

# **ICT Asset Management Plan 2012**

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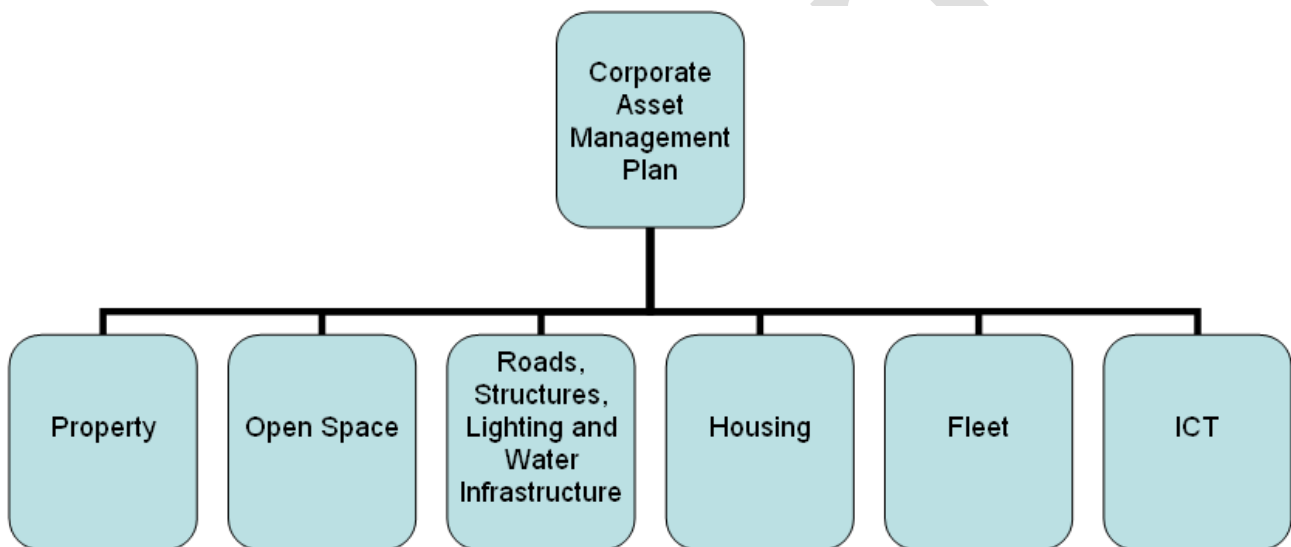
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# 1. Background

## 1.1 Role of Asset Management

1.1.1 The Council recognises that its assets are a significant and valuable resource to delivering efficient and effective services and in achieving the vision, aims and objectives of the Council. In order to maximise the potential from its assets they must be aligned with the organisation's strategic corporate goals and objectives and managed in an active, effective and efficient manner.

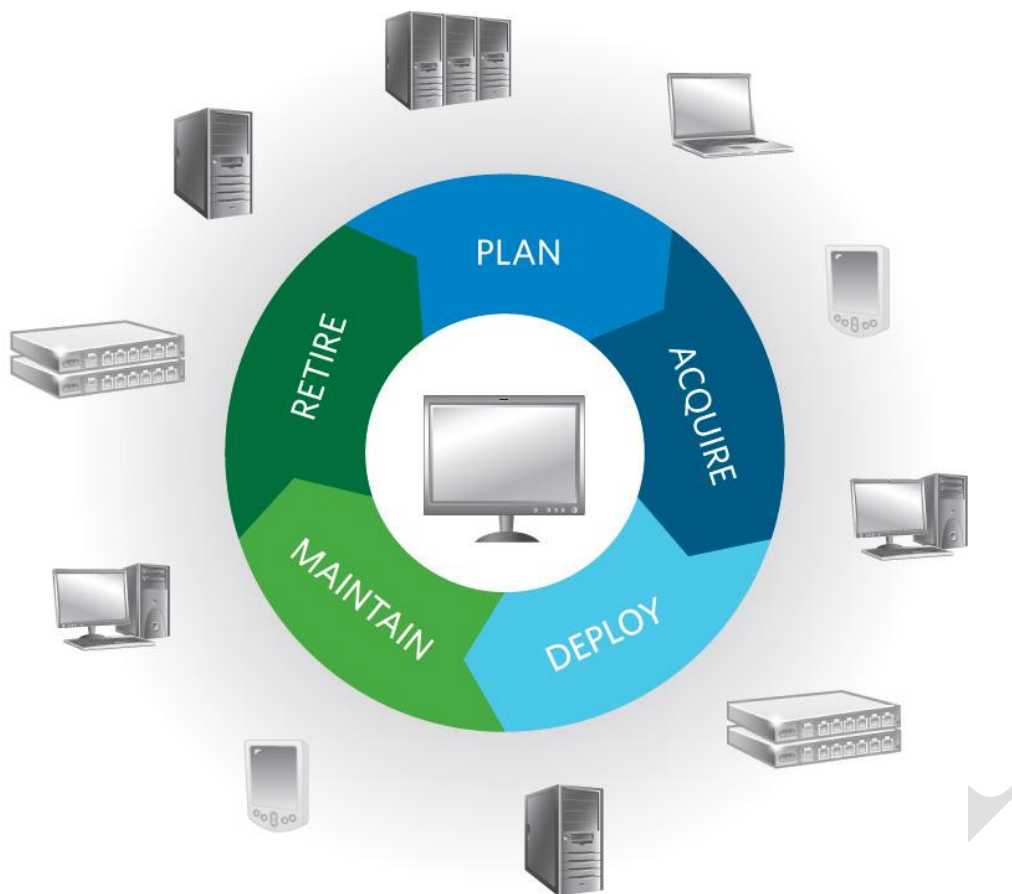
1.1.2 This is the Council's first ICT Asset Management Plan (AMP) and will be updated on annual basis to reflect changes in structures, systems and processes. This ICT AMP along with the Council's other AMPs will feed into the overarching Corporate AMP.



## 1.2 ICT Background

1.2.1 The ICT section, within Corporate Governance, Customer Service and Performance is committed to working within the Council and with its partner organisations to deliver a value for money, secure, quality service which enables business innovation through its use of ICT.

1.2.2 The following diagram identifies the main components that make up the related ICT Asset Management Process Life Cycle model. It serves as the basis for the methodology which underpins the implementation of the ICT Process Life Cycle model and, ultimately, the ICT AMP. The detailed methodology is described in Appendix A hereto.



