

White Paper

The Architect's Guide to Home Automation

| A 7-step methodology for smart home projects |

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Introduction

These days electronic and communications technology influences almost every aspect of the home environment. Smart home technology is increasingly common in new homes and major home renovations – especially at the top end of the market.

Busy architects have usually got their hands full providing their core services. You can't be an expert at everything and keeping abreast of rapidly evolving home automation technologies can be a chore.

The purpose of this guide is to present a step-by-step methodology for undertaking home automation projects and explain the advantages of working with a home automation designer.

Home automation defined

Home automation is the use of computerised system/s to control some or all of a home's functions and features automatically. A home automation system can include:

- ◉ Access control
- ◉ CCTV
- ◉ Data networks
- ◉ Distributed audio
- ◉ Energy management
- ◉ Home cinema
- ◉ HVAC controls
- ◉ Irrigation systems
- ◉ Lighting control
- ◉ Pool and spa systems
- ◉ Security systems
- ◉ Structured wiring
- ◉ Telephones and communications
- ◉ Window covering controls

Home automation may also allow home functions to be controlled remotely from anywhere in the world using a computer connected to the Internet or a telephone.

The fundamental components of a well-designed home automation system include the control system hardware, programming and interfaces (e.g. multi-function switch plates or touch screens), the various devices and systems to be controlled, cabling infrastructure with all the interconnecting cables and/or wireless links, high-speed Internet connection, emergency backup power source for the control system, and the essential home electrical systems.

The vision is to create a flexible, comfortable and user-friendly domestic environment, yet still allow non-technical people to easily interact with the most technologically-advanced systems available.

Automated homes are commonly called smart homes, digital homes or intelligent environments.

By designing and implementing an infrastructure that is capable of being readily upgraded, a smart home can easily maintain pace with advances in technology.

The home automation market in Australia

Data on the home automation market in Australia is scarce. One of the most comprehensive studies on the topic to date is *The Connected Home in 2007*¹. In December 2006, Connection Research surveyed 3005 households on their usage of digital and advanced technologies.

They found 2 percent of Australian homes have a fully integrated home automation system. According to the study: "This part of the industry is growing quickly, and many new homes are including the technology, but there is still a long way to go."

Of those respondents intending to build a new home in the next 12 months, 29.7 percent "will" or "might" install a smart lighting system, and 23.3 percent "will" or "might" install central control of doors or curtains, as part of a home automation system.

Future growth

While home automation is taking off slowly in Australia, the story in the USA is very different. A recent opinion piece in *Smarthouse magazine*² says the demand for home automation technology amongst American new home buyers is increasing, despite a struggling housing market.

New-home technology penetration (percent of new homes)

TECHNOLOGY	2003	2004	2005	2006
Structured Wiring	42%	61%	49%	53%
Monitored Security	18%	28%	29%	32%
Multi-room Audio	9%	12%	15%	16%
Home Theatre	9%	8%	11%	12%
Lighting Control	1%	2%	6%	8%
Home Automation	0	2%	6%	6%
Energy Management	1%	5%	11%	11%

Source: NAHB Research Centre, CEA

Another significant trend is the decline in prices of consumer electronics. While a home automation system may be seen as a luxury item in Australia today, many components, such as plasma screens, data networking and home cinemas are becoming more affordable.

Recent history shows that yesterday's luxury quickly becomes today's ubiquity.

¹Connection Research, 2007

²David Richards, 2007, "Dumb Australian Builders Missing Out On Millions in Profits", *Smarthouse*, <http://www.smarthouse.com.au/Automation/Industry/J6B9K9J5>

³quoted in Richards, *Smarthouse*

Can't the electrician do it?

In Australia many architects turn to an electrical contractor for guidance on scoping and installing home automation systems. However most electricians don't know how to design, integrate or program intelligent home automation systems.

According to *Smarthouse* magazine: "most electricians don't have a clue what to do ... when it comes to configuring intelligent home automation technology. Most have little understanding of distributed audio or getting a great performance out of a TV screen or configuring sophisticated software that drives a whole house system."⁴

The pitfalls of getting it wrong

While the potential benefits of a home automation system are great, the downside of getting it wrong is also considerable. The complexity of integrating so many electronics systems opens the door to many unwanted consequences, including:

The system doesn't work as planned: A poorly designed or integrated system may not be fully functional and/or prone to nuisance activation. In some cases the home owner's safety may be compromised.

Not true integration: A well integrated system requires a minimum of control devices. Multiple switch plates cluttering the walls is evidence of sub-par integration. Controls should be consolidated and intuitive to use.

Project time and cost blow-outs: Because so many contractors need to be coordinated, poor project management can cause significant delays and hassles during construction.

Compromised aesthetics: A smart home should not look like an electronics showroom. The electronic technology should blend seamlessly with the overall aesthetic of the home.

The bottom line is the client's expectations are not met, because the project took longer and cost more than expected and/or the home is not as functional as they were promised.

Working with a home automation designer

Working with a home automation designer is not much different to working with an interior designer, landscape architect or other design professional. They identify the client's requirements and aspirations, analyse the building plans, design a detailed smart home solution and recommend equipment.

