IT PLATFORM OPTIONS FOR GENERAL PRACTICE: ON-PREMISE, HOSTED & CLOUD COMPUTING CONSIDERATIONS
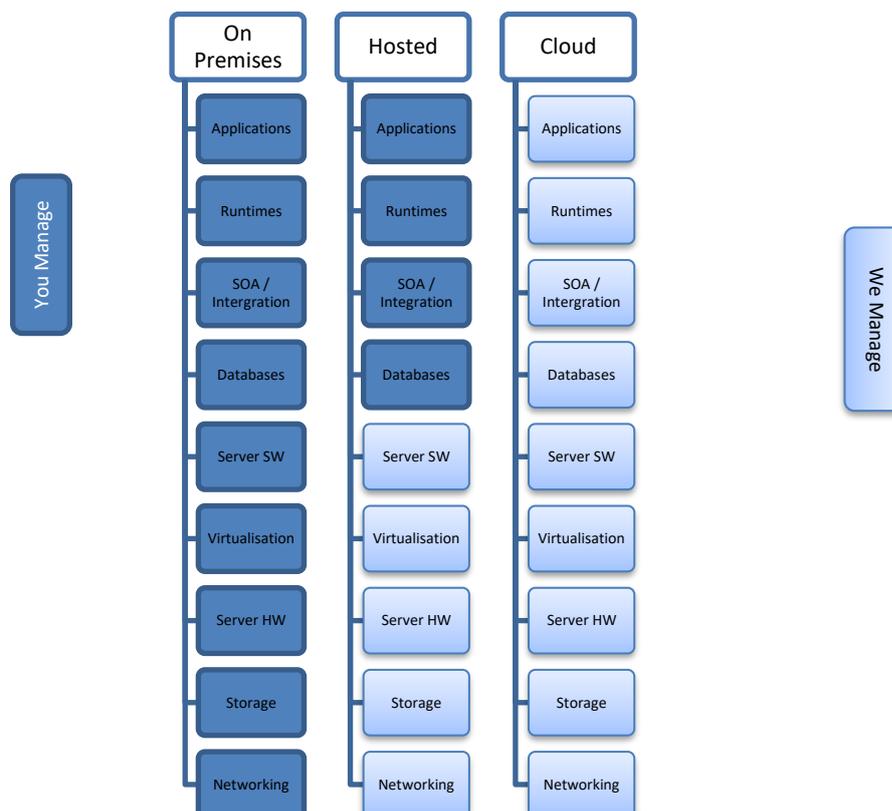
1   INTRODUCTION

The past decade has seen the development of significant new methods of deploying information technology (IT) infrastructure and delivering software applications – notably in relation to what's become commonly known as 'Cloud Computing' (internet-based resources available on demand). Within primary care, this has left managers and clinical staff with an increasing number of options with regard to IT implementations within a practice. This paper will define, compare and contrast the main three broad alternatives currently open to general practice - in terms of their technical, practical, business and service delivery capabilities.
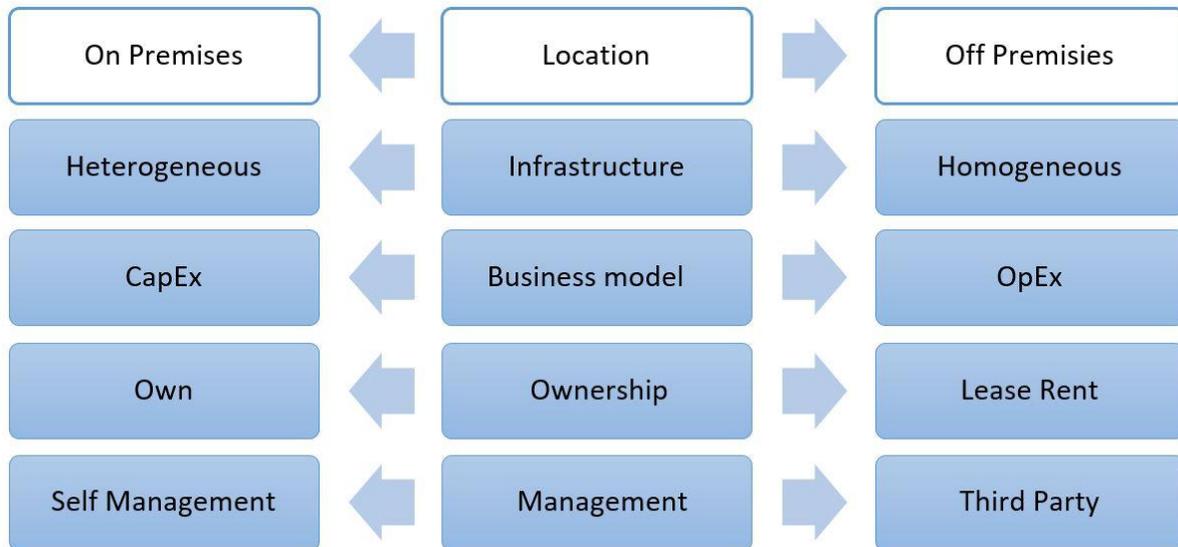
2   TECHNICAL OVERVIEW