### 1.2.3 The ICT AMP covers the following key ICT Assets:

- Data Centre and network communication facilities incorporating Server Racks, Uninterrupted Power Supplies (UPS), Generators and Air Conditioning;
- Communication Lines and network equipment including cabling, wireless access points, controllers, switches, routers and hubs;
- Telephone Systems and handsets, including mobile phones, Blackberry and other smart phone devices;
- Desktop computers, laptops and thin client devices;
- Servers;
- Shared network and local storage and backup facilities;
- Shared network and peripheral devices (printers and scanners);
- Local peripheral devices (USB memory sticks, printers, scanners);
- Enterprise Applications (Internet/Intranet presence, E-mail, Content Management, Firewall, Security);
- Enterprise Database Systems (Oracle and SQL Server);
- Enterprise Agreements, Contracts and Certificates;
- Data and Information

1.2.4 The following table provides a summary of the types, numbers and value of ICT assets across Aberdeen City Council.

Table 1: ICT Asset Types

Type	Number	Replacement Cost/ Investment Made (£)
Desktop Computers including monitors	10035 @ £350	£3,512,250
Laptop Computers	3264 @ £500	£1,632,000
Thin Client devices (Wyse terminals)	300 @ £200	£60,000
Interactive Whiteboards/Data Projectors	1250 @ £2000	£2,500,000
Network Switches	Circa 750	£450,000
Telephone Switches	220	Approx. £2,500,000
Wireless Access Points	Circa 1000	£250,000
Intersite Network Connection	350	Approx £500,000 initial installation investment.
Business Application Software	140	Approx £4,800,000
Mobile Handheld Devices, including smartphones	3206	£160,300
Physical Servers	226	£2,910,000
Virtual Servers	249	£500,000
Oracle Database Instances	31	£120,000
SQL Database Instances	157	£80,000
Security	Various protection methods deployed	£200,000
No of e-mail accounts	6000 employee including teachers	n/a
No of user accounts	10000 including pupil accounts	n/a
No of incidents and change requests per annum (2011/12)	44,507	n/a
ICT Goods and Services purchased on behalf of the Authority in 2011/12	3,314,140	n/a

## 2. Corporate Objectives and Priorities

### 2.1 Council's Vision and Asset Objectives

2.1.1 This ICT AMP follows the vision and objectives stated in the 2012 PAMP, with some appropriate amendments, including the need for all property and ICT reviews to consider the implications of the Priority Based Budget exercise.

2.1.2 To deliver our vision of 'Aberdeen – The Smarter City' we are focusing on key priorities that we have shaped around:

- The national priorities set by the Scottish Government.
- The national outcomes set out in the Single Outcome Agreement
- The constant desire to provide efficient, effective and joined up public resources
- Required assets being fit for purpose, in the right place(s), at the right time(s)

2.1.3 Within the Council's Single Outcome Agreement we have an aspiration that people who live and work in Aberdeen will:

- be well informed and actively supported to achieve their full potential
- acknowledge, and act on, their shared responsibility to shape the City's future
- support and celebrate cultural diversity, and share a commitment to social justice
- have access to services of a high quality that meet their needs

so that Aberdeen will be an ambitious, achieving, smart city that:

- Develops an economy based on knowledge and innovation;
- Encourages more efficient use of greener resource which generates a competitive economy;
- Uses technology and data to enable informed decisions to be taken;
- Enables citizens to interact in a city where there is a sense of place; and
- Encourages a form of governance which engages its citizens

Our citizens will recognize this and play their part in taking it forward. We will ensure all citizens are encouraged and appropriately supported to make their full contribution.

2.1.4 In effectively managing the Council's financial resources and assets it has further been identified that the aim is to produce a coherent balanced budget which is realistic and reflects the Council's priorities and encourages the efficient and effective use of the Council's resources, by:

#### **Budget Monitoring**

- Rigorous monitoring of spend income against budget (revenue; capital; headcount; savings programme)
- Ensure rigorous challenge of monitoring by Officers and Members
- Rigorous monitoring and review of income/charging

### **Budget Planning**

- Develop and observe a budget timetable for planning, consulting and deciding on options necessary to produce a balanced budget

### **Financial Planning**

- Develop and continuously review Medium Term Financial Plan

### **Use of Resources**

- Develop a rigorous programme of change aimed at improving the efficiency of the Council; and ensure that the programme is properly resourced and performance managed for complete and timely delivery
- Asset management strategy to be developed and implemented for the effective management of the property portfolio
- Benchmarking information used to improve decisions on effective planning and budget choices

2.1.5 In order to do this we need to:

- Identify areas where robust asset management can help support the delivery against these priorities
- Develop alignment between asset management and our strategic priorities into property strategies, plans and programmes
- Ensure that our approach to performance management is appropriately focused on priority areas

2.1.6 The above approach is being progressed as part of a Priority Based Budget project which has identified that the City Council's six key strategic priorities are:-

- Smarter Governance – Participation, acknowledging the role that citizens can play in the evolution of the city;
- Smarter Living – Quality of Life, challenging inequality and positively promoting wellbeing building cultural and physical activity;
- Smarter People – Social and Human Capital, focusing on education including lifelong learning and nurturing city of learning with a city-wide workforce which can grow and diversify the economy;
- Smarter Environment – Natural Resources, sustaining the environment by maximising the use of low carbon technology in our infrastructure and housing, and managing our waste and promoting our streetscape and green space;
- Smarter Economy – Competitiveness, recognising the importance of sustaining a competitive economy with clear financial parameters which attracts people to invest, work and export from;
- Smarter mobility – Transport and ICT, promoting the transport links to and from the city which are sustainable, and maximising digital connectivity for the benefit of all people and the development of business in the city.

### **Vision and Priorities**

Over the next five years we plan to deliver our services in a different way with a greater focus on income generation and delivering what we do in partnership with

other organisations and/or businesses. In particular we will be re-examining how we best use and manage the council's assets to both reduce costs and create income.

## **Outputs/Outcomes**

In pursuing these priorities we will contribute to the following National Outcomes:

**Outcome 1** - We live in a Scotland that is the most attractive place for doing business in Europe;

**Outcome 2** - We realise our full economic potential with more and better employment opportunities for our people;

**Outcome 10** - We live in well-designed, sustainable places where we are able to access the amenities and services we need;

**Outcome 12** - We value and enjoy our built and natural environment and protect it and enhance it for future generations;

**Outcome 14** - We reduce the local and global environmental impact of our consumption and production

**Outcome 15** - Our public services are high quality, continually improving, efficient and responsive to local people's needs.

Local Outcomes are set out in the Single Outcome Agreement approved by the Council and its partners in 2009. These are currently being reviewed and updated.

## **2.2 ICT Asset Management Objectives**

2.2.1 In designing our approach to ICT asset management we have identified the following 5 overarching aims and objectives that will seek to ensure that the Council's ICT assets are fit for purpose within the current budgetary restraints:

- ICT Assets should meet the needs of those that use them. This includes staff, members, pupils, visitors, customers and the general public through the different access channels (face to face, telephone and online). ICT Asset access needs to consider access for those with disabilities and or special needs, such as additional language support.
- ICT Assets should be economically sustainable with minimal operating costs on a whole life costing model. This means keeping running costs down, maximising existing asset use, reducing duplication and waste while planning for future capacity requirements, prioritising capital and revenue spending, proper option appraisal incorporating whole life costing and assessing opportunity costs. ICT Asset acquisition will follow evaluation and consideration of full life cycle costs and benefits appraisal.
- ICT Assets should be environmentally sustainable. This means considering local and global environmental factors, monitoring and reducing energy consumption and CO2 emissions through the whole ICT life cycle from manufacture, packaging, utilisation and disposal.
- ICT Assets must be safe, secure and comply with current legal and regulatory requirements and known future requirements. This means ensuring regular audits for DSE requirements and PAT testing of all ICT Assets, regular preventative maintenance and testing of critical ICT assets such as UPS and Air Conditioning within Data Centre and communications room facilities, compliance with WEEE regulations for electrical disposals, compliance with



software licensing terms and conditions, compliance with Data Protection Act (DPA) and Disability Discriminations Act (DDA) when designing new ICT systems.

