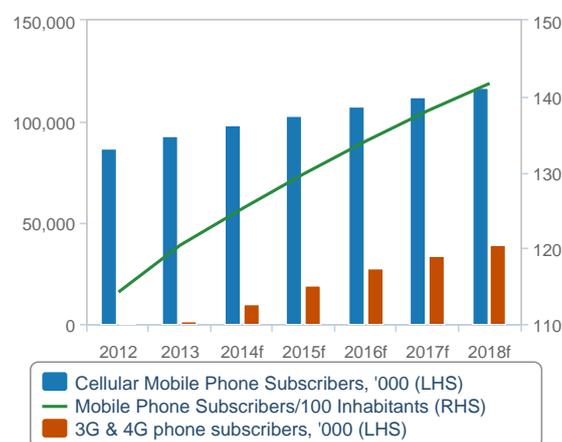
Smartphone/PDA revenue is expected to grow to USD1.3bn by 2018. In 2012 it was suggested that 9% of all mobile phone users in Iran were using an iPhone. This is another sign that, despite the US-led sanctions, multinational brand handsets were finding their way into Iran via third-party channels. However, the extent to which this user base has purchased official devices or replicas is not clear.

Iran's mobile operators will put an increasing emphasis on upgrading existing customers to higher value services, such as data and postpaid contracts. There are concerns over the regulatory handling of the 3G market in Iran, given that only one operator is currently offering 3G services to consumers. However a second operator was due to begin such services.

The state has given its support to 3G, praising the greater network capacity and wider bandwidths that it supplies, as well as the variety of services that it can support. Rapid progress is not expected, though, as Iran is keen to study the 3G policies in other countries before making a decision on future licences. The state also said any decision on 3G licensing would be based on consumer demand and technical feasibility studies.

Industry Trends - Mobile

(2012-2018)



f = BMI forecast. Source: BMI, Operators

Industry Trends And Developments

***BMI View:** Iran has the potential to be the Middle East's largest consumer electronics market as a consequence of its size and population. However, for the foreseeable future a restrictive regime and US-led international sanctions will continue to hold it back.*

BMI believes the lack of availability of some devices and the time required to develop manufacturing facilities, makes regional leadership unlikely. The authorities have allowed limited access to social networks, and in January 2013 announced they were in the process of refining a filtering programme, with a view to enabling access to web-based social networks. Early 2014 saw the government call on China to help build a restricted 'national' internet. Software will facilitate restricted access to US networking websites **Twitter** and **Facebook**. A respite in the block on Twitter lasted just one day in September 2013, and **BMI** does not expect the government to open up the market in the near term.

The government said that although it will introduce the compromise, the internet will remain subject to censorship to avoid the infiltration of controversial material. We expect consumers to continue to face considerable restrictions as Iran develops its own private state-controlled internet. This has included the issuance of a fatwa by four Iranian ayatollahs against **RightTel**, the sole 3G provider in the country.

For some vendors Iran accounts for 20-40% of regional demand in some product categories. Products made in the US or carrying a substantial amount of US components are subject to the US trade embargo. US companies such as **Dell** and **HP**, as well as global handset vendors such as **Sony** that feature US-patented technology in their products, are restricted in their local market operations, although the lifting of sanctions related to certain US technology products in 2013 changed the picture somewhat.

Lifting Sanctions Does Not Guarantee Strong Sales

In May 2013 the US lifted sanctions on the sale of mobile phones and other communications devices, software and services in Iran. The easing of sanctions was intended to provide Iranians with tools to help promote political freedom ahead of a national election. This allowed US and other vendors to tap into some of the latent potential in Iran's telecoms market, but **BMI** believe that high end smartphone sales will be limited by the fact that **Tamin Telecom** had exclusive rights to offer 3G services until September 2014 and the government remains intent on controlling the political environment, which could result in internal restrictions on devices. However, the lifting of the sanctions has allowed popular devices such as **Apple's**

iPhone and iPad as well as other handsets and tablets with US parts to be sold legally in Iran for the first time since 1992.

The sanctions on consumer electronics and communications software had been criticised by the National Iranian American Council on the grounds that they help the government limit citizens' freedom of communication and ability to develop civil society, while doing little to curb Iran's nuclear programme. However, the embargo did not mean products from US vendors were unavailable for sale in Iran. For instance, in July 2012 it was reported that around 100 stores selling Apple's products were understood to be operating in Tehran despite US sanctions. Shops selling a range of products, including laptops, iPods and iPads, have reported an increase in demand since 2009 and sell the devices at prices similar to those seen in the US. Stores source stock from the Middle East, while customers can take advantage of Apple's App Store. But although devices may be available, there are still problems for handset vendors. In April 2013 **Samsung** confirmed plans to block access to its mobile app store in Iran from May 2013. The move, believed to be part of international sanctions over Iran's nuclear programme, urged customers to update their apps before the cut-off date of May 22 2013. Samsung notified its customers by email that the online marketplace will be out of action, although the statement cited only 'legal barriers' as the reason for the move, rather than sanctions.

Although handsets are set to be the biggest area of growth in consumer electronics in Iran, limited 3G service means an immediate surge in high end smartphone sales is unlikely. Tamin Telecom is Iran's smallest mobile operator, having only launched commercial services in 2011, yet it had exclusive rights to offer 3G services until September 2014. **MCI** and **MTN Irancell**, the country's two major operators, with a combined market share of almost 99%, are still operating on 2G EDGE and GPRS networks with maximum download speeds of 60Kbps. Most high end smartphones use nano-SIMs and **BMI** believes MCI and Irancell will probably not adopt nano-SIM technology on their networks until they can launch 3G services. We expect increasing uptake of 3G services as infrastructure growth allows wider coverage.

Devices are widely available due to the multi-layered web of distribution channels in the Middle East. Of critical importance to the Iranian market is the re-export hub of Dubai, which supplies up to 90% of the consumer electronics products on sale in the country. In 2012 a survey found 16% of Iranian smartphone users, and around 9% of total mobile users, possessed a black market iPhone, and other Apple products such as the iPad are also widely used. **BMI** expects the grey market to remain a significant driver of high-end device sales in Iran.

