Printer Policy

Policy Statement

This policy is written in response to the drive for sustainable printing resources in the light of both the University's Strategic Plan and its environmental agenda. Printers represent the second highest office and laboratory IT equipment expenditure, after desktop PCs, and are yet often the least considered purchase.

Aims

This policy is intended to help reduce energy consumption due to ICT (equating to 33% of the University's total energy consumption), contribute towards the University's Carbon Reduction Target (currently the University emits 1,329,441 kg of CO_2 per annum) and play a key part in helping reduce consumable waste such as paper, ink and toner cartridges, transfer kits and imaging drums thus effectively reducing the total cost of printer ownership; supporting the University's Strategic aims.

The policy also aims to reduce the number of different toner cartridge types, reducing administration and storage.

Drivers for this Policy

Printing is an essential function in both the administrative and the pedagogical functions of the institution, yet historically it has not been closely governed and has led to unnecessary costs and waste generation.

In the last academic year, to July 2010, the University has increased the number of toner and cartridge types to over 290, with a resultant replacement expenditure approaching £124,000. Also, with an annual consumption of 26,000 reams of paper at current usage, we consume in excess of £60,000-worth of paper per annum

This policy also contains as an appendix the technical background of various print methods and thereby the rationale for the policy itself.

Application

This policy applies to all staff and students of Canterbury Christ Church University.

1 Staff Printing

1.1 Computing Services Department will no longer provide individual desktop printers of any type unless it can be proven to be critical to the pedagogical or business processes of the University. In the event of a dispute the final decision will be made by the Department Head and Head of Computing Services. .

1.2 All members of staff will normally only be connected to the nearest available Workgroup printer or networked Photocopier/printer which will be capable of reproduction speeds of up to 100 pages per minute. This significantly reduces the Total Cost of Ownership (TCO), reducing both energy consumption and consumables usage.

1.3 Staff should not be printing very large documents or very large numbers of copies of documents locally. This is more economic and efficient to be sent to Reprographics.

2 Exceptions

2.1 The following are the exceptions where a local printer will be supplied.

2.2 Disabled employees may be entitled to an individual desktop printer if walking to the nearest Workgroup printer proves difficult for the employee; however this is subject to confirmation by the University's Occupational Therapist.

2.3 Senior members of the University Management team will be supplied with a small local printer for printing confidential material. This may be installed in their PA's office if this fits better with their working methods.

2.3.1 Other members of staff who have significant confidential printing needs may choose to purchase a local printer via departmental funds. This will be reviewed with the development and application of "pull printing technology" throughout the University.

2.4 Where the only location for a networked workgroup printer/copier is a significant distance from an office then local printers may be supplied or purchased. They must be only used for small amounts of printing as the cost per page is significantly higher. Multiple copies or larger documents should still be sent to the workgroup printer.

2.5 Printers must not be purchased or installed outside of this printer policy unless further specific needs are identified and approved by the Department Head and Head of Computing Services.

3 Printer Configuration

3.1 All Workgroup or Photocopier/printers will be networked and will be a minimum A4 duplex monochrome type.

3.2 All Workgroup or Photocopier/printers will be purchased with a minimum 3year Support contract or on-going maintenance contract.

3.3 All printers (wherever possible) will be set to produce double-sided copies (duplex) by default, thereby reducing the consumption of paper by up to 50%. No new standard (A4 B&W) printers will be purchased that cannot print duplex.

3.4 All printers, wherever possible, will be set to a resolution no higher than 600dpi, reducing toner use, airborne particulate matter, and also enabling faster print throughput.

3.5 All printers will be set to use the best power saving option available to reduce energy consumption; although care should be taken to turn off printers ONLY in the prescribed fashion as costly damage can result.

3.6 All printers will be networked wherever possible and not directly connected to a PC.

4 Funding

4.1 Computing Services will fund any capital costs of providing a printer under sections 1 and 2 of this policy.

4.2 Printers purchased from Computing Services funds will be part of the standard 5year replacement cycle operated by Computing Services.

4.3 The department(s) will be responsible for all on-going recurrent costs of running any printer or photocopier supplied.

4.4 All consumables (including but not limited to toner, drums, transfer kits, pickup rollers, fuser units and paper) used in staff printers are the responsibility of the individual Department in which they are used.

4.5 Where a printer is not provided by Computing Services a Department may choose to purchase a printer from their own funds, or bid for IT capital funding. The purchase can then be made by completing a Purchase Order Requisition (POR) and forwarding this to Computing Services Administration for purchase. Only Computing Services purchase such equipment to ensure the best terms, i.e. quality, delivery, price and support, for purchase are obtained.

4.6 Printers purchased by individual Departments (with their own budget or IT capital funding) will not be automatically replaced. In the event of a problem with such a printer rendering it Beyond Economic Repair (BER) or at the end of its life, separate funding by the Department will be required to enable the purchase of a replacement.