To achieve optimum results, a home automation system should be designed, installed and programmed by an experienced home automation professional. They can not only program the control software and ensure all the electronic devices are integrated seamlessly, but ensure the finished system meets the client's personal needs, aesthetic considerations and environmental requirements.

⁴Richards, op. cit.

A proven methodology

What follows is a 7-step methodology that has been proven to work in dozens of successfully completed home automation projects.

Step 1: Develop the scope of works

A detailed scope of works is the foundation of every successful home automation project. However, since home automation is a relatively new field, home owners sometimes struggle to understand the benefits the latest technology can add to their lifestyle. They often need a little help to understand the wide range of possibilities.

So initially the home automation designer usually sits down with the client and explains all the options; because the client's needs can't be fully explored until they know what's possible.

After discussing the client's requirements and aspirations the scope of works is prepared. It should always take into account their budget, aesthetic preferences, functionality, energy efficiency and future technological needs.

Budgeting for home automation

A common mistake is to lump all the electric and electronic components into the electrical PC sum. This can lead to the client getting an unpleasant surprise when they find out the budget they agreed on for their new home doesn't include their multi-room audio, home cinema, local area network, systems integration, etc.

When budgeting for a smart home, the home automation "bells and whistles" should be itemised separately (i.e. over and above the prime cost (PC) sum for the electrical infrastructure).

Step 2: Design and documentation

The design and documentation requires a huge amount of liaison with the client, architect, builder, interior designer and other contractors to produce a set of documents that meet the needs of all of the contractors involved in the construction of the home.

This stage of the project can be very complex and it's when many projects come unstuck.

The home automation designer goes through the home's plans room by room in fine detail with the client, architect and builder. Once the designer understands the function of each room they can specify what services and electronic hardware are required.

Their plans are overlaid with information from everyone involved in the construction (e.g. engineers, plumbers, air conditioning contractors, interior designers, etc.) to ensure the positioning of the electrical infrastructure, electronic hardware and controls is both functional and aesthetically pleasing.

The end result is a set of documents that includes:

- An electrical contractor tender specification document
- All electrical layouts including power points, telephones, floor heating, towel rails, fans, pumps, etc.
- Electronic systems layouts including audio visual, home theatre, security, access control, CCTV, etc.
- Communications layouts including internet and telephone
- Lighting layouts including zoning, switching and switch plate design
- Systems distributions locations
- Cable routing locations

It's important that all contractors involved in the home automation process have a **single set of plans** to work from. Confusion is inevitable when you have multiple plans for electrical, lighting, air conditioning, audio visual, etc.

Step 3: Selecting an electrical contractor

The home automation designer creates the tender specification document for the electrical contractors during the design and documentation phase. A detailed tender specification helps minimise erroneous interpretations by electrical contractors. This means tenders can be compared to each other easily and accurately. It also helps ensure the project will be completed with a minimum of costly variations.

It's also a good idea to include an accreditation checklist for the electrical contractors to complete. It's prudent to ensure the chosen contractor has the appropriate accreditations for all systems to be installed. This helps ensure the project won't be delayed as the electrician learns on the job.

Step 4: Cabling and infrastructure installation

At this step the selected electrical contractor installs all the electrical, lighting, audio visual, communications and data cabling infrastructures.

If the design documents have been prepared properly and an experienced and accredited electrical contractor has been selected this process should go smoothly. The cabling and infrastructure installation should flow with the project and not impede any aspect of the construction.

Step 5: Project management

It takes a team of skilled designers and contractors to build a high quality smart home. Open communication is essential, because each contractor needs the input of the others to do their job properly.

Throughout the cabling and infrastructure installation the home automation designer supports and liaises with the electrician, designers and other trades-people e.g. architects, builders, engineers, landscape architects, interior designers, plumbers and security contractors.

It's their job to help the designers, builders and contractors understand the exact requirements of the electrical infrastructure and systems to be installed. This ensures the home automation systems are implemented to the highest standard.

Having a single point of contact saves time and helps reduce wastage and duplication of effort. The client can realise substantial cost savings by streamlining the project management process.

Step 6: Product selection and installation

At the scope of works stage the home owner decides on the various components they would like their home automation system to include e.g. a home cinema, distributed audio, CCTV, access control and lighting.

The scope of works includes budget estimates for the equipment so the client understands from the outset what their total outlay will be. However, in most cases, the actual products are not selected and purchased until the home is nearly finished. There are two reasons for this.

Firstly, as the construction may take many months the client can take advantage of technological advances and price reductions that have occurred since the scope of works was developed.

Secondly, once the client has been on site and envisaged how they will live in the home they have a much better appreciation for their requirements.

Initially equipment choice is somewhat theoretical. For example, a client may want a plasma screen in the study. But only when they walk into the room and think about where they're going to put the sofa can they decide whether they want a 42 or 60 inch plasma screen.

Once selection has been made, the chosen system components are purchased, installed, programmed and commissioned. At the completion of this stage the entire home automation system is ready for handover.

