

# Transforming the appliance industry

Switching on revenue streams in services

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## Key topics

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- ***Describes how pervasive networking is transforming white goods into 'intelligent devices', providing their manufacturers with an opportunity to enhance their customer relationships, services and revenue streams***
- ***Establishes the benefits and opportunities offered by networked appliances***
- ***Addresses the challenges of implementing intelligent devices***
- ***Sets out the key business transformations and strategies needed when implementing networked appliances***

## Executive summary

In response to recent advances in networking, sensor and integration technologies, combined with lower prices, white goods manufacturers have begun to expand their products to offer a range of Internet-based services. As with the automotive industry, forward-looking kitchen appliance manufacturers have started to develop network capability and integrate Internet-based services with their products, transforming them into platforms for service delivery. Currently, pilot projects are underway in households in the USA, Europe, the Middle East and Asia to bring 'intelligent appliances' into people's day-to-day lives. As a result of these new technology waves, buyers will take more interest in the choice and purchase of white goods than they have for many years and closer customer relationships will be formed throughout the product's lifetime.

'Service' usually means 'repair' or 'maintenance' today, but means something quite different with the opportunities presented by pervasive networking. The range of services – and revenue streams – is virtually limitless. For example, manufacturers could work with food suppliers, enabling customers to scan items before they go into the oven, retrieve cooking instructions and other useful information, or establish automated cooking cycles. Further in the future, a video of a TV chef could be downloaded to guide the customer through the preparation. Far fetched? Not long ago many people would have laughed at the idea of having an 'alarm clock' tucked away in a cooker, but now a timer is a standard feature on ovens.

Suppliers need to be considering how the household will be run in the future and the implications of this fundamental transformation to their business models. By taking advantage of falling communication hardware costs, networked sensors and always-on Internet connectivity, new services can be created and brand differentiation can be achieved. One example of this new model is food manufacturer loyalty clubs, which provide consumers with special offers on repeat purchases via their intelligent appliance.

The Internet is evolving to interconnect all network-attached devices, effectively becoming the largest data acquisition and control network. Some key enabling factors driving this are the move toward always-on broadband connections, the availability of inexpensive wireless networking, both Wide Area Network (WAN) and Local Area Network (LAN) and falling cost of network connection hardware. However, as things stand it is only the high-end models whose prices can comfortably incorporate the technology.

This paper considers the importance of integrating pervasive networking and intelligent appliances into households. It also explores how white goods manufacturers need to change their existing business model and internal structure to deal with the new, ongoing relationship with the customer. This growth in the importance and value of customer relationship is prompting a need to form partnerships with Information Technology (IT) or Internet services suppliers, application service providers and other industries. As a result, manufacturers need to change their concept of Customer Relationship Management (CRM) from one that effectively ends with the sale to one that promotes an ongoing involvement with the customer and builds on their brand recognition to develop valuable, revenue-generating relationships. In addition, manufacturers will need to re-evaluate their corporate governance and decision-making control in this new environment and their supply chain strategies given the increased high-technology content in their products.

### **Opportunities and benefits – a new platform for service offerings**

From the white goods supplier's perspective, one of the main benefits of the networked appliance is its ability to continue to sell services to customers throughout the lifetime of a product. When the appropriate components are added, such as processor(s), network interface, sensors and actuators, products can be transformed into rich service delivery platforms.

For example, cross-industry development within the food industry could lead to an oven equipped with an inexpensive Universal Product Code (UPC) scanner that retrieves cooking instructions and other useful information. This could automatically set up cooking cycles and a screen would then display (or even speak) the instructions, prompting the user through the full preparation process at the appropriate times. Other useful information might be provided such as suggestions of alternative recipes or – as these products spread over time to the mass market – notices of price discounts at a local food store. The networked service could even e-mail coupons from the food product company in response to continued use of their food products. This is along the lines of supermarket loyalty clubs – moving the customer loyalty concept from the food store to the food manufacturer, with the appliance manufacturer realising a new revenue stream by providing the relationship to the customer and the service delivery platform.

Refrigerators will be able to track contents, usage rates and expiry dates and will order staples automatically. Think of the tonnes of food wasted per day in refrigerators because it lies forgotten in some dark corner! They will be equipped to provide a grocery list as products are used up and later submit it electronically to a local store.