4.7 All Workgroup or Photocopier/printers must be purchased with a minimum 3 year Support contract or on-going maintenance contract.

5 Colour and larger format printing

5.1 Colour printers are responsible for the largest usage of printer consumables as they usually require four toner cartridges and a transfer unit to produce an image. Their numbers will therefore be kept to a minimum whilst allowing adequate accessibility to colour printing for all staff and students.

5.2 We will aim that all staff will have access to a colour printer and an A3 printer. However, this will not exceed one colour / larger format printer per area or building and will normally be via access to a remote networked colour copier/printer wherever possible.

5.3 Other colour and larger format printers will only be purchased where there is a proven pedagogical or business need and provision of adequate funding via an appropriate IT Capital request or departmental funding.

6 Student Printing

6.1 Student printing will, where possible, be to combined networked printer/photocopiers controlled via smart card.

6.2 All students will have a printing account and this account will be debited accordingly for every print or copy made

6.3 Every student will receive £12.50 of print credit at the start of their course. Every registered student will receive a further £12.50 of print credit each September.

6.4 Further credit may be purchased either online or via a kiosk.

6.5 The costs per page for printing in monochrome and in colour together with the cost of purchasing print credits will be clearly displayed on the Computing Services website.

7 Disposal of Printers

7.1 Statutory Instrument 2006 No.3289, the Waste Electrical and Electronic Equipment Regulations, requires that the University disposes of its electrical and electronic waste in a controlled way through licensed disposal companies.

7.2 Computing Services will take responsibility for correct legal disposal of all printers supplied under sections 1 and 2 of this policy.

7.3 Departments who purchase their own printers are responsible for ensuring their correct and legal disposal at end of life.

Effective date

The effective date of this policy is 1st January 2009.

Document control/change history

Version	Author(s)	Date	Circulation	Comments
0	DC		Internal	Multiple internal drafts
1	DC	January 2008	ISC	Final as approved
2	IE/DC	January 2009	CCCU	Revised after use for first year
3	DC	January 2012	CCCU	Revised with latest statistical info.

Appendix – Rationale

Printer types

Laser printers

Laser printers are of two main types; light emitting diode (LED) and infrared (IR) laser. Both types use the same electrostatic method[1] of Raster Image Processing (RIP) requiring the sensitisation of a metallic drum, the photoreceptor, on which the latent image is produced and toner to act as the "ink". Toner in its early form was simply carbon powder; then, to improve the quality of the printout, the carbon was blended with a polymer. The specific polymer used varies by manufacturer but can be a styrene acrylate copolymer or a polyester resin.

LED printing is more energy efficient and requires fewer moving parts than IR laser and thereby requires less maintenance. It is, however, unable to attain the higher dots-per-inch (dpi) resolution figures of IR laser printers.

Infrared laser printers tend to be less energy efficient and require more maintenance than LED printers; however they have superior resolution employing a dot overlap system which removes irregularities in the formation of each character or image, resulting in superior overall image quality. In these printers a laser is aimed at a rotating polygonal mirror, which directs the laser beam through a system of lenses and mirrors onto a photoreceptor. The beam sweeps across the photoreceptor at an angle to make the sweep straight across the page; the cylinder continues to rotate during the sweep and the angle of sweep compensates for this motion. The stream of rasterised data held in memory turns the laser on and off to form the dots on the cylinder. The laser beam neutralises (or reverses) the charge on the white parts of the image, leaving a static electric negative image on the photoreceptor surface to lift the toner particles.

The toner is then deposited on the paper and passed between a pressure roller and a heated roller, effectively both squeezing and melting the toner onto the paper and permanently binding with it. The temperature employed in this process can be a few hundred degrees Centigrade.

Both types of printer suffer from overall mechanical limitations which reduces their maximum coverage to the smaller paper sizes[2].

Both types use the same electrostatic method of Raster Image Processing (RIP) usually encoded by Printer Command Language (PCL) to form a bitmap of the final image in raster memory.

Associated health risks

There have been a number of reports regarding the potential effects of electromagnetic radiation (EMR) on health. In many instances this is limited to the use of mains electricity and the magnetic field it produces. These fields reverse direction 50 times every second; i.e. at a frequency of 50 hertz (Hz), and are referred to as extremely low frequency (ELF) fields. The strength of the electric field depends on the voltage[3] and is present in any live wire whether an electrical appliance is being used or not. At the present time there is no evidence that exposure to such electric fields is a health hazard.

[1] Invented by Gary Starkweather of Xerox in 1969
[2] Typically A4 (210mm x 297mm) and A3 (297mm x 420mm)
[3] typically 240 Vac

Recent research by the International Laboratory for Air Quality and Health[4] has tested several makes and models of laser printer and found that 27% emitted significant levels of particulate pollution when in use. The research[5] focused on particles of less than 1µm in diameter as these are not easily filtered out by the lungs and are thereby suspected of causing long-term health problems. Old and badly maintained laser printers achieved particulate emission in similar levels to those produced by an average cigarette smoker. Toner usually employs Styrene in its formulation which is classified as a possible human carcinogen.[6]

It is therefore reasonable to make best efforts in reducing the proximity of our staff and students to laser printers and thereby also reduce the possible dangers associated with particulate emissions and EMR.