There has been an increasing tendency for Iran to move away from US-dominated IT and consumer electronics industries. In December 2012 Iran rolled out its own video-sharing website Mehr, operated by the Islamic Republic of Iran Broadcasting (IRIB). The website allows people to share short videos and access IRIB-generated material. The website is aimed at promoting Iranian culture and attracting Farsi-speaking users. It serves as an alternative to YouTube, which is banned in the country as its content is considered inappropriate. While US vendors are restricted from direct involvement in the market, their Asian rivals, in particular, have fewer inhibitions. Many, including **Samsung**, **LG** and **Sharp**, have hastened to take advantage of the opportunity presented to them by building up distribution and even production strength in the country. South Korean electronics firms are not directly affected by the latest international sanctions, which do not include restrictions on sale of electronics goods. However, the tightening international web of economic sanctions targeted at Iran has raised concerns that doing business in Iran could become more difficult.

There has been strong speculation that the Iranian Revolutionary Guard Corps (IRGC) is heavily involved in Iran's black market for mobile phones and other electronics goods. The size of Iran's smuggling industry has been estimated at as much as USD12bn, with the IRGC understood to control a large part of that.

Market Characteristics

Growth in Iran's consumer electronics market is driven by demographic trends. Overall population growth may have eased to around 1.2% a year, but owing to the demographic curve the population entering the workforce is rising by about 3% a year. Four major provinces make up around 40% of Iran's population in what is the third most populous country in the Middle East, after Egypt and Turkey.

In the past decade, a new generation, which has grown up with the internet and satellite television and is increasingly aware of global consumption trends and foreign brands, has emerged. Iran's population has also become more urban, with around two-thirds of the population now living in cities, up from 47% in 1976. Iran is a youthful country, with at least 40% of the population believed to be under the age of 30. Nearly two-thirds of the population is aged 39 or younger. In 2009 there were 15.5mn households in Iran with an average of 4.8mn persons per household. By 2014 it is estimated there were 13.8mn households with an average of 5.7 persons per household.

Tehran is Iran's largest consumer electronics market and a number of souks spread across the city specialise in various products. Other major regional centres include Rabriz and Mashhad in the north, Esfahan in central Iran and Shiraz in the south. Consumers from smaller towns and rural areas tend to commute to the larger town and cities to buy consumer electronics goods, particularly foreign brands.

Perhaps because of the youthful population, Iran is considered by distributors to be a 'brand-conscious' market, even compared with other leading markets in the region, with most consumers prepared to pay a premium for a known brand. Iran has a higher purchasing-parity adjusted GDP than either Egypt or Turkey. However, the market remains price sensitive, with per capita GDP of USD4,950 and USD11,478 at purchasing power parity (PPP).

Investment in telecommunications infrastructure since 1995, with a growing number of telephone lines, and mobile and broadband subscribers, also helps to fuel demand for consumer electronics devices.

Tariffs

In the past few years the government's import tariffs policy has added to the uncertainty in the market. In 2006 Tehran imposed a 60% tariff on imported handsets, a sharp raise from just 4% previously. The purpose was to support domestic manufacturing and encourage foreign vendors to invest in local production. Although the policy did achieve some results, by the government's admission they fell short of targets, as many vendors continued to regard Iran as a complex and risky investment destination. One of the main results was probably to encourage piracy. In 2009 the government lowered the tariff again, to 25%, in an attempt to reduce the flow of smuggled handsets, but by the government's own admission in 2010, without much obvious success.

The government imposes high taxes on many other, although not all, consumer electronics goods and home appliances. Vendors must also pay an additional 10% surcharge when using foreign shipping companies. For many non-US vendors, the solution has been to invest more in local production while continuing to distribute those products for which import tariffs are lower. Consumer electronics leader **BenQ**, for example, employs **Iran Nara** to carry out semi-knocked down (SKD) assembly of its monitors in Iran, while partnering **Farzanegan** to distribute products not subject to high customs duties, such as notebooks, cameras and projectors.

The government has occasionally hinted at lowering tariffs, given criticism that Iran lacked the ability to meet domestic demand. However, most observers doubt that the government has any plans to significantly revisit its tariff policy.

Other Trade Barriers

One of the central facts of the Iranian market for vendors and distributors has been the US trade embargo. This has affected a large number of big names in IT and consumer electronics including **Dell**, **AMD**, **Intel**

and **HP**. In reality, owing to the multi-layered nature of the Middle East's consumer electronics distribution channel, it is difficult for vendors to prevent their goods ending up in Iran. Vendors usually require end-user certification for big account sales, but it is far more difficult if not impossible for product flow to be tracked for volume sales.

Many regional managers of companies affected by the US embargo do regard Iran as coming within their purview, although they cannot actively promote sales to Iran or conduct marketing. However, the grey nature of market sales can land companies in trouble. **HP** received criticism following reports of the mass availability of its printers in Iran through distributor **Redington**.

Another risk is the possibility of UN sanctions in relation to Iran's alleged nuclear programme or other issues. This possibility has likely had an (albeit difficult to quantify) affect on vendors' willingness to invest. **Daewoo Electronics** is one company that recently made the decision to suspend plans to invest in assembly plants in Iran due to the political situation. This is despite the fact that Iran is one of Daewoo's largest markets in the Middle East. Daewoo will continue to serve the market through an exclusive channel relationship with Tehran-based distributor **Parcon Electronics**.

Vendors must also be aware of Iran's sensitivities. In January 2008 the government endorsed a bill that would sanction foreign companies doing business with Israel, in the face of the Israel's action in Gaza. The sanctions were to apply to companies that 'invest in the occupied lands [of Palestine] or help the Zionist regime'. The bill could affect companies such as Samsung and other vendors involved in the Iranian market. There are also cultural sensitivities to navigate in a country whose paranoia has been exacerbated by what is seen as international bullying in the form of sanctions. In early 2012 the authorities looked set to ban all Samsung products in response to one of its products featuring in an Israeli television ad that was deemed offensive. Earlier, Iran had ordered that all billboards featuring South Korean companies including Samsung and LG be taken down, but the order was rescinded after the South Korean embassy protested.

