White Paper

Local Systems and the Centralised EMR –

An Integration and Rationalisation for the Best of Both Worlds

"information collection is the vanguard of knowledge evolution"

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1. Introduction

The Debate

Discussions about centralised EMR solutions and local best-of-breed systems inevitably position them as opposites. Hospitals can choose one or the other. The debate about which is the better system rages on. A more fruitful way forward is to build an architecture that combines the strengths of each system. This white paper draws the outline of this architecture.

A Solution

This white paper addresses these issues from a perspective of management and financial planning and situates clinical matters into the background. It introduces the idea that each strategy has its merits but that optimal "system performance" will be achieved by striking a balance between the two, stemming from a clearer idea of the strengths and weaknesses of each and by understanding the sequence in which each should be introduced.

The idea of a new form of architecture that better supports the coalescing of the two opposing viewpoints is introduced in the form of a localised hub of clinical care information systems that is compatible with the objectives and functioning of a centralised EMR.

To shift the discussion away from the traditional rivalries we change the language to talk about local systems and centralised systems. This has the effect of identifying the manner in which these systems are managed and displaces some of the elements of entrenched attitudes to the topic.

2. The Best of Both Words

2.1 Premises

It is important to identify some significant starting points in a discussion of this topic. We offer the following three observations that are generally accepted in the field.

1. Centralised enterprise systems are better for fulfilling the organisational administrative obligations.
2. Localised systems are more efficient for local operations.
3. Centralised systems are very expensive to implement.

2.2 Advantages of a Centralised Systems

While there has been much discussion of the disadvantages for centralised systems, the list of their advantages is less widely promoted. We offer the following brief evaluation:

1. Centralised systems are necessary for whole of organisation efficiency particularly for access to everything by everyone.
2. A central system collates and aggregates the commonalities across the whole organization to identify the system-wide phenomena.
3. A centralised system means that a single software installation supports multiple departments of an organisation ostensibly lowering the cost of IT maintenance and services.
4. Localised systems negate this efficiency because they:
    a) Constitute local 'silos of information' that are expensive to connect to for wide access due to the connectivity explosion.
    b) Increase maintenance costs to the IT Services as each has to be individually maintained.

In this context, if localised systems could be built so that they don't have these drawbacks then other advantages will accrue.

2.3 Disadvantages of Centralised Systems

Centralised enterprise systems serve different purposes to localised systems.

1. Centralised systems can't deliver the detail required for local departments because they are designed around generalisations of data and system workflow, and can't achieve any **Economy of Scope** for solving local workflow and for the collection of specialised or ephemeral data.
2. Centralised systems are premised on the commonality of data for different activities and the uniformity of processes, BUT for local systems the data is common only up to a point and diverges for detailed and specialised settings. Hence efficiency gains are principally achieved by supporting local workflows that are inaccessible to centralised systems due to their generalisations.

2.4 A Balanced Solution

1. The balanced solution is to optimise **locally** for local workflow and processes, and optimise **centrally** for system-wide processes and workflow. This approach lowers the conflict level between central and local parties.
2. Therefore a software architecture to break the historical disadvantage of local systems over centralised systems needs to have the functionality so that:
    - a set of local systems can be built in the one software application, so that it eliminates software maintenance for individual localised systems.
    - a set of local systems that can connect to the central system through a single gateway, that is, remove siloing of data and explosion of connectivity.
3. The local systems have to be able to be built and behave AS IF they are autonomous but underneath they need to have a single architecture, universal data sharing capabilities with a single connectivity gateway to the central system.