Inkjet printers

There are three main types of inkjet printer: thermal, piezoelectric and continuous inkjet. The thermal inkjet printer, also known as “bubble jet”, is usually the cheapest and relies upon small chambers in the cartridge being heated to a point where the ink temperature is sufficient to cause a steam explosion in the ink chamber forming a bubble which deposits a droplet of ink on the paper. The contraction of the bubble draws further ink supply into the chamber, ready for the next heat cycle.

Piezoelectric inkjet printers are the most widely used and use the piezoelectric properties of certain materials to change the shape of the material in response to an electrical pulse. This change of shape squeezes a droplet of ink from the nozzle allowing a wider variety of ink types to be used; however the cost of replacing the print head is significantly higher than in the other types.

The continuous ink jet printer has been in existence since the middle of the 19th century[7] and uses a high pressure pump directing ink from a reservoir through a gun body and microscopic nozzle creating a continuous stream of ink droplets. Creating an acoustic wave a piezo[8] crystal causes the stream to break up into droplets at regular intervals; up to 165,000 droplets per second may be achieved. The droplets are then subjected to an electromagnetic field; the charge upon them varying according to the deflection required; and passed through electrostatic deflection plates so that a very high degree of accuracy can be achieved. The high velocity of the droplets enables a greater distance to be achieved between the print head and the paper. Only a small percentage of the ink reaches its target; the majority of the ink falls into a gutter and is recycled into the reservoir.
Ink jet printers all have a number of significant disadvantages when compared to laser printers. The ink is very expensive, currently equating to £1500/litre, resulting in high cartridge costs. Intelligent “chips” are included in most cartridges which, when an error occurs, can cause the printing to cease until the cartridge is replaced; thereby wasting ink. The lifetime of inkjet prints produced by inkjets using aqueous inks is limited; they will eventually fade and the colour balance may change. Because the ink used in most consumer inkjets is water-soluble, care must be taken with inkjet-printed documents to avoid even the smallest drop of water, which can cause severe "blurring" or "running." Because of the high

[4] Queensland University of Technology in Brisbane
[5] led by Professor Lidia Morawska PhD
[6] by the United States Environmental Protection Agency (EPA) and by the International Agency for Research on Cancer (IARC)
[7] first patented in 1867 by Lord Kelvin
[8] Gallium orthophosphate ($GaPO_4$) or Langasite ($La_3Ga_5SiO_{14}$) - quartz analogue crystals

cost of ink and replacement cartridges third-party cartridges and inks are often used which can damage the print heads, leak, and produce inferior-quality output.

Ink jet printers are suitable, however, for large prints[9] and often achieve unbeatable photographic quality, dependant upon the media used. On the other hand they can be slow; often taking several minutes to print in high quality modes.

In comparison to laser printers they exhibit a high cost of ownership, are slow and frequently experience mechanical failure of the head positioning mechanism and feed rollers.

Associated health risks

There are no known health risks associated with the use of ink jet printers, however it is reasonable to make best efforts to reduce the proximity of our staff and students to any mains operated printers and thereby reduce the possible dangers associated with EMR.

Student printing facilities

In comparison with other university sites visited[10] the printing facilities at Canterbury Christ Church University are above average, providing good quality laser printing in both colour and monochrome at reasonable cost. A3 colour printing and colour photo-quality printing are also available to all students.

Student printing is provided in all Open Access and Computing laboratory locations in order to facilitate students in preparing coursework and work for assignments. Currently the printing is charged to the student, at cost, via the software “PCounter”. The charge will vary dependent upon whether the print is monochrome or full colour. The unit cost of colour printing, as opposed to monochrome, is approximately 4:1; due to the higher cost of coloured toner, the need for four separate colour cartridges and the additional requirement of a transfer belt or drum to lift the composite image to the imaging drum.

Student printing currently accounts for approximately 180,000 sheets of A4 paper per month, or 2.16 million sheets per annum.[11]

Staff printing facilities

The somewhat insular and separate offices across the University has historically led to the use of standalone ink jet printers with a resultant high cost of ownership, low productivity and high level of jamming, mechanical feed and print head problems with associated downtimes and customer dissatisfaction. Other solutions have involved the use of low throughput[12] monochrome laser printers which have used toner and imaging drum combinations; the replacement cost of which represents 20 - 35% of the cost of a replacement printer.

[9] *Up to A0 (841 x 1189)*
[10] *East Anglia, London South Bank, Bath, Northampton*
[11] *As at December 2007*
[12] *Commonly only six pages per minute*