- ICT Assets should link to the Council's strategic business objectives. This means that governance and decision making around ICT Assets are integral to the strategic planning process and managed to deliver its strategic priorities and service in line with risk, providing value for money services for the benefit of the local community.

2.2.2 Capital and Revenue spend on ICT Investment will be governed by the Corporate Asset Management Group and Enterprise Architecture Board.

To achieve objectives, the ICT Service will hold and maintain a comprehensive ICT Asset Register which will record all its ICT Assets including details of their age to enable life cycle management of its infrastructure and enable trend analysis.

Minimum details which will be recorded will be:

- Type of Asset
- Unique Asset Identifier
- Specification Description of the Asset
- Serviceability status (i.e. asset is serviceable or requires repair/disposal and/or replacement).
- Date the ICT Asset came into effect
- The initial cost of the ICT Asset
- The ongoing annual cost of the ICT Asset
- Who uses the ICT Asset
- The location of the Asset
- Details of what other ICT Assets are linked to the Asset
- How effectively the ICT Asset is supporting the business (fitness for purpose assessment)

In addition, ICT will maintain a service catalogue outlining all ICT services provided and have in place robust reporting processes to assist Council to make prompt asset related decisions regarding new or changed use of ICT Assets through the Enterprise Architecture Board.

## 3. Current Asset Management Performance

### 3.1 Section 1 - General

- 3.1.1 Historically, the ICT Infrastructure which is currently in use has grown on an ad-hoc basis through investment by individual services or through discrete projects. A rolling programme of ICT Repairs and Renewals was established in 2005 followed by a separate Curriculum PC replacement budget in 2007 through the council's non Housing Capital Programme. These programmes were combined to a single ICT Investment Programme in 2011/12, which was transferred to revenue expenditure from financial year 12/13. Priorities for investment in both new and replacement projects are prioritised against Corporate and known Service priorities. There is an unknown funding gap to maintain a program of ICT Investment.
- 3.1.2 ICT Service is a centralised service covering all services, including support of educational establishments. The current ICT service has a head count of 83 fte, after significant head reduction in 2010. Corporate Data Centre services, including server and storage management, were transferred to a Managed Service Provider in January 2011. Education server and storage management services is provided and supported in-house by ICT services. The service is heavily biased towards delivering support services including ICT purchasing and is under-resourced for delivery of transformational services and helping services use technology to deliver efficiencies.
- 3.1.3 The ICT Service supports a wide variety of individual departmental applications (departmental applications, local spreadsheets and databases). System administration of some of the Council's business applications is carried out within services. There is opportunity to review and consolidate business and desktop applications
- 3.1.4 The ICT Service has recently appointed an analyst with responsibility for reviewing ICT training needs through trend analysis of calls raised through the ICT Service Desk (also commonly known as the ICT Helpdesk). The objective of this is to help move ICT support mechanism from ICT demand to self-support.
- 3.1.5 The ICT Service has Service Level Agreements for ICT Service Delivery with a number of services including details of all ICT Assets for that Service being supported and delivered by ICT.
- 3.1.6 The ICT Service operates an ICT Account Manager function as single point of contact for departmental liaison.
- 3.1.7 The ICT Service operates a centralised ICT Service Desk between 08.30am to 5pm Monday to Friday to record and workflow all requests for incident and problem management, and changes to ICT services. An out of hours Service Desk operates through our Managed Data Centre provider to record all incidents and resolve server related incidents within their control.
- 3.1.8 The ICT Service is working towards implementing ITIL Best Practice Framework. All job descriptions and processes are created using this. Overview training on the

Framework was carried out in 2008 but has not been extended due to limited budget. A comprehensive programme of staff training needs to be completed.

3.1.9 To date, ICT Assets have been recorded in a number of different spreadsheets and systems. Automated tools are used to gather information on installed desktop computer software for compliance.

## 3.2 Section 2 - Condition Survey info

3.2.1 **Desktop Computers, Laptops and Thin Client Devices.** There are a large number of ageing desktop and laptop computers across both corporate and educational establishments. Introduction of Virtual Desktop Environment (VDE) can extend the lifespan of desktop computers and laptops computers working wholly in a VDE environment. For those devices which require to operate in a non-VDE environment, the devices need to be replaced every 4 years or as and when any new application or operating system requirement requires additional memory and/or processing power. Desktop and laptop computer operating system standard is currently Microsoft Windows 7 EnterpriseProfessional. Table 2 below shows desktop and laptop estate by age to show level of ICT investment required to refresh the estate to be fully supported in a Microsoft Windows 7 EnterpriseProfessional environment. Information is continuing to be gathered and evaluated to determine how many of these will be able to continue to operate in a VDE environment. In this case, the devices will be replaced by thin clients if there is any hardware malfunction. VDE is currently not viable in the curriculum environment. Based on current ICT Service Desk call analysis, there are on average 200 PC hardware failures per annum. Desktop and laptop computers are purchased through Procurement Scotland agreement, which is auctioned every 12 – 18 months. This provides stability of build at component level thus reducing installation and support costs over the life of the device.

Table 2: Summary of Client Device Estate (PC and Laptop)

Type of device	Age	No of devices	Suitable for Windows 7
Corporate Desktop computers	> 4 years	3195	No
Corporate Desktop computers	2 – 4 years	355	Some
Corporate Desktop computers	1 – 2 years	308	Yes
Corporate Desktop computers	0 – 1 years	142	Yes
Corporate Laptop computers	> 4 years	461	No
Corporate Laptop computers	2 – 4 years	187	Some
Corporate Laptop computers	1 – 2 years	87	Yes
Corporate Laptop computers	0 – 1 years	322	Yes

Curriculum Desktop computers	> 4 years	3135	No
Curriculum Desktop computers	2 – 4 years	1454	No
Curriculum Desktop computers	1 – 2 years	988	Yes *
Curriculum Desktop computers	0 – 1 years	923	Yes *
Curriculum Laptop computers	> 4 years	1088	No
Curriculum Laptop computers	2 – 4 years	1197	No
Curriculum Laptop computers	1 – 2 years	99	Yes *
Curriculum Laptop computers	0 – 1 years	123	Yes *

\* while these models are suitable for using Windows 7 operating system, curriculum server and storage environment currently primarily uses RM CC3 curriculum network software which does not support Windows 7 clients. (See section 3.2.9 Server)

**3.2.2 Network switches, hubs and routers.** Through investment in previous financial years, these ICT Assets are generally fit for purpose, with equipment on lifetime warranty basis. A small stock of spares are retained to allow for faulty equipment to be swapped out and returned for repair. Within corporate environment these are standardised to HP range of equipment, while within the curriculum environment this is standardised to CISCO range. Equipment is re-utilised through property and schools estates rationalisation projects and ICT investment only required where additional buildings are added to the Council's property portfolio.