Future Prospects

Iran is generally considered to be the largest market in the region, but the rate of growth may have slowed in the last one to two years. While anecdotal evidence is difficult to back up, given the difficulty of gathering official statistics, in Q308 Saudi Arabia overtook Iran to become Dubai's largest export market. Previously, Iran had been the largest export market, according to Dubai figures.

If the market has slowed, then this is likely due to a number of factors including stagnant purchasing power and underdevelopment of the local channel, which remains dominated by small players. In the current

economic climate, Dubai suppliers have taken a conservative view on extending credit to Iranian clients given the lack of insurance cover. The trade embargos have also likely had an effect, especially on the banking side.

Significance To Vendors

Political sensitivities complicate vendors' responses to the Iranian market. Vendors affected by the US embargo are unable to build up channel programmes, cultivate retail or distributor support in the country or conduct marketing. For less affected vendors, such as Samsung and LG, Iran is a big opportunity, but is also a challenge due to the complex nature of the local channel. The import tariffs hikes have also had a big effect. Perhaps due to these difficulties, Iran has sometimes been perceived as a market where vendors or distributors offload old stock.

Iran dominates regional exports from Dubai, which is the hub for regional consumer electronics trade. About 40% of Dubai trade is accounted for by re-exports and since the 1980s Iran has been a major destinations. According to data from the Dubai Chamber of Commerce and Industry, Iran was Dubai's main export destination between 2002 and 2006, accounting for a 15% share of total exports from Dubai. Iran imported electronics goods worth AED94.3bn during that period, although the market grew by less than the 28% annual average growth of total exports.

Retail Sector

Iran remains dominated by diffuse networks of small retailers, which acts as an impediment to channel development. In the UAE and even in the smaller Gulf Co-operation Council (GCC) countries, more organised retail outlets such as hypermarkets and specialist electronics stores have come to account for around 40-60% of sales. A recent development has been the growth of big box retailing associated with 'power retailers' such as **Sharaff**. In Iran, however, the souk still reigns. In Tehran, a number of souks specialise in products such as AFV systems (Jomhouri) and small domestic appliances (Shariati). Large hypermarkets and retail chains do not really exist in Iran in the same way as in the UAE or Saudi Arabia.

This fragmented channel means higher prices for consumers, while eating into margins for retailers and distributors. Certainly, the situation presents a challenge to tier-one distributors and vendors, which would usually aim to build share in a country by working with the 'power retailers' and hypermarkets. Instead, vendors have to identify key players in each city and then create marketing and sales programmes. The lack of an organised retail channel also means lower service levels, which undermines the ability of official goods to compete with pirate products. There is hope, however, of more structure in the retail channel.

Three larger government-owned retailers, **Refah**, **Ekta** and **Shahrvand**, have expanded their consumer electronics ranges and offerings. Some consumer electronics vendors, such as **JVC**, have outlined plans to launch their own networks of retail outlets in Iran in conjunction with local distribution partners.

Production

Iran responded to the tightening sanctions by trying to restrict imports of non-essential goods and boost local production. In the 1970s Iran had an emerging electronics industry, which was considered by some to be on a par with South Korea's. However, the main focus of the electronics industry during the past 30 years has been military applications, with most electronics firms coming under the supervision of the Defence Industries Organisation. Particularly as a result of the Iran-Iraq war, most big electronics companies were reorganised to focus on defence applications. In the past few years, however, as the domestic consumer electronics market has grown, a number of industrial complexes have been retooled for the civilian market. Typical products include TV sets as well as computer products and peripherals.

Organisations with a military background include **Pars Electric Manufacturing**, one of Iran's oldest electronics manufacturing establishments. Another is **Iran Electronics Industries**, one of the leading electronic firms and one that is sometimes mentioned in reports investigating Iran's alleged weapons of mass destruction (WMD) programmes. The firm makes a range of consumer electronics products and for a while assembled mobile handsets under licence from Belgian company **Sagem**. However, the major domestic consumer electronics manufacturer is **Maadiran**, a distributor of multinational brands such as LG, which also assembles products such as handsets and LCD monitors for those brands, in addition to having its own brand in several product areas.

Two major factors have encouraged the development of consumer electronics production in Iran over the past few years. First, the government has taken steps to encourage domestic production of products for which there is sizeable domestic demand, notably mobile handsets. Secondly, Asian manufacturers in particular have taken moves to establish assembly operations in Iran. The main decision factors for these companies have been the growing local market, reduced competition from US rivals and a desire to avoid heavy import taxes. A number of multinationals have set up production facilities in special economic zones, including Daewoo, Samsung and **Panasonic**.

A major landmark came in 2007, when the government imposed a 60% tariff on handset imports and encouraged domestic companies to hold talks with foreign vendors to explore cooperation possibilities. The

government also set a number of production targets. Yet domestic supply remains unable to come close to satisfying the strong domestic demand for consumer electronics products.

AV

Iran's AV device production capacity is growing in scale and sophistication. The local industry started to develop in the 1990s, and by the early 2000s there were about five manufacturing plants in Iran producing a range of colour and black and white TV sets. However, the tubes generally had to be imported from abroad.

Mobile Handsets

Mobile handset production is a government priority but remains small in relation to the size of the market. The industry hopes that this level of production will have an impact on demand for smuggled goods and low-cost Chinese brands.

Despite an investment by LG, the government has admitted that the results of its drive to create a major handset production base had fallen short of expectations. The government has said that illegal import of mobile phones has been one of the obstacles to domestic production, exacerbated no doubt by higher import tariffs. Despite LG leading the way, other handset vendors have appeared more cautious about major investment in Iran.

Distributors

Because of the risks associated with local manufacturing, success in Iran for most vendors comes down to development of a strong partner network. However, many vendors fail due to a lack of proper in-country understanding, and because they choose the wrong partners. The distribution chain in Iran is longer than in many other countries in the region. Typically a big reseller will sell quantities to sub-distributors that will then sell to smaller dealers. With several medium to large distributors in Iran, they distribute to a further 6,000-7,000 dealers. The channel is also less structured than elsewhere, with less segmentation, as resellers do not really specialise in particular areas.