The Electrolux Screenfridge is already gaining mind-share, with a touchscreen mounted on the door which will help you with grocery shopping and dinner ideas, keep track of what you have in your fridge and function as a message centre for the whole family. Household members can use it to select, buy and order food without ever leaving the kitchen. Video messages can be posted and the Screenfridge is also equipped with a TV and radio receiver. The 'shopping list' for the local store may also include data from the washing machine. Further applications could include:

- *A clothes washing machine which can reference care instructions from clothes makers so as not to cause damage. For this added function, requiring radio frequency tags, a small fee per month could be levied.*
- *A washing machine could indicate the local supermarket's detergent specials and add it to the user's electronic shopping list for pick-up or delivery.*
- *Users can be woken earlier if weather and traffic reports indicate travel delays that morning and kitchen equipment activated accordingly to ensure that the first cup of coffee is always ready in time.*
- *As has already been announced by Merloni, new Web-connected devices could be marketed to consumers under a pay-as-you-use model, greatly accelerating their rollout.*
- *Broadening the field further, home security can be adjusted according to calendar information entered on the fridge Web tablet.*

In these instances the single unit is linked to the whole home network. White goods should not be seen in isolation, but as part of the whole networked home.

**From the manufacturer's perspective, other benefits include:**

*The ability to collect information about customers' usage habits and behaviour*

A far more sensitive area is collecting information about customers' usage habits and behaviour. However, pervasive networking could provide manufacturers – and a wide array of companies – with very useful marketing information, via the live connection into the kitchen. Data received from sensors within the equipment will lessen the need to conduct customer surveys during future product planning and design. Appliances could be used for collecting and reporting usage information.

Clearly it would be essential to work with groups concerned with protecting personal privacy before going ahead. In Europe, large supermarket chains gather a considerable amount of information about their customers' buying habits, but it is a different matter getting the information from within the home. It must be borne in mind that the first adopters would be the least likely to want to exchange information on their buying habits for certain privileges with the supplier (as supermarkets do) since they will be high-income and less attracted to push-based offers.

*Remote diagnostics*

A major opportunity arises in improving the white goods supplier's service quality. The ability to service the intelligent appliance remotely and head off technical problems is a clear practical advantage. A networked appliance could enable diagnostic data to be sent automatically to a warranty management centre and components could be detected before they fail. Both warranty management and field service firms can be fed machine status information and the manufacturer gains far more detailed information about a machine's internal operations in the field than a customer survey would ever yield.

Combining the data from all the appliances in the field in this way will allow analysis of operational parameter patterns that correlate to failures – such as calls to the warranty call centre. Once determined, these patterns could then be used for preventative maintenance service offerings. Together, these factors make an individual machine a much more attractive proposition for the buyer whilst augmenting the supplier's revenues and operating efficiencies.

*Brand differentiation*

Perhaps more important than anything else is the boost that the network dimension gives to the appliance in terms of brand differentiation. Initially, like most new technologies, from colour TVs to mobile phones, the appliances will move from high-end purchasers to all categories of users. Economic benefits, such as access to local food bargains and food 'loyalty clubs' for repeat purchasers of certain food products, will need to be promoted as products spread to the mass market. In the near future though, the PR value brought by the manufacturer's association with cutting-edge technology concepts is likely to be the main value.

As regards product differentiation, the integration of IT sets a model/brand apart, providing the user with services beyond its primary function and more importantly, augmenting the core functions of the product, while pioneering models such as the Electrolux Screenfridge and Merloni's Margherita2000 have brought considerable PR kudos.

**Background – bringing the kitchen to life**

*The enabling technology*

It is the combination of technology advances – especially surrounding the Internet, broadband communications and wireless networking – and falling prices for sensors and actuators (basic enabling analogue devices) which has made the intelligent appliance feasible for ordinary households. It is by taking advantage of falling communication hardware costs, always-on Internet connectivity and the application of network-addressable sensors and actuators, that the new services can be created.

These services will become an integral part of the product – and not simply a gizmo add-on – in much the same way that a mobile phone is only complete when combined with a mobile network. Some key enabling factors driving Internet expansion are the move toward always-on connections and the falling cost of both wireless networking (both WAN and LAN) and of network connection hardware. Both wired and wireless technologies are coming below the price acceptance thresholds of more and more product categories. The price of devices is now low enough to be able to incorporate into high-end products without damaging margins. Wireless radio frequency costs some \$25 per node today based on two industry initiatives, Bluetooth and HomeRF. Dual-use wire solutions could fall to \$5-\$10 or less. If power line data networking advances, it would give a major push to IT enabled appliances. To get a house networked is not necessarily expensive: it does not need to be dependent on dedicated network wiring: a normal a/c power line could in future be used. Though networking via the power supply has been investigated for some time, the arrival of intelligent appliances has given a new impetus to leading standards bodies and trade associations such as HomePlug to make it a reality.