**3.2.3 Telephone Switches.** ICT investment through the ICT rolling programme, 3Rs schools estate building programme and Marischal College works means that the majority of the Council's telephone switches in major office accommodation and a proportion of those within educational establishments are fit for purpose and enabled for VOIP. The exceptions to this are Central Library, Spring Garden and Kittybrewster and Mastrick location telephone switches. These will require replacing or upgrading within the next 2 years to allow the Council to take advantages in voice communications technology to meet business efficiencies through the use of unified communications. In addition, various smaller telephone switches will be required over a rolling programme of replacements. Investment required is shown in Table 3 below.

Table 3: Telephone Switch Replacements

Site	Size of Telephone Switch	Estimated cost of Replacement/Upgrade
Central Library and Art Gallery	Up to 150 users	£85K
Spring Garden	Up to 100 users	£60K
Kittybrewster	Up to 350 users	£100K
Mastrick sites	Up to 150 users	£60K

Individual sites, including schools	Vary from 15 – 200 users	Vary from £5K to £25K depending on site
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3.2.4 **Interactive Whiteboard and Data Projectors.** The Council has invested significantly through Capital funding in 2009/10 and 2010/11 in the installation of interactive whiteboards with associated data projectors to support its learning and teaching environments and to facilitate sharing of information through electronic presentation. Whiteboard assets are purchased with a 3 year warranty and it is anticipated that the lifespan of this equipment is around 7 years. A high proportion of whiteboards and projectors fall out of warranty from October 2012, and any repairs or replacements will require to be funded from revenue. This is revenue budget which is not currently provisioned. Indicative quotes have been provided for a support contract to cover all Whiteboards and Data Projectors at a cost of around £80K per annum. The situation will be closely monitored from October 2012 and business case for funding will be developed if it is seen that a support contract is essential.

3.2.5 **Internal Wireless LAN Connectivity.** To meet Council's objective for more mobile and flexible working and learning, and to support the anticipated demand of Bring Your Own Device (BYOD), the Council has invested in the implementation of internal wireless technologies within major Council office accommodation and educational establishments. Significant investment is required to complete installation in all educational establishments. Table 4 below shows those sites where Wireless connectivity is already available for connection and whether the sites allow public access as well as connection for Council approved devices. Table 5 shows those sites where wireless connectivity has been identified as a requirement and the level of ICT investment required to achieve this.

Table 4: Sites with managed wireless access available

Site	Access for ACC Owned Devices and approved guest access	Public Access
Marischal College	Y	N
Town House	Y	N
Kittybrewster	Y	N
Crown House	Y	N
Spring Garden	Y	N
Central Library	Y	Y
Cults Academy	Y	Y – only in library
Bucksburn Academy	Y	Y – only in library
Oldmachar Academy*	Y	N
Heatheryburn Primary	Y	Y – only in community wing
Hazlehead Primary	Y	Y – only in community wing
Mile End Primary	Y	Y – only in community wing
Seaton Primary	Y	Y – only in community wing
Manor Park Primary	Y	Y – only in community wing
Braehead Primary	Y	Y – only in community wing
Hanover Street Primary	Y	N
Kaimhill Primary	Y	Y – only in community wing
Airyhall Primary	Y	Y – only in community wing
Walker Road Primary (partial)	Y	N
Gilcomston Primary	Y	N
Kingswells Primary	Y	N
Woodside Primary	Y	N
Cults Primary	Y	N
Dyce Academy	Y	N
Kincorth Academy	Y	N
Harlaw Academy	Y	N
Bridge of Don Academy	Y	N
Central Library	Y	Y
Kittybrewster Store	Y	N
Whytemyres OT Store	Y	N

\* This site was one of the first sites for wireless technology to be installed and refresh of the central controllers is scheduled through ICT Investment in 2012/13 for compatibility with all other sites.

Table 5: Sites with no managed wireless availability

Site	Funding Approved	Anticipated Costs (K)
Aberdeen Grammar School	Y	40K
Torry Academy	Y	30K
Northfield Academy	Y	30K
St Machar Academy	Y	40K
Riverbank Primary	Y	15K
Greenbrae Primary	Y	15K
Scotstown Primary	Y	15K
Middleton Park Primary	Y	15K
Forehill Primary	Y	15K
Danestone Primary	Y	15K
Stoneywood Primary	Y	15K
St Peters RC Primary	N	15K
Bramble Brae Primary	N	15K
Holy Family Primary	N	15K
Dyce Primary	N	15K
Fernielea Primary	N	15K
St Josephs Primary	N	15K
Hazlewood Special	N	15K
Abbotswell Primary	N	15K
Ashley Road Primary	N	15K
Charleston Primary	N	15K
Cornhill Primary	N	15K
Culter Primary	N	15K
Ferryhill Primary	N	15K
Glashieburn Primary	N	15K
Kingsford Primary	N	15K
Kirkhill Primary	N	15K
Kittybrewster Primary	N	15K
Loirston Primary	N	15K
Muirfield Primary	N	15K
Newhills/Bucksburn Primary	N – to be done in conjunction with new school	15K
Quarryhill Primary	N	15K
Skene Square Primary	N	15K
Tullos Primary	N	15K
Westpark Primary	N	15K

**3.2.6 Intersite Network Connections.** A register of leased lines is maintained with annual recurring costs over a number of suppliers (BT, Cable & Wireless, O2, Capita and IFB). Significant investment has been made to implement a core meshed wireless network for educational establishments. The design was created to reduce resilience on single links and reduce annual running costs from traditional leased line circuits. This has worked for the majority of educational establishments

and reduced annual recurring costs by £100K in financial year 2012/13 but a number were not suitable for this technology. Until a prolonged period of operation has been in place and any lessons learnt, this technology will not be extended for corporate sites. In the meantime, there are a number of key network links which have been identified as single points of critical ICT service delivery for which additional resilient links should be considered. Table 6 below identifies these connections. An options appraisal needs to be carried out to determine level of investment going forward for all network connectivity.

Table 6 Vulnerable network connections with single point of failure

Site A	Site B	No of users affected
Balgownie One	Town House	300
Kittybrewster	Town House	350
Tullos Primary School	Town House	Telephony DR Site
West Tullos Roads Depot	Town House	Up to 70

**3.2.7 Application Software.** ICT maintains an ICT Applications Software Register and carried out a fitness for purpose audit in summer of 2011. This audit highlighted a number of applications which were not performing to their maximum potential. A further exercise is to be carried out to identify where applications can be consolidated and rationalised to reduce recurring support costs. This is a priority activity to identify potential level of ICT investment required. The Council currently uses either Oracle or SQL Server database as its preferred underlying database. As part of the application review, a review of the backend database will be undertaken to optimise costs for licensing and support. During the year 2012/13, a major program of work (Nevis Programme) to upgrade the Council's e-mail and office productivity tools to Microsoft Exchange and Microsoft Office 2010 will be carried out.