The distribution channel is less streamlined than in the Gulf countries. A large number of distributors supply a complex channel of resellers, wholesalers and local agents, who in turn supply a fragmented retail market. Major distributors travel to Dubai, and from there products are taken to the free trade zones and then to Iran through organised channels. Most shipments move from Dubai to Iran and the free trade zones of the islands of Kish, Kashan and Shabhar, from where they enter Iran through the south.

There is also a sizable grey market channel, although some believe this is declining in significance due to more direct vendor involvement in the market and increasing government action to curtail the market for illegal goods. Two common points of entry are via the Pakistani and Afghan borders or from the north via Turkey by way of Iraq.

Channel development has been one victim of the trade embargoes, as Iranian dealers lack the services and benefits their counterparts in other countries receive, such as access to local programmes, sales incentives and so on from US vendors. Some distributors and dealers take on training and service development themselves, but many lack the capability to do so.

In Iran the local distributors for leading brands include Samsung Electronics (distributing Samsung products), Redington Gulf (HP), Pars (Sony), Maadiran (LG) and Parcon Electronics (Daewoo).

Regulatory Development

BMI View: The transition from analogue to digital broadcasting has been chosen as the major reform to be carried out in the media sector.

Digital Broadcasting Migration Under Way

Iran launched its digital migration in 2010, and in 2011 state broadcaster Voice and Vision announced that three new channels would be launched by the end of the year using digital systems. The capital cities of all provinces were to be equipped with digital transmitters. At the time of writing, digital antennas have so far been installed in Ardabil, Namin and some parts of Raza'I, Nir and Meshkinshahr.

The reform also continued to be implemented at a local level. Officials in West Azarbaijan Province launched several projects that provided residents of Orumieyeh Township with 15 digital TV and 10 digital radio channels. A total of 750,000 residents of the province were reportedly able to watch a wide selection of digital channels. Another project was aimed at making 180 transmitters operational to provide 348,985 residents of 12 townships of the province with access to more digital channels. As of August 2011, it was reported that 17 provinces of Iran had been provided with the services.

In October 2013 the Deputy Head of the Islamic Republic of Iran Broadcasting (IRIB) announced the Iranian state broadcaster planned to launch eight new satellite TV channels by early 2014.

Iranian Internet Controls Grow

Iran would serve as an internet service provider to other countries by March 2013, according to Infrastructure Communications company deputy head Mehdi Karimi Neyestani. This development was to take place after the first phase of the Europe-Persia Express Gateway (EPEG), a communications highway connecting Europe with Eastern Asia, which started operating in March 20 2013. Iran was to be upgraded from the current Tier3 level (internet service consumer) to Tier2-level (internet service provider) after the official inauguration of this project, Neyestani said.

The country was reported to be consulting China for its National Internet Network, it was reported in January 2014. State control over content does not look to be weakening and will, to some extent, affect demand for more high-end devices for consumers who can afford them and can manage to bring them into the country.

Local Production Of Mobile Handsets

The government has renewed calls to strengthen local production of mobile phones to ensure that the domestic market is not dominated by foreign vendors. An Ministry of Industries and Mines official said that the market should not be 'conveniently accessible' to products of other countries. However the major challenge for the local mobile phone industry is understood to be smuggling, with estimates that as many as 80mn smuggled mobile phones exist in the domestic market.

New Mobile Operator

In November 2011 the third Iranian mobile phone operator, **RITEL**, was officially launched in Tehran. In April 2010 **Tamin Telecom** had been formally awarded a licence to provide 2G and 3G mobile telecoms services in Iran after securing a joint concession in December 2008 at a cost of USD399mn. Tamin was offered an exclusivity period of three years to provide its 3G services, according to the Communication Regulation Agency (CRA). In February 2013 the operator's 3G exclusivity period was extended by a year, to September 2014. **BMI** believes the operator's subscriber base gives it third place in the market, behind **MCI** and **MTN Irancell**.

Five-Year Plan

Information and communication technology (ICT) had a central role in Iran's national development plan. The plan has a number of ICT-related targets for increasing internet users, telephone subscribers and mobile subscribers, and these have the potential to drive the market for electronics devices. The government wants to encourage the development of electronic services such as e-government, e-health, e-commerce and e-learning. Various cooperation projects have been launched between the Ministry of ICT and other relevant departments. A related goal is the development of a national electronics and IT production base, through the encouragement of foreign investment. A particular priority of the last two years has been to encourage domestic mobile handset production, through attracting multinationals such as **LG** to invest.

Competitive Landscape

Due to sanctions imposed by the US and its allies on Iran, the country's consumer electronics market is very different from most in that it includes a large grey market. Aside from the three major supermarket chains, Carrefour spin-off **Hyperstar** and local **Refah** and **Shahrvand**, **BMI** understands that the large majority of electronic devices in Iran are sold in small shops owned by individual traders. In Tehran most of these shops are concentrated in the Capital Computer Complex, where more than 350 traders sell devices to an increasingly tech-savvy population. According to the CEO of **RadanMac**, despite US sanctions, by 2013 there were around 100 unofficial **Apple** retailers operating in Tehran. These individual merchants source their products through underground trade routes, either directly from Hong Kong, Singapore and Malaysia, or via Dubai or Turkey.