Step 7: Handover and tuition

Once the products have been installed and commissioned the home is ready for handover. At this stage the home automation designer explains how to operate the finished system. Since the essence of a great home automation system is simplicity, lengthy manuals should not be required.

The learning curve of a home automation system should be gentle. A well-designed system will be very intuitive to use. However, the home owners usually experience a brief period of adjustment as they become accustomed to using centralised controls such as touch screens and multi-function switch plates.

There is also inevitably a period of finetuning the system, because the client doesn't know exactly how they're going to live in the home until they've moved in. So the home automation designer will return in the following weeks to refine the system to meet the exact needs of the client.

What to look for in a home automation designer

As a design professional you'll appreciate that incorporating home automation technology into a project requires the help of expert and experienced consultants. When looking for a home automation designer to partner with, be sure to consider the following requirements:

Experience in similar projects: Seek a designer who has significant experience designing, project managing and installing home automation systems for projects of similar scope and complexity.

Rapport: A good home automation designer has an informative and helpful attitude, and is never patronising. Home automation technology can be complex and is new to many architects and clients alike. You need a designer who is eager to explain the multitude of possibilities and guide everyone through the process.

Product neutral: Ideally the designer should recommend a solution that suits the client's needs rather than their own business interests. When a designer is not aligned to any product manufacturer they are free to recommend the best products for the client's requirements and budget.

Accreditations: While there is not yet a university degree in home automation design, a designer ideally should have the following accreditations:

- Manufacturer's accreditation for the intelligent lighting control system they recommend (e.g. Clipsal C-Bus or Dynalite)
- Manufacturer's accreditation for all other products they recommend
- State security industry licence
- General Induction with Occupational Health and Safety for Construction
- Electronic systems integration accreditation (available through several industry bodies)
- CEDIA (Custom Electronic Design & Installation Association) accreditations

Level of documentation: Accurate and well developed documentation is essential to a successful project. If everyone is working off the same page and with a clearly defined objective, the project will run more smoothly and achieve the desired result. Ask to see some plans from previous projects the designer has undertaken.

Project management: A home automation designer should work alongside other contractors to help them understand the requirements of the electrical infrastructure and electronic hardware. Meticulous product management is essential to ensure the project runs smoothly.

Adequate staff and resources: Make sure the designer has adequate design, documentation, project management, systems programming and installation staff and resources to ensure the project is carried out on time and to budget.

What to look for when hiring an electrical contractor for a home automation project

Choosing an inexperienced electrical contractor for a home automation project can lead to missed deadlines, budget overruns and client dissatisfaction. To choose the best electrical contractor for the job, be sure to consider the following requirements:

Specialists: For a smart home project it's best to use an electrical contractor that specialises in home automation systems.

Multi-skilled: The electrician should be expert in all areas of electrical requirements for home automation and have the following skills:

- The ability to undertake all works associated to the project such as telephony, data, security, etc.
- The ability to work with, and under the guidance of, a home automation designer
- An excellent understanding of home automation principles
- Computer literacy
- Good communication skills

Experience in similar projects: Seek an electrical contractor who has significant experience installing the electrical, lighting, audio visual, communications and data cabling and infrastructure for projects of similar scope and complexity.

Accreditations: Accreditation gives you the confidence that installation is carried out to the highest standards. Some manufacturers (e.g. Clipsal) also offer extended warranties if their products are installed by certified electricians.

Appropriate accreditation would include:

- Electrical licence
- Australian Cabling Authority (ACA) Accreditation
- State security industry licence (security cabling requirement)
- Manufacturer's accreditation for all lighting and other products they install

Adequate staff and resources: The electrical contractor must have sufficient trained staff and resources to keep up with the construction program. The farming out of parts of a project to sub-contractors can lead to inconsistent quality and responsibility issues during maintenance, and is generally not recommended.

About the sponsors of this guide

AVD provides home automation consulting, design, engineering and project management services to clients in Australia, South East Asia and the USA. The company pioneered audio visual control systems in Australia in the late 80s, and they're still leading the way with award-winning home automation projects.

To make it easier to create intelligent environments in new homes, AVD provides home owners, architects, builders and interior designers with an end-to-end home automation solution.

Their specialist skills include developing scopes of work, design, engineering, documentation, project management, installation, commissioning and on-going support.

AVD relieves the burden of juggling the countless tasks associated with creating a smart home. When AVD looks after the complexities of the project there are fewer problems, the work is streamlined, and ultimately a better and more cost-effective result is achieved.

Project Connection is an electrical contracting company that works almost exclusively on home automation projects. The company has been installing smart home systems since the technology was introduced in Australia in the early 1990s.

Their hard-won experience gives clients the confidence they'll get it right the first time. Project Connection's experienced team of electricians are fully trained and accredited installers for all the products they use. And all their work is guaranteed.

Project Connection works with architects and builders to create intelligent environments in new homes to the most exacting requirements and tastes. They also provide assistance to other electrical contractors when a project involves areas outside their fields of expertise.

For more information

To find out more about AVD, visit www.avd.com.au or call **+61 2 9906 2424**.

To find out more about Project Connection, visit www.project-connection.com.au or call **+61 2 9439 9111**.