**3.2.8 Mobile Devices.** The Council approved at its Finance & Resources Committee Meeting in March 2012 to extend its current Vodafone contract for mobile devices, including Blackberry and smart phones until June 2014. As part of its ICT Asset Management plan actions, the service will be working towards maximising benefits included within the Vodafone agreement, challenging usage costs of mobile devices and ensuring accurate billing information is processed timeously.

**3.2.9 Servers.** Corporate servers were refreshed or planned to be refreshed through the Council's Managed Data Centre contract with Atos. Prior to the Managed Data Centre, the Council had invested significantly in the use of server virtualisation technologies to reduce the number and environmental impact of server hosting. This has been continued through the Atos contract. Within the educational environment, servers are hosted locally within schools. With the exception of those implemented within the 3Rs programme of works, all are now over 3 years old, are running operating system which is no longer supported by Microsoft, and are constrained in local storage resources. A significant investment to refresh and rationalise schools server estate is required to ensure that these are fit for purpose for the next 5 years. An options appraisal for this requirement, including an



analysis of ongoing storage requirements for schools, is due to be completed in late December 2012 to identify level of investment required for financial year 2013/14.

**3.2.10 Storage.** Prior to the Council's Managed Data Centre contract with Atos, centralised storage and backup facilities had been implemented using EMC SAN technologies and Netbackup backup software. These were due for refresh in 2010/11 and refreshed to Hitachi SAN technology and upgraded Netbackup software as part of the move to the Managed Data Centre. This is a shared storage facility used by a number of Atos clients. As part of its ICT Asset Management plan, Council needs to consider level of investment to increase capacity within the lifetime of this contract for corporate business as storage needs expand as records of video, sound and pictures are captured. This requirement is even greater within the educational environment as pupils use technology for creating their personal e-Portfolios through their learning experience from P1 to S6. A long term strategy for storage needs to be reviewed and determined. It is likely that emerging cloud based storage solutions may be appropriate for most data. A sound records management, and information governance model needs to be introduced to ensure that we are capturing, recording and retaining (and disposing) of electronic information to meet business requirements within legislative requirements.

**3.2.11 Security Systems.** The Council has invested significantly in technology to minimise the threat of electronic attack through the introduction of anti-virus, anti-malware, encryption, intrusion-prevention protection and detection at strategic points within the infrastructure, with different layers of technology. There is a continuing need to review threats and keep subscriptions for appropriate ICT Security Assets in place to minimise threats and ensure compliance with GSX code of connection and PCI DSS regulations for cash and credit transactions. Table 7 below identifies current security measures that are funded through ICT Revenue budgets. Table 8 identifies security initiatives approved through ICT Investment fund for 2012/13.

Table 7: Current ICT Security Systems

Description	Annual Cost	Notes
Corporate Gateway – anti-virus/anti-malware	£12K	
Corporate Gateway – internet filtering	£45K	
Corporate Gateway – Intrusion Prevention and Firewalls	£12K	
Corporate Client – anti-virus/anti-malware	£11K	Consideration to be given to replacement with Microsoft tools provided with Microsoft Enterprise Agreement
Corporate Client – endpoint encryption	£6K	To be replaced with Microsoft Enterprise Agreement tools (from September 2012)
Education Gateway – internet filtering	£13.5K	To be upgraded with Education Gateway Security ( Unified Threat

		Management)
Education Gateway – anti-virus	none	No gateway anti-virus – only via client. consideration to be done through Education Gateway Security (Unified Threat Management) Covered with gateway
Education Gateway - Firewall	£3.5K	No Intrusion Prevention
Education Client – anti-virus	£17.5K	Consideration to be given to replacement with Microsoft tools provided with Microsoft Education Subscription Agreement or with improved Education Gateway security

Table 8: Proposed Additional Security Measures 2012/3

Description	Investment and Anticipated annual costs	Notes
Education Gateway – Intrusion Protection and Internet Filtering	Capital £60K – Annual revenue - £10K	Scheduled 2012/13 ICT Investment. Required to facilitate access for mobile devices from educational establishments. Replaces current education internet filtering solution
Mobile Device Management Solution	Capital Annual Revenue	Scheduled 2012/13 ICT Investment Enables control of mobile devices, whether Council or Employee owned (Bring your Own Devices (BYOD)

### 3.3 Section 3 – Maintenance and Key Performance Indicators (KPIs)

3.3.1 Corporate Governance, Customer Service & Performance spends approximately £3.5M per annum on maintenance support and services including line rental charges for corporate voice and data network, security services, software licences and application support. In addition other Council Services spend an additional £2.3M from service budgets on ICT maintenance support and services.

3.3.2 There are no statutory KPIs for ICT Assets. However a number of the standard SOCITM Performance Indicators are measured and monitored through Corporate Policy & Performance Committee. A Benchmarking Service can be purchased from

SOCITM to compare these figures with other local authorities but to date this has not been used. Those that are routinely measured are:

- Cost per unit Workstation
- % Employees with Remote Access to Council network from non council premises
- % server availability

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## 4. Key Challenges and Achievements

### 4.1 Key Challenges

- 4.1.1 There is a continuing requirement to increase efficiencies and deliver more for less. Each ICT Asset must be used to its maximum potential and obtain maximum value and return on investment. We must therefore Maximise use of corporate systems and services and decommission of underused and/or under performing assets, maximise license usage and redeploy or cancel licences and support to recoup savings on licence contracts.
- 4.1.2 In order to support ICT Asset decisions around business requirements, we need to develop a cross-service Enterprise Architecture Governance framework, incorporating existing PMO processes and ICT Account Managers, also taking cognisance of the Scottish Local Government ICT Strategy, Scottish Public Service Network requirements and Aberdeen City Council's own ICT strategies.
- 4.1.3 There is a requirement to ensure that ICT Asset records are accurate and up to date to help deliver support and make informed business and financial decisions. This can be resource intensive and there needs to be a cultural shift to ensure that individual users take responsibility for checking status and reporting changes in their use of ICT Assets. Linking and maintaining ICT Assets to employees and pupils is required to enable this.
- 4.1.4 As the Council seeks to maximise its limited corporate office accommodation, and reduce spend on property assets, the ICT Assets must be able to support mobile and flexible working which is required to facilitate this. This will require an investment in VOIP and Wireless technologies.
- 4.1.5 Through the consumerisation of ICT and the increasing use of Smartphones, iPads and android tablet equipment, the Council's ICT Assets must embrace this and seek ways to enable staff to make use of such devices, including potentially their own personal equipment, to access Council services in a secure way. This will require investment in additional network security and resource to manage its introduction in a controlled, secure manner.
- 4.1.6 Having achieved a rationalisation of server and storage ICT Assets in the corporate environment, education establishments individually have servers and storage. There are potential savings if these were rationalised and an options appraisal is required to assess the options going forward, including rationalisation of the underlying authentication services to the ICT services.
- 4.1.7 As the world uses more photo and video within their normal working operating environment, this puts a strain on existing storage. This is particularly relevant in the educational establishments where pupils are expected to keep an ePortfolio of their work through their school life. While short term local storage options can be purchased, this does not address long term storage requirements of the Council and introduces potential risks associated with loss of control of data. All local external storage requires to be encrypted to minimise this risk. An options appraisal is required to assess options and provide recommendation for investment.