International Company

Table: Hyperstar

Address	Shahid Sttari Boulevard, Tehran; and Sepidan Street, Shiraz
Company history	Hyperstar launched in Iran in 2009. It is a hypermart based on Carrefour's model, though has no association with the French company. The Hyperstar chain was established by Dubai-based Majid al-Futtaim (MAF), which is Carrefour's franchisee in the Middle East. Hyperstar was the first large supermarket chain to open in Iran. When the first location opened in Tehran, MAF reported that the store had an average of 10,000 visitors a day. In 2013 MAF stated on its website that there were three Hyperstar superstores in Iran, of which one was in Tehran and another in Shiraz.
Products and services	Based on the Carrefour model, Hyperstar sells everything from food, to home decoration, clothing and electronics. In the electronics section, Hyperstar sells large and small home appliances, audiovisual equipment, PCs (including tablets), cameras and mobile handsets. Hyperstar sells both local and international consumer electronics brands, such as Dell, LG, Sony, Samsung and Iranian brand Pars.
Company developments	In 2012 MAF Hyperstar LLC sold its operations in Iran and Syria to its parent company, MAF Capital LLC. This followed net losses of AED143.5mn for its Iranian operations during the year ended December 2012, down from net profits of AED49.9mn the previous year. The sharp decline in profit was likely due to inflation of the Iranian rial and foreign exchange losses. In May 2013 MAF Holdings bought out Carrefour Group's 25% share of MAF Hypermarkets LCC for EUR530mn (USD716mn) and extended its exclusive franchise partnership with the French company until 2025.

Source: Hyperstar, BMI

Local Company

Table: Refah Chain Stores Co

Address	RCS Head Office, 19 Shahid Sarparast St, West Taleghani Ave, Felestine Square, Tehran
Company history	Refah is a supermarket chain established in 1995 with some 160 branches throughout the country. Though smaller than hypermarkets such as Hyperstar, Refah is based on a similar model and sells everything from food to cosmetics, clothing, textiles, household appliances and consumer electronics. Refah also has an online store.
Products and services	In the consumer electronics section Refah sells televisions, computers, notebooks, cameras, printers, fixed-line telephones and other audiovisual equipment. Refah sells local brands, and international electronics brands, such as Sony, Panasonic, Sharp, Samsung and LG. Refah does not advertise the sale of mobile phones on its website, but these may be available in store.
Company developments	Not available.

Source: Refah Chain Stores Co, BMI

Company Profile

Maadiran Group

Company Overview The 100% privately owned Maadiran Group is one of Iran's largest consumer electronics and IT firms. It was established in 1963 as Iran Office Machines Company Ltd. Its product range spans IT products (monitors, notebooks/netbooks, accessories, printers), office equipment (cash registers, calculators, copiers, printers), banking machines, consumer electronics (LED/LCD TVs, mobile phones) and solar panels. Since 2004 the group has exported its locally manufactured products, particularly LG monitors, to other markets in the Middle East.

Structure The Maadiran Group consists of three subsidiaries: IOMCent (sale and distribution of imported products), IOMInd (sale and distribution of its own manufactured products) and IOMServ (after-sales services for products sold). It has 18 wholly owned service centres and 25 distribution centres nationwide, and a total of 7,802 outlets with 1,802 dealers and 6,000 sub-dealers. It has 500 official service centres.

Maadiran Group serves as sole exclusive distributor for a number of brands in the Middle East and Commonwealth of Independent States (CIS). The company's first exclusivity deal was signed with Sharp in 1964. Besides the products it manufactures on licence, Maadiran has its own brand of printers, PC accessories and TV sets including LCD TV sets. Maadiran Group has launched a number of wholly owned brands in the region.

2006 saw the launch of X-Vision, which the company claims is now the third largest LCD TV brand in Iran. In 2007 Maadiran Group began mass production of five models of LG phones, adding to existing contracts for the assembly of LG monitors, Epson dot matrix printers and Olivetti bank slip printer. LG is an important brand for Maadiran. 2008 saw the launch of MEVA, the group's computer peripherals, consumables and lifestyle brand.

Strategy On the distribution side, an important part of Maadiran's value proposition is built around high levels of service. Maadiran promotes its ability to have a technician at the customer's premises within two hours of receiving a call. This level of service has allowed it to achieve exclusive distribution agreements with LG, Olivetti, Sharp, Asus, Acer, Epson and Plustek.

Maadiran also builds its growth strategy around regularly strengthening its portfolio of consumer electronics and IT brands with new technologies. In 2008 Maadiran said it would be producing and selling AOC brand monitors in Iran, after a search to select a new brand to complement LG and Samsung. Maadiran already produces monitors for LG. In 2008 Maadiran also launched a line of PC accessories from MEVA. However,

following the success of its LCD TV brand, Maadiran will also continue to focus on its own products.

Maadiran has gradually expanded its production operations, which began in 1994 when the company became the first Iranian CKD monitor producer. The company also operates what it has described as the most modern plastic injections factory in the Middle East, with 14 injection machines.

In 2013 Maadiran said that its production capacity had increased dramatically, and that it had become the largest electronics manufacturing operation in the Middle East with its facility in Hashtgerd (80km from Tehran). Annually it is able to produce 1.6mn DVB-T products (set-top boxes/USB devices), 800,000 monitors, 250,000 Touch & PC POS, 150,000 all-in-one PCs, 400,000 LCD/LED TVs, 60,000 thin-client PCs, 30,000 printers and 20,000 interactive whiteboards.

Maadiran had stated goals to increase its number of retail outlets to 9,000 by the end of 2014, and to manufacture more than 300,000 LCD/LED/3D TVs under the X.VISION and Sharp brands in 2014, up from 171,000 in 2013.

Financial Data

In 2012/13 (fiscal year ending March 2013) Maadiran reported a market share of 16% for LED/LCD TVs, 65% of the monitor market, 68% of set-top boxes/USB devices, 19% of inkjet printers, 98% of dot-matrix printers, 73% of copiers, 19% of notebooks and 5% of all-in-one PCs. No further updates have been released.

Company Details

- Maadiran Group
- 3 Aftab St
Khoddami Ave
Vanak Sq
Tehran
Iran
- Tel: +98 (21) 8862 3700
- Fax: +98 (21) 8862 3728
- www.maadiran.com

Electronic Industries (IEI)

Company Overview Established in 1973, IEI is one of the major producers of electronic systems and products in Iran. It has a number of subsidiaries, offering over 100 electronics products, with 5,200 trained engineers. The company's background is in electronics with a military application, but in recent years it has also moved into some consumer electronics fields. With its state background, the company has sometimes featured in Western reports concerning Iran's alleged weapons of mass destruction programmes.