*Other industries, especially automotive, heading in same direction*

Similar moves are underway in the automotive industry, which is further ahead in applying networking technology. Onboard car information such as navigation systems and traffic movement updates (with alternative route guidance) are by now in widespread use, largely in top-range cars. The appliance industry has a head start as some 'middleware' can be adapted from the automotive industry (and let's face it, far fewer communications challenges occur: how many refrigerators will travel at 80mph through tunnels and lose the signal?) The automotive industry is likewise planning real-time diagnostics, entertainment, as well as emergency call and fleet management over the Internet. This demonstrates that suppliers in different manufacturing industries are researching how they can apply the Internet to their individual machines. Microwave vendors are moving in this direction by having codes on packaging which automatically set off the appliance to carry out the correct cooking instructions.

### **Philosophy of Pervasive Computing**

Pervasive Computing devices are networked and they work in a distributed computing environment. Typically they depend on interacting with other devices or network services.

Three main rules must be applied:

- *A compelling set of benefits must be presented.*
- *The product should be easy to install and use. The device form-factor and user interaction must be optimised for the location and tasks being performed.*
- *The technology must be transparent. Users should be able to focus on the tasks they are performing rather than the tools they are using.*

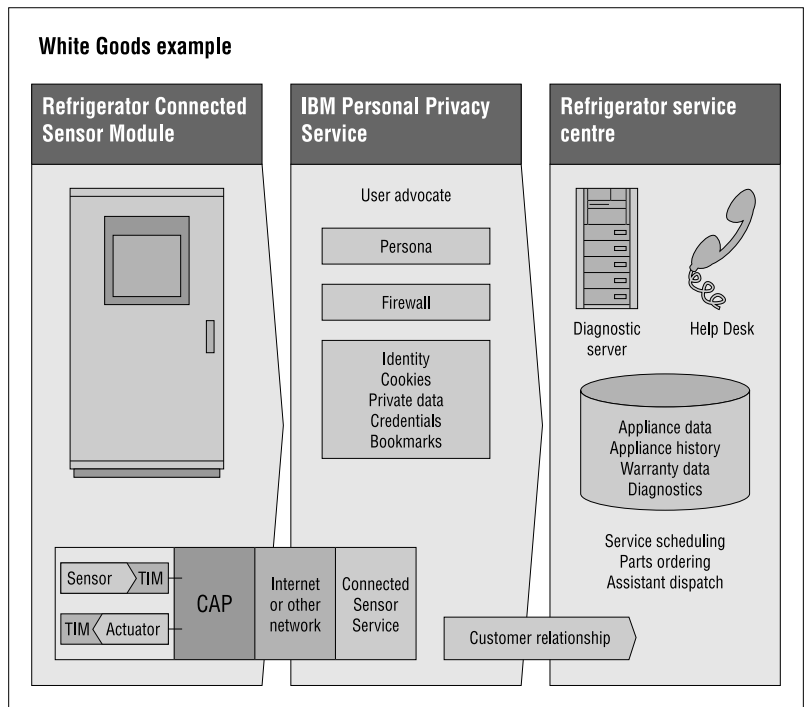
IBM's philosophy of the User Experience of Pervasive Computing states that 'for all the pervasive devices in a user's home – there is a perception that the user is always interacting with a single underlying system and the devices simply serve as access points to that environment'.

### **Challenges**

#### *Security*

The privacy issue is very important, when collecting and imparting information on customer behaviour. The initial customer will have to be sophisticated (and affluent) enough to want to take advantage of networked technology – which implies that they will also be more attuned to the privacy intrusion by information gathered on their habits. As mentioned, consumers are by now used to supermarkets collecting information on their food buying habits, but it is a different matter if you are being monitored in your own home.

A very cautious approach is needed in this area. It will be necessary to gain the full co-operation of privacy protection groups, before going ahead with this kind of monitoring – otherwise newspaper headlines such as ‘Spy in the Kitchen’ would soon appear, killing the intelligent appliance before it takes off. How willing people will be about their habits being known remains to be seen – but whatever happens there will be a need for authentication to guarantee confidentiality.