- 4.1.8 Furthermore there is a continuing challenge to have better governance of and intelligent reporting from Council's electronic records. The Council uses and has access to a number of different document management and reporting tools, and needs to consider how best to maximise usage of these tools.
- 4.1.9 There is a continued requirement to meet various Government security standards including PCI DSS compliance for credit transactions and GSX compliance for Government secure e-mail and internet services, which places constraints on how ICT Assets can be configured and managed, and from time to time require additional ICT security assets to be purchased.
- 4.1.10 Risks from electronic threats continue to be high, and there is a continuing need to operate preventative measures on our ICT Assets such as intrusion prevention, internet access controls, operating system and application patching and anti-virus and anti-malware protection, detection and cleansing.
- 4.1.11 The Council has recently entered into a Microsoft Enterprise Subscription Agreement, which will facilitate an upgrade to its Email and Desktop productivity applications. This coupled with the implementation of Virtual Desktop Environment is intended to provide a more flexible desktop service with standardised software and more efficient application deployment and licence control. This is required to be implemented fully by February 2013.
- 4.1.12 The Council needs to consider how to provide ICT data centre facilities at the end of the existing Managed Data Centre contract in January 2016. Options could be continuing and retendering for managed data centre, co-location of facilities within either public or private sector data centre, shared services with other public sector body or building and managing its own data centre facilities. Regardless of the preferred option, there is likely to be a requirement for significant investment in either Capital or Revenue at this time.
- 4.1.13 As the Council transforms and moves its transactional services from traditional services to web and telephone services as a way of meeting customer demand, and achieving cross Council efficiencies, this will have an impact on its ICT Assets particularly on requirement for better systems integration.
- 4.1.14 While there has been an established ICT Rolling Programme (now ICT Investment Fund) for some years, the level of funding constrains what can be achieved within the programme.

## **4.2 Achievements**

- 4.2.1 To date, ICT Assets have been recorded in a number of different spreadsheets and systems, and a priority is to review how and where our Assets are recorded, and the processes in place to keep the information accurate and up to date. Automated tools are used to gather information on installed desktop computer software for compliance purposes.

- 4.2.2 A successful program to rationalise and consolidate corporate Wintel server estate has been completed which reduced power and CO2 emissions and floor space requirements.
- 4.2.3 Core meshed wireless network to link educational establishments to the internet and Council services has been completed. This has been extended to some corporate sites where applicable.

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## **5. Delivery Arrangements**

### **5.1 Customer Service and Performance – ICT Service**

ICT Asset Management responsibility is delegated to the ICT Section of Customer Service and Performance. The ICT Service is fronted by an ICT Service Desk as a single point of contact for all ICT queries. In addition there are two ICT Account Managers who act as point of escalation for any ICT queries and who will work with services to ensure that their business requirements are worked through to ICT technical implementation, where required. Where a business requirement requires new ICT Capital investment then this will be put forward to the Corporate Asset Group for funding.

### **5.2 ICT Service Delivery reports for Asset Management**

- 5.2.1 Service Desk Support Reports – KPI performance and SLA performance reports are regularly produced. This information is used to identify common faults and repeat failures.
- 5.2.2 New Starts and Leavers Reports – a report from the HR system is distributed to ensure that access to departmental systems is ceased or changed as appropriate, that any licences are redistributed and/or telephone and network connections are cancelled.
- 5.2.3 Customer Satisfaction Survey – a customer satisfaction reporting mechanism which was in place for random selection of service desk incidents ceased due to limited resources in 2010. ICT services are however included in wider Corporate Governance Customer satisfaction which is done on a bi-ennial basis.
- 5.2.4 Major Incident Reports are produced and shared when a major incident takes place to establish lessons learnt and identify recommendations to prevent incidents recurring through asset replacement, training, procedural change etc.
- 5.2.5 Internet Monitoring – bandwidth reports are produced regularly to ensure that business usage not impacted negatively by any personal usage. ICT Acceptable use allows 15 mins per day personal internet usage, and ad-hoc reports to line managers to review individual staff usage are issued on authorised request.
- 5.2.6 Reports from Asset Register are produced for Service Level Agreements with other services and trusts.
- 5.2.7 Centralised software library where media is stored and recorded.

### **5.3 ICT Service Management**

- 5.3.1 The ICT Service Management Team meets on a weekly basis. This group reviews and approves operational changes to existing ICT Assets, reviews and approves major incident reports and takes action on the recommendations arising from these reports. The ICT organisational structure is featured at appendix B.

## **5.4 Enterprise Architecture Board**

5.4.1 The Head of Customer Service & Performance will chair the group with the following officials representing each Service:-

- Head of Procurement, Corporate Governance
- Head of Environment Services, Housing & Environment
- Head of Regeneration and Housing investment
- Head of Planning and Sustainable Development
- Head of Adult Services
- Head of Educational Development, Policy and Performance
- ICT Account Manager, Corporate Governance, Social Care & Wellbeing and Housing & Environment
- ICT Account Manager, Education, Culture & Sport, Enterprise Planning & infrastructure and Office of Chief Executive
- Senior Programme Manager, PMO
- Enterprise Architect (post subject to approval)

5.4.2 The group will meet on a bi-monthly basis, with support coming from ICT Enterprise Architect and ICT Technical teams. The group will also meet between regular meetings as and when ICT Enterprise Architecture decisions have to be made.

## **5.5 Corporate Asset Group**

5.5.1 The Head of Asset Management & Operations continues to chair the group, with the following officials representing each Service:-

- Head of Finance, Corporate Governance
- Head of Environment Services, Housing & Environment
- Head of Regeneration and Housing Investment
- Head of Service, Office of Chief Executive
- Head of Customer Service and Performance
- Head of Adult Services
- Head of Educational Development, Policy and Performance
- General Manager, Asset Management

5.5.2 The group meets on a monthly basis with support coming from the Asset Management Team.

## **5.6 Partnership & Collaboration**

5.6.1 Where possible, ICT Assets are purchased through Procurement Scotland frameworks. This contributes to maximum buying volumes for all public sector bodies within Scotland.

5.6.2 Where no specific framework exists, ICT will work in collaboration with Central Procurement Unit to ascertain if there are any other public sector with a similar requirement and partner for joint procurement.



5.6.3 Customer Service & Performance Service is a member of SOCITM and actively participates in SOCITM through regular meetings and ICT consultations.

## **5.7 Communication**

5.7.1 The ICT Service Desk uses the Council's intranet pages to communicate maintenance periods. ICT Account Managers maintain electronic distribution lists of system owners to advise and communicate on ICT maintenance and support.