Structure IEI currently has six subsidiaries, with each specialising in the production of a blend of products with military and consumer applications. IEI subsidiary Iran Electronic Research Centre produced telecoms products including the assembly of mobile handsets under licence from Belgian company Sagem. The main subsidiaries and consumer electronics products areas of each subsidiary, not including military applications, are as follows:

Shiraz Electronics Industries (SEI):

- Computer peripherals

Iran Communication Industries (IEI):

- Telecommunications products
- Electronic components

Electronic Components Industries (ECI):

- Semi-conductors (transistors and ICs)
- Electronic credit cards
- Multilayer, single and double sided PCBs

Information Systems Of Iran (ISI)

- Computer hardware installations
- Design and implementation of networks
- Software migration
- Consultancy services

Iran Electronic Research Centre (IERC):

- Telecoms products

Strategy IEI produces around 100 different types of electronic products. Over the years, the company has attempted to develop more consumer electronic manufacturing capabilities. Currently, its manufacturing capabilities are claimed to include:

- Electro-optics and laser including all types of lenses, glasses and metallic mirrors, prisms and all types of coating.

- Information and communication technology including capability of manufacturing all types of PC and PABX.
- Automatic assembly lines with automatic insertion machines and surface mounted technology.
- Multi-layer printed circuit board design and production of up to 16 layers and all types of rigid and flexible boards.
- Smart credit cards and SIM card production line.

Financial Data Annual revenue is in the region of over USD10mn.

Demographic Forecast

Demographic analysis is a key pillar of **BMI**'s macroeconomic and industry forecasting model. Not only is the total population of a country a key variable in consumer demand, but an understanding of the demographic profile is essential to understanding issues ranging from future population trends to productivity growth and government spending requirements.

The accompanying charts detail the population pyramid for 2015, the change in the structure of the population between 2015 and 2050 and the total population between 1990 and 2050. The tables show indicators from all of these charts, in addition to key metrics such as population ratios, the urban/rural split and life expectancy.

Population

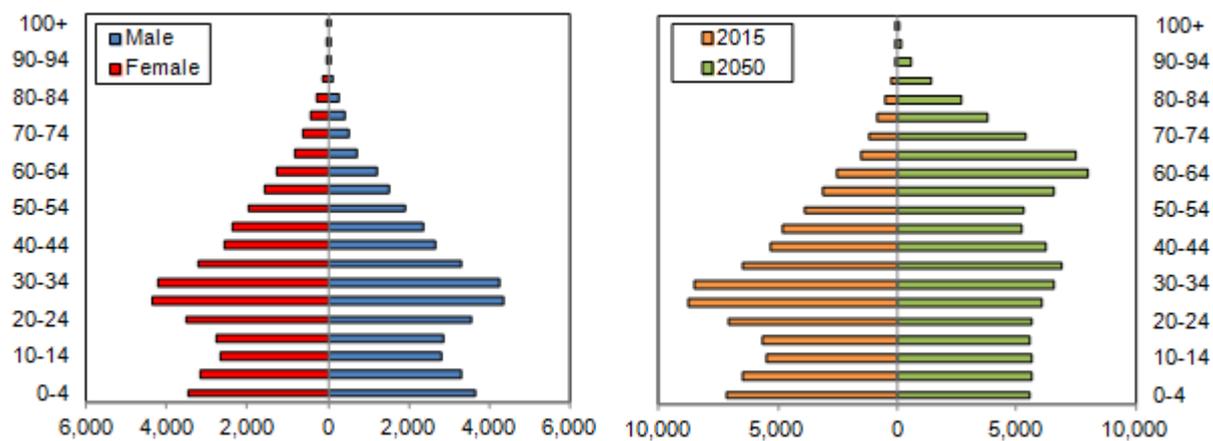
(1990-2050)



f = BMI forecast. Source: World Bank, UN, BMI

Iran Population Pyramid

2015 (LHS) & 2015 Versus 2050 (RHS)



Source: World Bank, UN, BMI

Table: Population Headline Indicators (Iran 1990-2025)

	1990	2000	2005	2010	2015f	2020f	2025f
Population, total, '000	56,361	65,911	70,152	74,462	79,476	84,148	88,064
Population, % change y-o-y	na	1.6	1.2	1.3	1.3	1.1	0.8
Population, total, male, '000	28,807	33,504	35,917	37,656	39,915	42,307	44,213
Population, total, female, '000	27,554	32,406	34,235	36,805	39,560	41,840	43,850
Population ratio, male/female	1.05	1.03	1.05	1.02	1.01	1.01	1.01

na = not available; f = BMI forecast. Source: World Bank, UN, BMI

Table: Key Population Ratios (Iran 1990-2025)

	1990	2000	2005	2010	2015f	2020f	2025f
Active population, total, '000	28,945	40,290	48,583	53,034	55,945	58,184	60,945
Active population, % of total population	51.4	61.1	69.3	71.2	70.4	69.1	69.2
Dependent population, total, '000	27,415	25,620	21,569	21,427	23,530	25,964	27,118
Dependent ratio, % of total working age	94.7	63.6	44.4	40.4	42.1	44.6	44.5

Key Population Ratios (Iran 1990-2025) - Continued

	1990	2000	2005	2010	2015f	2020f	2025f
Youth population, total, '000	25,543	22,850	18,115	17,585	19,140	20,362	19,984
Youth population, % of total working age	88.2	56.7	37.3	33.2	34.2	35.0	32.8
Pensionable population, '000	1,872	2,770	3,453	3,841	4,389	5,601	7,134
Pensionable population, % of total working age	6.5	6.9	7.1	7.2	7.8	9.6	11.7

f = BMI forecast. Source: World Bank, UN, BMI

Table: Urban/Rural Population And Life Expectancy (Iran 1990-2025)