*Design has to come from the perspective of user*

Another vital element – and one which it is easy to overlook – is that the intelligent appliance needs to be designed from the perspective of the end-user. Large numbers of new technologies at the same stage as the intelligent appliance is today have failed because this has been ignored. Currently no one knows exactly what the customer will find useful. Manufacturers need to have adaptive designs and need to keep in touch with how the user interacts. It is important that a user does not have to learn a whole new way of interacting with the system, or it will fail (e.g. many old people who would benefit from buying a home PC are put off through an aversion to operating it). It is not enough to provide a mass of different devices for different user tasks, each connected to the network. The device must be easy, compelling and enjoyable to use. In other words, it is pointless to foist systems onto householders ‘straight from the research lab’: they must be designed from the perspective of the overall user experience. This includes the whole life cycle of ownership from initial advertising to purchase, installation and use, to support/upgrade and eventual replacement.

*CRM looms*

Customer Relationship Marketing (CRM) is more important than ever in customer retention – and for intelligent appliance suppliers, increases the company’s own value. White goods manufacturers will need to change their concept of CRM from one that effectively ends with the sale to one that promotes an ongoing involvement with the customer, building on their brand recognition and treating the relationship as a valuable revenue generating asset.

They are no longer dealing with a customer who may only need to return many years later to replace his/her refrigerator. Ongoing customer relationships become a key asset: by augmenting products with networked services, white goods manufacturers put in place a channel for ongoing interactions with the customer. Their product becomes a valuable interface to the customer, opening new revenue streams that come not only from the customers themselves (perhaps in the form of subscription services), but also from partners wishing to take advantage of that service delivery interface. CRM becomes a key asset of the corporation.

*Businesses will need to make fundamental changes in their structure to adapt*

As products are transformed, business transformation will also be required. Along with these new business models and revenue streams come the necessity of evolving the company to handle them properly. As CRM becomes a key process, the need arises for example to develop call centres to handle non-traditional requests and problems. The company also of course needs to put in place the mechanisms for delivering networked services to its products and for creating and managing the partnerships that grow from that.

Some of these transformations require very different and diverse core skills, both from a business and a technology perspective. The manufacturer will be dealing with new technologies that they have little or no experience with and a very different environment. In well-established organisations which have been offering similar products for decades, the decision-making structure is unlikely to have evolved in the same way as for handling advanced technology. The word 'service' takes on an entirely new meaning.

There are implications for supply chain management, currently targeted towards producing solid goods and 'owned' by the manufacturer, but which will need to change into forming partnerships with suppliers of 'intangible' services. The white goods manufacturer will no longer need, or even be able, to own the whole supply chain.

It is important to identify the right partners, as opposed to trying to do it all in-house (e.g. retailers could be used as channel for customer service). In the case of the call centre, if the in-house method is continued, staff would have to be re-trained or new expertise recruited to deal with the new sets of queries on – for example, in the case of an oven maker, cooking cycles and recipes. A new company may need to be bought.

The manufacturer needs to understand how to leverage existing core competencies and where to develop new competencies, versus partnering for skills and assets.

### *Technology challenges*

Human-computer interaction appropriate to the task and location needs to be sorted out. Liquid Crystal Display (LCD) touchscreens, voice recognition and text to speech output look like far better alternatives to the traditional PC with keyboard and mouse as methods of input and output. A consistent software user interaction model for white goods will also help achieve the wider goal of simplified learning and use. Also, it will encourage application development, so avoiding software companies having to transfer their products to several different platforms. Existing desktop operating systems will not adapt well to pervasive computing as they depend on the present user input/output methods. With the home, the network infrastructure is critical. The wireless solution is widely regarded as the only realistic way forward, but as mentioned, another alternative is to have dual use of existing wire.

In summary, a major rethink is required for white goods vendor strategies in the age of the intelligent appliance:

- *Rethink product concepts*
  - *Products become potential service offering platforms*
  - *Service offerings drive ongoing interaction with customers.*
  
- *Rethink business models*
  - *Ongoing annuity revenue becomes part of the picture*
  - *Customer relationship becomes a valuable asset in creating new partnerships (builds on brand recognition and trust)*
  - *Opportunities to both offer services and to serve as a service integrator.*
  
- *Leverage increased customer interaction and data collection capabilities*
  - *Increase customer satisfaction*
  - *Improve products*
  - *Increase company's partnership value and power lines.*

**Case studies: intelligent appliances in action**

*Whirlpool's Web-enabled fridge meets the real world*

The major white goods brand Whirlpool is already engaged, starting with experiments in 'planned communities' in the USA (these are upmarket housing developments, with a strong emphasis on supplying residents with services such as security, maintenance, cable TV access and broadband).