5.7.2 Frequently asked questions and Advice and Guidance notes on the use of Council's ICT Assets are published on the Zone on an ad-hoc arrangement.

5.7.3 Quarterly security advisories are published on the Zone.

5.7.4 ICT Account Managers meet regularly with Business representatives to review SLA performance, and ongoing changes to ICT Assets.

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## 6. Investment Planning

### 6.1 Capital

- 6.1.1 Capital Bid for £3M funding for refresh of corporate server, storage and backup infrastructure within Data Centre facilities has been submitted to the Corporate Asset Management Group for 2015/16 onwards to continue ICT Service delivery beyond the current Managed Data Centre contract.
- 6.1.2 Capital bid for £5.7M funding for significant ICT Investment to support transformation of Corporate Governance services to the Council has been submitted through the Corporate Asset Management Group. Bids are being considered for 2015/16 onwards, although transformation to deliver savings identified through PBB needs to be delivered from 2013.14 onwards.
- 6.1.3 Investment for refresh of items included within this ICT AMP have previously been funded through Capital ICT Rolling Programmes. Corporate Asset Management Group agreed that this rolling programme be changed to a revenue budget as from April 2012.

### 6.2 Revenue

- 6.2.1 Revenue funding for £1.1M is available for ICT Investment rolling programme. Allocation of spend from this budget was approved at Finance & Resources Committee, with identified reserve items to the value of £625K should additional funding become available.
- 6.2.2 Priority investment arising from this ICT AMP has identified projects to the value of £1.6M. This includes all identified reserve projects from 2012/13.
- 6.2.3 There is currently revenue across all services to the value of £1.6M on WAN network connectivity, and fixed and mobile telephony calls and rental.
- 6.2.4 There is currently £3.5M revenue within ICT to fund annual hardware, software and ICT services arranged on behalf of the Council by ICT.
- 6.2.5 In addition other Services currently have revenue funding to the value of £2.3M against ICT supplies and services budgets. This funding is generally used for service specific application software licence, support and maintenance, and fixed and mobile telephony calls and rental.

## 7. Performance Management

### 7.1 Performance Management

An informed organisation collects high quality information on context, activities and results; analyses it to expose issues or opportunities; and presents informed options to decision-makers internally, and candid assessments of plans and performance externally. Without high quality information, organisations will not be well placed to respond to the immediate challenge of cuts to funding and longer-term challenges of providing sustainable high-quality public services and creating the right climate for economic growth.

Option appraisal is crucial to ensure organisational interventions are fully informed and based on robust evidence. The core method of economic appraisal, cost-benefit analysis, has been designed to inform comparison between options for government interventions, recognising that in the public sector appraisals need to go beyond traditional financial analysis, and pick up broader social, environmental and economic effects which may not have ready market values. Appraisal techniques can be applied at project or programme levels, and have particular value when there is pressure to reduce costs while minimising effects on front line services or the wider economy.

There are no statutory performance indicators relating to ICT Assets. However, there are a number of factors such as cost, usage, availability, sufficiency (demand) and accessibility that can be measured and monitored to assess how the Council's ICT Assets are performing.

### 7.2 Performance Measures

#### 7.2.1 Costs:

The following cost measures will be considered:

- ICT revenue expenditure as a % of all revenue spend
- Annual Capital expenditure on ICT Assets
- Unit cost for Workstation (whole life cycle cost)
- Unit cost for Network Connection (whole life cycle cost)
- Maintenance costs, including repairs and electrical testing as % of revenue expenditure
- Application licence and support costs as % of revenue expenditure
- Disposal costs as % of revenue expenditure

#### 7.2.2 Usage

The following usage measures will be considered:

- Network Bandwidth usage to determine whether network links are working efficiently, require additional capacity or whether there is potential to reduce connectivity.
- % of PCs and laptops that are in active/inactive use to determine whether equipment can be redistributed to meet business requirements.
- PC performance to determine whether equipment is being utilised effectively.
- Server usage and capacity to determine peaks in usage or where servers are not being effectively utilised.

- Storage usage and capacity to determine where additional capacity is most required.

#### 7.2.3 Availability measures

The following availability measures will be considered:

- % Network Availability – this measure can include availability of individual network links, and the data points, wireless access points, switches, hubs and routers allowing individual client devices to connect to Council applications.
- % Application Availability – this measure can include availability of server and operating systems, underlying database and storage infrastructure as well as the applications themselves.
- % Datacentre Availability – this measure includes power, and datacentre environmental controls affecting datacentre availability,

#### 7.2.4 Accessibility

In order to assess ICT accessibility, the following measures will be considered

- % of employees with a business e-mail account
- % of employees with access to Internet Services
- % of employees with access to a PC
- % of employees with full access to Council Services from non council premises
- Number and type of special ICT needs functionality provided (e.g. Zoomtext large text viewer)

#### 7.2.5 Demand

In order to assess future demand, measures that will be considered are:

- No of Employees
- School Rolls
- No and type of Property providing Council services

### 7.3 Grading System

Following best principles of ICT Asset Management, we will be looking to introduce a grading system for suitability and serviceability conditions which will be applied and recorded against ICT assets. The criteria for this will be subject to consultation with users across all services and will take into consideration individual service business requirements.

## 8. Key Priorities 2012 – 2015

### 8.1 Key Priorities

8.1.1 The following priority areas will be progressed.

Priority Area	Start Date	Completion Date
Formation of Enterprise Architecture Board, including approval and recruitment of Enterprise Architect post	August 2012	March 2013
Microsoft Enterprise Subscription – Implementation of software licences through Nevis Programme	November 2012	February 2013
Schools Server Replacement – Options appraisal and implementation of replacement strategy	November 2012	August 2013
Options Appraisal on Schools Storage Strategy	November 2012	January 2013
Network Infrastructure – identification of network connections with little or no resilience and carry out options appraisal for additional resilience	January 2013	June 2013
Application Review	October 2012	ongoing
Development of Business Intelligence reporting	September 2012	December 2013
Review current ICT Asset procedures and registers and develop detailed improvement action plan	September 2012	April 2013
Data Centre Options Appraisal	October 2012	July 2014

## 9. Glossary of Terms

ACROYNM	TITLE	SUMMARY
GSX	Government Secure Extranet	Government Secure Network Service for wider communications, largely with other Scottish Local Authorities
ITIL	IT Infrastructure Library	ITIL is the most widely adopted approach for IT Service Management. It provides a practical, no-nonsense framework for identifying, planning, delivering and supporting IT services to the business.
PBB	Priority Based Budgeting	Council's approach to 5 year business budget
PMO	Programme Management Office	Supports the management and implementation of Aberdeen City Council projects identified within PBB and other improvement programmes.
VDE	Virtualised Desktop Environment	Desktop computers which in the main have no local processing capability. Sometimes referred to as 'dumb terminals'. They get their programs and data from the main ICT data centre.
WEEE	Waste, Electrical and Electronic Equipment Regulations	This aims to prevent the generation of electrical and electronic waste and to promote re-use, recycling and other forms of recovery in order to reduce the quantity of waste discarded.