The following diagram depicts how management of the major hardware and software components in an IT solution is handled by the major types of deployment platform. To place these categories in context:

i.   '**On-premises**' is the traditional model whereby servers and data is contained within a healthcare facility. Typically a practice will own the servers and the software licenses.

ii.   '**Hosted'** is a hybrid model seen in use by an increasing number of practices – this incorporates the "infrastructure as a service" and "platform as a service" models, along with remote desktop and terminal services implementations. Servers and data are held by a third party on behalf of the practice. Usually a practice rents the servers and connectivity from the hosting provider but still owns software licenses.

iii.   **'Cloud'** is a term covering a range of technologies, but in this context, it relates purely to the "software as a service" cloud model - for example the Xero accounting software used by many small to medium businesses. In this model, a practice owns neither the servers nor the software, and simply rents or leases both from the service provider.

You Manage	On Premises	Hosted	Cloud	We Manage
	Applications	Applications	Applications	
	Runtimes	Runtimes	Runtimes	
	SOA / Intergration	SOA / Integration	SOA / Intergration	
	Databases	Databases	Databases	
	Server SW	Server SW	Server SW	
	Virtualisation	Virtualisation	Virtualisation	
	Server HW	Server HW	Server HW	
	Storage	Storage	Storage	
	Networking	Networking	Networking	

3   SHARP CONTRASTS

The broach choices facing IT decision makers can be viewed from the extreme opposite perspectives of the On-Premises and Cloud offerings depicted in the following image…

On Premises	←	Location	→	Off Premisies
Heterogeneous	←	Infrastructure	→	Homogeneous
CapEx	←	Business model	→	OpEx
Own	←	Ownership	→	Lease Rent
Self Management	←	Management	→	Third Party

4   PRACTICAL COMPARISONS

The following table considers the major pros and cons of each of these platforms, grouped by generic features:

FEATURE	ON-PREMISES	HOSTED	CLOUD
Access	Restricted to within practice but not dependent upon internet connectivity. Remote access depends on internal practice infrastructure and availability of practice resources.	Access from anywhere. Software usually desktop and doesn't suit low internet connectivity areas. Usually requires desktop access (e.g. not mobile devices)	Access from anywhere. Purpose built 'across-the-internet' systems can often handle lower level internet connectivity. Can often run on mobile devices and not tied to desktop platforms.
Architecture	Single tenant – a single resource for each user, although virtualisation may help resource sharing.	Improved resource-sharing.	Multi-tenanted by default, resources can be shared safely between multiple clients without separate instances.
Backups & Disaster Recovery	Responsibility of practice and IT support supplier. Variable – depending on vendor and support contracts. Requires physical, off-site, backups.	Dependent on Service Level Agreements and service provider resources. Usually responsibility of hosting provider.	Optimal and agile. Systems, services and data can recover rapidly as there is no dependency on a single physical instance. Responsibility of cloud service provider.
Business Model	Capital Expenditure – usually fixed fee structures.	Hosted environments can share server hardware, and uses	Operational Expenditure. Cloud provider owns