Whirlpool is bringing out a refrigerator with a portable Web tablet (a device with a flat screen to receive messages and information) and broadband connectivity, which gives access to the Web and to local community information. A set of services is to be built around it and the Web tablet will be mounted on the refrigerator. It may be used for accessing events, notifying the family of schedules, and automated food delivery. Later uses may be for example downloading recipes and replenishing food stocks. Voice recognition is also planned for the Web tablet.

Developers of the planned community Playa Vista will use Whirlpool for its Integrated Home Solutions, including a line of Internet-enabled appliances and associated services, in a new development now under construction on the West side of Los Angeles. Each of the 13,000 planned new homes will be available with high-speed broadband Internet service. Playa Vista reckons that the Internet-enabled appliances that Whirlpool will be providing will help residents order groceries, manage schedules and 'help take care of the many day-to-day tasks'. Playa Vista envisages that American families will replace the 'endless pile of notes on the refrigerator door' with a Web tablet. With the new device, which will be available on certain Whirlpool and KitchenAid brand Internet-enabled appliances next year, families at the planned communities will be able to prepare a meal by using an integrated Web-browser to search for recipes that match the food items they have on hand. They can then prepare the meal by watching a celebrity chef on the Web tablet. (Playa Vista is a high-profile development as it was selected by Bill Clinton when he was president as one of five P.A.T.H. - Partnership for Advancing Technology in Housing - communities in the US.)



Recently Whirlpool showed further commitment to the Web-enabled appliance concept by acquiring an equity stake in zBox, whose flagship product is an Internet-enabled 'smart' delivery appliance installed at a consumer's residence and used for receiving, shipping and returning packages when nobody is home.

*Carrier Air-conditioning: pilot scheme in Europe*

This summer the world's largest air-conditioner company Carrier will provide around 400 homeowners in the UK, Greece and Italy with access to their air conditioning units away from their homes, via the Web. In the pilot scheme, users will be able to turn their system on or off and adjust temperature settings via WAP (Wireless Application Protocol) mobile phones or a PC linked to the Internet. Using a new Web site, called MyAppliance.com, consumers should be able to cut energy costs, as well as arriving home to a suitably chilled home (or perhaps warmed, in the case of the UK!) This is a simple, practical application which is likely to attract public attention in Europe to the concept of the intelligent appliance.

With MyAppliance.com, Carrier's dealers, installers, and engineers will have individual unit control and be able to access key customer data. Myappliance.com will also send fault codes and other diagnostic alerts instantaneously via mobile phones, e-mail or fax. Carrier dealers can differentiate themselves from the competition with faster service response times, first-time fix and improved scheduling. Unit performance and maintenance information over time can be gathered and recorded to anticipate and address potential problems.

### **Conclusions**

Several key technology trends and developments are serving as catalysts in the re-evaluation of traditional product concepts and business models in the white goods industry. If properly exploited, these changes will not only improve existing products, but also open new revenue and partnership opportunities for manufacturers. Some industries, such as the automotive industry, are already bringing these changes to the market.

It must be emphasised however that these opportunities will require not only product, but also business transformations, to take place. Companies must plan carefully to understand the best strategy for approaching these changes; they must understand their core strengths, decide where they want to augment those strengths to move in new directions and where they should partner to close the new business model loops.

Looking at the intelligent appliance from a wider perspective, industry standards need to be set: standardisation is vital both at the hardware and software levels serving as it does to help control development costs and encourage widespread deployment. For example, Ethernet networking is an open, international standard and has become low cost and pervasive through the influence of standardisation. Both the IT and appliance industries need to co-operate in developing and deploying a new class of products and services. The next step is to set up standards and a new consortium to drive development.

The field is wide open and there is unlimited scope for creativity. Designs need to be adaptive to different users' needs and wants – particularly as no one knows yet what the final business models will be. It is also unknown how revenues will be shared with different types of service providers, nor can anyone at this stage be certain where the main opportunities will lie. This is always the case with new technology, from the PC to the smartphone. There is still a way to go for identifying compelling user tasks – experience shows though that far more applications will be found after the technology is deployed and in use. However, it is logical for white good manufacturers to get themselves a place at the playing table and build control points now. Product designers should look for fee-based services.

With the intelligent appliance, the white goods industry benefits from product differentiation, new business opportunities such as e-commerce delivery and device diagnostic monitoring. In addition it has the potential to collect live data about products, and improve warranty period management. Finally, there is the PR value of capturing customer mind-share in a way the industry has never seen before. Besides, how long is it since a fridge or oven has presented exciting new technology to the public at large?



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