## Appendix A

### Asset Management Methodology

#### **ICT Current Position**

ICT Asset Management is carried out by ICT on behalf of the Authority and is done in line with BSi Standard PAS55 and Information Technology Information Library (ITIL) best practice principles and processes.

PAS 55 describes asset management as the systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organisational strategic plan.

PAS 55 is divided into two parts, viz:

- Part 1 – the Specification for the management of physical infrastructure assets.
- Part 2 - Guidelines for the application of PAS 55 Part 1 requirements. Part 1 specifies the requirements for an asset management system for the management of physical assets and asset systems over their life cycles. The management of physical assets is inextricably linked to the management of other asset types and these other asset types are considered within the asset management system insofar as they have a direct impact on the management of physical assets. The optimal life cycle management of physical assets is heavily dependent upon information and knowledge, human assets and financial resources, and often has a significant impact on reputation and customer satisfaction. Applying PAS 55 enables us to demonstrate a high level of professionalism in whole life cycle management of our physical assets, specifically in respect of achieving the following benefits:
  - The ability to demonstrate best value within a constrained funding situation.
  - Establishing an asset management system to optimally and sustainably manage our physical assets.
  - Implementing, maintaining and improving our asset management system.
  - Demonstrating and proving compliance with corporate asset management strategy and policy (and to others).
  - Having a clear audit trail that serves as a basis for taking decisions and associated risks.
  - The ability to show that sustainable development is actively considered over assets' life cycles.

Specific aspects of the ITIL solution to managing assets builds on the PAS 55 approach by applying the principles of its IT Asset Management Process Life Cycle model approach (as referred to under Section 1.2.2. of the main document).

Establishing management processes, their role in the asset life cycle and the departments that are involved in each process. The following table includes the main processes (as derived from the Asset Management Process Life Cycle model) in an IT Asset Management methodology:

<b><u>Process Name</u></b>	<b><u>Functions</u></b>	<b><u>Departments</u></b>	<b><u>Roles</u></b>
<b>Request</b>	<ul style="list-style-type: none"> <li>• Request to provision a service or an asset</li> <li>• Approval(s) of request</li> <li>• Determine fulfilment type (from inventory or new purchase)</li> </ul>	<ul style="list-style-type: none"> <li>• IT</li> <li>• Finance</li> </ul>	<ul style="list-style-type: none"> <li>• Asset Manager</li> <li>• Department Budget Manager</li> <li>• Service Desk</li> </ul>
<b>Procure</b>	<ul style="list-style-type: none"> <li>• Procure new assets or services when not in inventory</li> <li>• Negotiate and establish contracts with suppliers</li> <li>• Link contracts to catalogue line items</li> </ul>	<ul style="list-style-type: none"> <li>• Finance</li> </ul>	<ul style="list-style-type: none"> <li>• Procurement Manager</li> </ul>
<b>Receive</b>	<ul style="list-style-type: none"> <li>• Receive new assets or services from suppliers</li> <li>• Validate shipment (match received goods to order)</li> </ul>	<ul style="list-style-type: none"> <li>• Finance</li> <li>• Facilities (or IT)</li> </ul>	<ul style="list-style-type: none"> <li>• Asset Manager</li> <li>• Financial Manager</li> </ul>
<b>Manage</b>	<ul style="list-style-type: none"> <li>• Execute IMAC processes</li> </ul>	<ul style="list-style-type: none"> <li>• IT</li> </ul>	<ul style="list-style-type: none"> <li>• Service Desk</li> </ul>
<b>Retire</b>	<ul style="list-style-type: none"> <li>• Retire obsolete assets from operational use</li> <li>• Acquire legal indemnification for disposed assets</li> <li>• Update asset status</li> </ul>	<ul style="list-style-type: none"> <li>• IT</li> <li>• Finance</li> </ul>	<ul style="list-style-type: none"> <li>• Asset Manager</li> <li>• Financial Manager</li> </ul>
<b>Plan</b>	<ul style="list-style-type: none"> <li>• Provide enough stable consistent</li> </ul>	<ul style="list-style-type: none"> <li>• IT</li> <li>• Finance</li> </ul>	<ul style="list-style-type: none"> <li>• Asset Manager</li> <li>• Department Budget</li> </ul>



	information for accurate budgeting and forecasting		Manager • Financial Manager
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The following table illustrates the phases of an implementation programme and the business benefits delivered at each level. Regardless of which level an organisation is currently in, it is important to prioritise future efforts. Establish a phased approach by targeting areas of the infrastructure that provide the highest business value and enable greater cost control over the IT assets. This strategy delivers business benefits where they are most important to supporting the delivery of IT services.

<u>Level</u>	<u>Phase</u>	<u>Activities</u>	<u>Benefits</u>
1	Asset Discovery	<ul style="list-style-type: none"> <li>• Identify deployed assets</li> <li>• Know what is in the infra structure at any given point in time to a given level of detail: hardware, software, network, etc.</li> <li>• Know who is using assets, how frequently, how much)</li> </ul>	<ul style="list-style-type: none"> <li>• Understand and manage asset usage</li> </ul>
2	Inventory Management	<ul style="list-style-type: none"> <li>• Identify owned assets</li> <li>• Compare owned with deployed (inventory)</li> <li>• Identify “over” or “under” deployment of assets and reasons (change policies, processes, procedures) and, over time, reduce the gap</li> </ul>	<ul style="list-style-type: none"> <li>• Manage compliance</li> <li>• Reduce over-purchasing</li> <li>• Enforce standards (manage non-standard)</li> <li>• Redeploy assets</li> </ul>
3	Contract Management	<ul style="list-style-type: none"> <li>• Introduce contracts</li> <li>• Link contracts to assets (hardware, software, network, etc.)</li> <li>• Identify and capture critical terms and conditions</li> <li>• Create workflow</li> </ul>	<ul style="list-style-type: none"> <li>• Manage maintenance costs</li> <li>• Manage contract service levels</li> <li>• Automate contract renewal</li> <li>• Improve negotiations and vendor/spend management</li> </ul>

		and event notifications, such as lease notifications, re-negotiation windows, cancellations, etc.)	
4	Financial Management	<ul style="list-style-type: none"> <li>• Planning and budgets</li> <li>• Analyse infrastructure blueprint prior to planning and budgeting</li> <li>• Reconcile with fixed assets</li> <li>• Provide accurate asset data to fixed assets</li> <li>• Invoice reconciliation</li> <li>• Automate invoice reconciliation process</li> <li>• Asset allocation and chargeback</li> <li>• Track asset costs by cost centre and chargeback</li> </ul>	<ul style="list-style-type: none"> <li>• Improve budgeting process</li> <li>• Improve management of fixed assets/depreciation</li> <li>• Improve management of tax payments</li> <li>• Reduce payment of erroneous invoices</li> <li>• Manage IT demand and behaviour by allocating cost to actual consumers</li> </ul>