	Investment can be capitalised and depreciated.	Operational Expenditure. Software usually remains a Capital Expenditure item. Arrangements can vary greatly dependent on hosting provider and software supplier.	hardware and software. Pay-as-you-go service fees. Flexible, but limited opportunities to capitalise investments.
Flexibility / Customisation	High - offers the greatest potential degree of personalisation.	Moderate flexibility, although dependent on application functionality.	Dictated by platform and dependent on the software.
Mobile Devices	Not usually designed for mobile devices. Low user experience unless specific App available.	Not usually designed for mobile devices. Low user experience unless specific App available.	Usually available on mobile devices, platform independent.
Performance	Fastest client response times, until local servers struggle under high demand loads. Limiting factor practice servers.	Usually slowest, as delivering on-premises software across internet. Potentially offers faster access to on-line services, but dependent on provider infrastructure. Limiting factor usually internet connection.	Fast to moderate depending on internet connection and application. Designed for internet access to usually optimised. Easy ability to scale servers dependent on need.
Reliability	Lowest due to dependency on facility-based infrastructure. Single point of failure in practice server.	Moderate – multiple points of failure. Some hosting options allow quickly switching to alternative hardware in event of failure either manually or seamlessly. Connectivity is also dependent on reliability of an internet connection.	Highest as platforms are adaptive to failure. Overall reliability still dependent on internet connectivity.
Scalability	Relatively low. Usually requires capital expenditure to scale solutions.	Moderate, may be limited by vendor infrastructure.	High, additional resources can be provisioned rapidly.
Security	High risk: depends on both local and service provider support to secure patient data behind firewalls. Physical security of the facility required.	Medium risk as less dependent on local and facility security implementations. Data security requirements must be specified in Service Level Agreements.	Platform requires Ministry of Health approval if health data is to be hosted offshore. Physical security not an issue.
Service Delivery	Potentially longer implementation cycles. Multiple providers, servers usually separate to software.	Dependent on maturity of the hosted functionality. Multiple providers, servers usually separate to software.	Fastest as only requires provisioning of existing services (web, database, etc.). Usually single provider, hardware and software responsibility of service provider.
System Upgrades	Places a significant burden on facilities.	Lessens the burden at facilities, but still requires some local upgrades to be performed.	Least burdensome - performed remotely by platform provider at no additional cost. Considered usually a part of the service.
Technical & Third Party Support	On-going support required. Periodic application and server maintenance required.	As per Service Level Agreement(s), but control of some server resources belongs to the provider.	Automatic server and system software support. Application support depends on level of client control

			offered by platform provider.
TOTAL COST OF OWNERSHIP	Lowest cost over a period of 3 years, or more.

Requires upfront investment in hardware and software. Upfront capital usually required. All errors, faults and maintenance additional ongoing costs.

Internet connectivity less essential so lower redundancy (and likely cost) needed. | Medium cost over a period of 3 years, or more.

Requires moderate upfront investment in hardware and software.
Usually lower capital investment as server resources can be leased. Still error and fault and maintenance costs additional as ongoing costs.

Potential increased costs in ensuring redundancy in internet connectivity to hosting provider. | Highest cost over a period of 3 years, or more.

Requires minimal upfront in software and servers.

No capital investment usually required. Potentially higher monthly service fees, but usually a known quantity as errors, faults and maintenance all covered within service fees.

Potential increased costs in ensuring redundancy in internet connectivity to hosting provider. |

5   CONCLUSION

Selecting the correct choice will require some careful consideration of these factors, taking into account the resources and location of individual practices together with an assessment of the health information security risks inherent in each option. There is little doubt that the IT industry as a whole is moving towards cloud computing platforms and that software as a service is already a compelling choice for many domains. However, it is still a rapidly evolving technology that's yet to be adopted by most healthcare application vendors.

On the other hand, the well-established on-premises model is being increasingly stretched by the need to integrate with sector-facing web services (such as NES, Health Identity, eSAM and NZePS), security concerns and the complex IT requirements of integrated models of care. These factors might prompt the decision makers facing such challenges to pay serious heed to the hybrid solutions offered by the hosted model – particularly those that can be accessed via mobile devices.