	1990	2000	2005	2010e	2015f	2020f	2025f
Urban population, '000	31,748.6	42,210.8	47,393.5	51,332.8	55,362.4	59,374.4	63,078.7
Urban population, % of total	56.3	64.0	67.6	68.9	69.7	70.6	71.6
Rural population, '000	24,613.2	23,700.3	22,758.8	23,129.5	24,113.9	24,774.2	24,985.6
Rural population, % of total	43.7	36.0	32.4	31.1	30.3	29.4	28.4
Life expectancy at birth, male, years	61.2	68.7	70.0	71.3	72.8	74.2	75.5
Life expectancy at birth, female, years	65.8	70.6	73.1	75.1	76.6	78.0	79.2
Life expectancy at birth, average, years	63.4	69.6	71.5	73.1	74.6	76.0	77.3

e/f = BMI estimate/forecast. Source: World Bank, UN, BMI

Table: Population By Age Group (Iran 1990-2025)

	1990	2000	2005	2010	2015f	2020f	2025f
Population, 0-4 yrs, total, '000	9,312	6,316	5,483	6,555	7,146	6,751	6,148
Population, 5-9 yrs, total, '000	8,905	7,552	5,476	5,416	6,507	7,116	6,729
Population, 10-14 yrs, total, '000	7,324	8,981	7,154	5,613	5,487	6,494	7,105
Population, 15-19 yrs, total, '000	5,822	8,800	9,247	7,215	5,643	5,466	6,474
Population, 20-24 yrs, total, '000	4,697	6,932	9,143	8,993	7,067	5,595	5,424
Population, 25-29 yrs, total, '000	4,054	5,315	6,859	8,704	8,726	6,997	5,541
Population, 30-34 yrs, total, '000	3,535	4,442	5,202	6,521	8,484	8,649	6,937
Population, 35-39 yrs, total, '000	3,030	3,886	4,693	5,210	6,497	8,410	8,579
Population, 40-44 yrs, total, '000	2,123	3,372	4,112	4,833	5,262	6,431	8,333
Population, 45-49 yrs, total, '000	1,620	2,857	3,421	4,032	4,757	5,193	6,353

Population By Age Group (Iran 1990-2025) - Continued

	1990	2000	2005	2010	2015f	2020f	2025f
Population, 50-54 yrs, total, '000	1,526	1,929	2,800	3,244	3,895	4,665	5,101
Population, 55-59 yrs, total, '000	1,393	1,431	1,766	2,637	3,109	3,788	4,548
Population, 60-64 yrs, total, '000	1,140	1,322	1,336	1,639	2,500	2,985	3,652
Population, 65-69 yrs, total, '000	898	1,145	1,257	1,279	1,550	2,340	2,813
Population, 70-74 yrs, total, '000	507	825	1,055	1,129	1,143	1,369	2,090
Population, 75-79 yrs, total, '000	269	508	654	802	876	902	1,105
Population, 80-84 yrs, total, '000	135	203	347	413	528	598	637
Population, 85-89 yrs, total, '000	48	66	112	172	216	290	343
Population, 90-94 yrs, total, '000	10	17	21	38	63	84	119
Population, 95-99 yrs, total, '000	1	2	3	4	8	15	22
Population, 100+ yrs, total, '000	0	0	0	0	0	1	2

f = BMI forecast. Source: World Bank, UN, BMI

Table: Population By Age Group % (Iran 1990-2025)

	1990	2000	2005	2010	2015f	2020f	2025f
Population, 0-4 yrs, % total	16.52	9.58	7.82	8.80	8.99	8.02	6.98
Population, 5-9 yrs, % total	15.80	11.46	7.81	7.27	8.19	8.46	7.64
Population, 10-14 yrs, % total	13.00	13.63	10.20	7.54	6.90	7.72	8.07
Population, 15-19 yrs, % total	10.33	13.35	13.18	9.69	7.10	6.50	7.35
Population, 20-24 yrs, % total	8.34	10.52	13.03	12.08	8.89	6.65	6.16
Population, 25-29 yrs, % total	7.19	8.06	9.78	11.69	10.98	8.32	6.29
Population, 30-34 yrs, % total	6.27	6.74	7.42	8.76	10.68	10.28	7.88
Population, 35-39 yrs, % total	5.38	5.90	6.69	7.00	8.18	9.99	9.74
Population, 40-44 yrs, % total	3.77	5.12	5.86	6.49	6.62	7.64	9.46
Population, 45-49 yrs, % total	2.88	4.33	4.88	5.42	5.99	6.17	7.22
Population, 50-54 yrs, % total	2.71	2.93	3.99	4.36	4.90	5.54	5.79
Population, 55-59 yrs, % total	2.47	2.17	2.52	3.54	3.91	4.50	5.17
Population, 60-64 yrs, % total	2.02	2.01	1.90	2.20	3.15	3.55	4.15
Population, 65-69 yrs, % total	1.59	1.74	1.79	1.72	1.95	2.78	3.19
Population, 70-74 yrs, % total	0.90	1.25	1.50	1.52	1.44	1.63	2.37
Population, 75-79 yrs, % total	0.48	0.77	0.93	1.08	1.10	1.07	1.26
Population, 80-84 yrs, % total	0.24	0.31	0.50	0.55	0.66	0.71	0.72

Population By Age Group % (Iran 1990-2025) - Continued

	1990	2000	2005	2010	2015f	2020f	2025f
Population, 85-89 yrs, % total	0.09	0.10	0.16	0.23	0.27	0.34	0.39
Population, 90-94 yrs, % total	0.02	0.03	0.03	0.05	0.08	0.10	0.14
Population, 95-99 yrs, % total	0.00	0.00	0.00	0.01	0.01	0.02	0.03
Population, 100+ yrs, % total	0.00	0.00	0.00	0.00	0.00	0.00	0.00

f = BMI forecast. Source: World Bank, UN, BMI

Methodology

Industry Forecast Methodology

BMI's industry forecasts are generated using the best-practice techniques of time-series and causal/econometric modelling. The precise form of model we use varies from industry to industry, in each case being determined, as per standard practice, by the prevailing features of the industry data being examined.

Common to our analysis of every industry is the use of vector autoregressions, which allow us to forecast a variable using more than the variable's own history as explanatory information. For example, when forecasting oil prices, we can include information about oil consumption, supply and capacity.

When forecasting for some of our industry sub-component variables, however, using a variable's own history is often the most desirable method of analysis. Such single-variable analysis is called univariate modelling. We use the most common and versatile form of univariate models: the autoregressive moving average model (ARMA).

In some cases, ARMA techniques are inappropriate because there is insufficient historic data or data quality is poor. In such cases, we use either traditional decomposition methods or smoothing methods as a basis for analysis and forecasting.

We mainly use OLS estimators and in order to avoid relying on subjective views and encourage the use of objective views, we use a 'general-to-specific' method. **BMI** mainly uses a linear model, but simple non-linear models, such as the log-linear model, are used when necessary. During periods of 'industry shock', for example poor weather conditions impeding agricultural output, dummy variables are used to determine the level of impact.

Effective forecasting depends on appropriately selected regression models. **BMI** selects the best model according to various different criteria and tests, including but not exclusive to:

- R^2 tests explanatory power; adjusted R^2 takes degree of freedom into account;
- Testing the directional movement and magnitude of coefficients;
- Hypothesis testing to ensure coefficients are significant (normally t-test and/or P-value);
- All results are assessed to alleviate issues related to auto-correlation and multi-collinearity.

BMI uses the selected best model to perform forecasting.

Human intervention plays a necessary and desirable role in all our industry forecasting. Experience, expertise and knowledge of industry data and trends ensure that analysts spot structural breaks, anomalous data, turning points and seasonal features where a purely mechanical forecasting process would not.

Sector-Specific Methodology

Consumer Electronics forecasting is complicated due to the fragmented nature of the market, with little transparency of vendor data and low apparent agreement between many sets of figures in terms of market definition, base and methodology. Individual variables taken into account in creating each forecast include:

- Economic context, and GDP and demographic trends;
- Technological developments, and diffusion rates;
- Underlying demand trends;
- Telecommunications market developments
- Projected GDP share of industry;
- Maturity of market structure;
- Regulatory developments and government policies;
- Exogenous events.

Estimates for each industry segment are calculated using government statistics, where available, and our own macroeconomic and demographic forecasts.

Sources

Sources used in electronics reports include national ministries, statistics agencies, ICT regulatory bodies, national industry associations, officially released company results and figures and international and national industry news.

Risk/Reward Index Methodology

BMI's Risk/Reward Index (RRI) provide a comparative regional ranking system evaluating the ease of doing business and the industry-specific opportunities and limitations for potential investors in a given market. The RRI system divides into two distinct areas:

Rewards: Evaluation of sector's size and growth potential in each state, and also broader industry/state characteristics that may inhibit its development. This is further broken down into two sub categories:

- Industry Rewards (this is an industry-specific category taking into account current industry size and growth forecasts, the openness of market to new entrants and foreign investors, to provide an overall score for potential returns for investors)
- Country Rewards (this is a country-specific category, and the score factors in favourable political and economic conditions for the industry)

Risks: Evaluation of industry-specific dangers and those emanating from the state's political/economic profile that call into question the likelihood of anticipated returns being realised over the assessed time period. This is further broken down into two sub categories:

- Industry Risks (this is an industry-specific category whose score covers potential operational risks to investors, regulatory issues inhibiting the industry and the relative maturity of a market)
- Country Risks (this is a country-specific category in which political and economic instability, unfavourable legislation and a poor overall business environment are evaluated to provide an overall score).

We take a weighted average, combining industry and country risks, or industry and country rewards. These two results in turn provide an overall Risk/Reward Index, which is used to create our regional ranking system for the risks and rewards of involvement in a specific industry in a particular country.

For each category and sub-category, each state is scored out of 100 (100 being the best), with the overall Risk/Reward Index a weighted average of the total score. Importantly, as most of the countries and territories evaluated are considered by **BMI** to be 'emerging markets', our score is revised on a quarterly basis. This ensures that the score draws on the latest information and data across our broad range of sources, and the expertise of our analysts.

BMI's approach in assessing the risk/reward balance for infrastructure industry investors globally is fourfold:

- First, we identify factors (in terms of current industry/country trends and forecast industry/country growth) that represent opportunities to would-be investors;
- Second, we identify country and industry-specific traits that pose or could pose operational risks to would-be investors;
- Third, we attempt, where possible, to identify objective indicators that may serve as proxies for issues/trends to avoid subjectivity;

Finally, we use **BMI's** proprietary Country Risk Index (CRI) in a nuanced manner to ensure that only the aspects most relevant to the infrastructure industry are incorporated. Overall, the system offers an industry-leading, comparative insight into the opportunities/risks for companies across the globe.

Sector-Specific Methodology

In constructing these indices, the following indicators have been used. Almost all indicators are objectively based.

Table: Consumer Electronics Risk/Reward Index Indicators

Rewards

Industry Rewards

Consumer electronics sales, USDmn

Sales per capita, USD

ICT development

Growth, %

Country Rewards

Urban/rural split

Young population

Richest 10%, % of total

GDP per capita, USD

Risks

Industry Risks

Barriers to entry

Government consumer electronics policies

Country Risks

Consumer Electronics Risk/Reward Index Indicators - Continued

Short-term economic risk

Real PC growth, volatility

Short-term financial risk

Trade bureaucracy

Institutions

*Source: BMI***Weighting**

Given the number of indicators/datasets used, it would be inappropriate to give all sub-components equal weight. The following weighting has been adopted:

Table: Weighting Of Indicators

	Weighting (%)
Rewards	70, of which
Industry Rewards	65, of which
Consumer electronics sales, USDmn	50
Sales per capita, USD	16
ICT development	16
Growth, %	16
Country Rewards	35, of which
Urban/rural split	25
Young population	25
Richest 10%, % of total	25
GDP per capita, USD	25
Risks	30, of which
Industry Risks	40, of which
Barriers to entry	10
Government consumer electronics policies	10
Country Risks	60, of which
Short-term economic risk	10
Real PC growth, volatility	10
Short-term financial risk	10

Weighting Of Indicators - Continued

Weighting (%)

Trade bureaucracy	10
Institutions	10

Source: BMI

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.