2.5 Franchising Management Model

The best management exemplar for this arrangement is *franchising*. The central management requires information and processes for optimizing central administration, while local systems (franchisees) need a locally optimised system for managing their own particular operations.
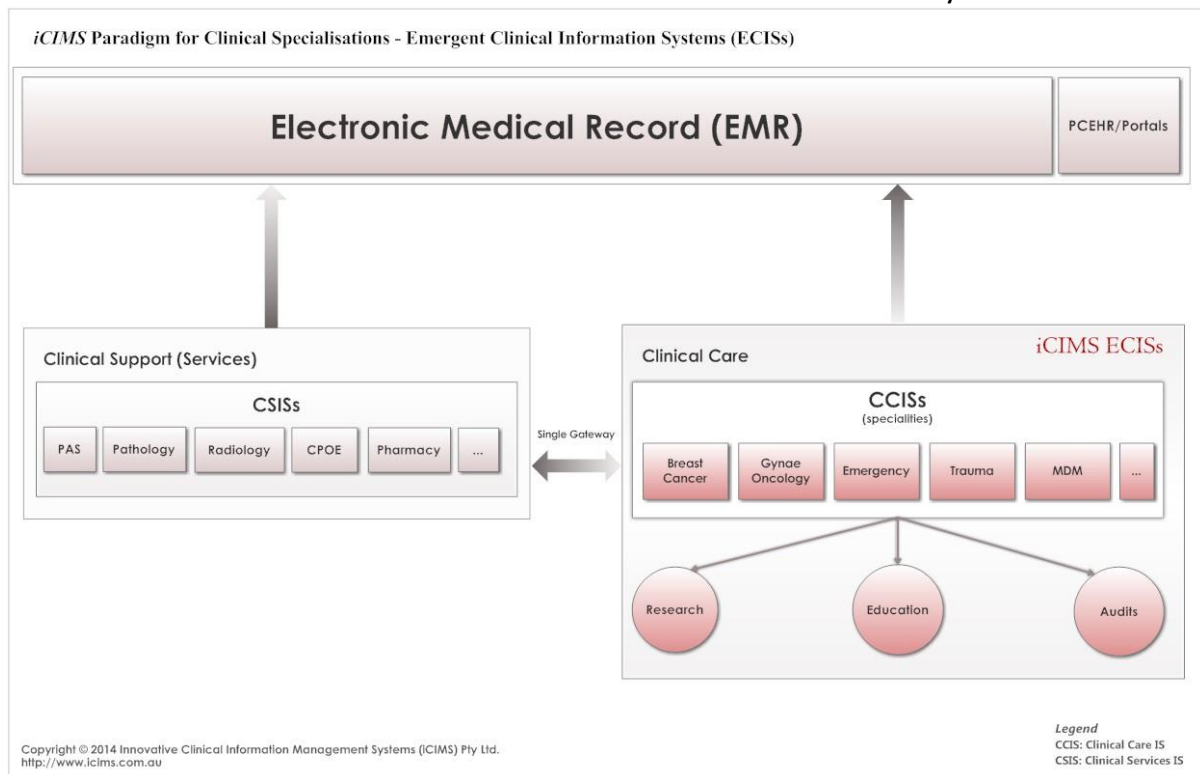
3. Architecture of Centralised Controller & Repository for Health Systems

An architecture is proposed here which draws together the two sets of requirements so that they co-operate rather than compete for a role in the health organisation.

The idea proposes that there are two classes of health information systems:
   a. Clinical Support Services ISs that have to serve a large majority of the hospital such as {PAS, RAD, PACS, PATH, EMR...}, and
   b. Clinical Care ISs that serve the individual clinical departments, such as {Gynaeoncology, breast cancer, endocrinology, cardiovascular, …} (see figure 1).

Figure 1. Hub & Virtual Spoke Architecture for Clinical Care Information Systems connected to Centralised Clinical Services Information Systems.

The subsequent architecture has these features:
   1. The Central EMR is the repository and controller for access to system wide

content, or uses an E-Gate as a middleware intermediary to assist it.

2. Clinical Services Systems have direct connectivity to the Central Controller & Repository.
3. Clinical Care Systems have a Hub & Virtual Spoke architecture (HVSA) with a single channel open for connectivity to the Central Controller. See CISCO Web Page for one application of this idea[1].
4. The Clinical Care System has Virtual Spokes so that each system believes it operates autonomously but is actually managed by the Hub so that connectivity to the Clinical Services is maintained, but through the one gateway. This is much like the architecture of many Virtual Machines running on the one piece of hardware.

4. Advantages of Introducing Local Systems before Centralised Systems

Consideration needs to be given to the issue of when these systems should be introduced. Centralised solutions may be seen to be the best approach to begin with intuitively so local systems can be made to toe the line, but this is not necessarily the case when all matters are considered closely. The advantages of creating local systems first can be:

1. Defining the process analysis in the local site without it being needed for the EMR installation.
2. Enabling systematic collection of data to commence before the introduction of across the organisation operation of the EMR.
3. Making it a smaller task to commission the EMR as local systems define much of what the EMR has to do when it is installed.
4. Lowering the cost of EMR implementation because good solutions for data collection have already been tried and tested in the local systems.
5. Lowering the effort to create the EMR.
6. Changing locally is a lesser effort without needing to change for everywhere.
7. A local system can be turned off when enterprise systems cover all its features.

5. Disadvantages of Introducing Centralised EMR First

There is also the consideration of the disadvantages of introducing central systems prior to the local systems, such as:

1. Central Enterprise vendor will attempt to minimise support for local systems and increase price per feature that is requested for them.

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[1] http://www.compositesw.com/solutions/hub-and-spoke-architecture/

2. Central Enterprise vendor will do their own process analysis to optimise to their product features and bypass local requirements that don't match their products.
3. Higher cost to produce a process analysis of local processes.
4. The central enterprise vendor has no interest in co-operating with the localising vendor as they will see them as competitors unless the enterprise vendor believes they can only get the business by co-operating with the localising vendor. Hence you cannot create a co-operative relationship when introducing the enterprise vendor first.

6.   Emergent Advantages

Emergent advantages are those that emerge due to the nature of the hybrid solution but are undefined in the design of the solution itself.

1. Local service systems support centralised management systems. Local service units deliver information based on local efficiencies. This establishes criteria for comparing the local systems without personal favour.
2. Flexible small systems enable the organisation to change their data requirements readily and hence increase the power of the central system by delivering more data of more diversity to it.
3. Administration will get more information of more value, more efficiently and be able to make better decisions for the allocation of funds to achieve the desired economies of scale.

7.   Advantages of One Technology to produce many Local Systems

7.1 Economies of Scale, Scope, Speed, and Migration

An innovative technology should support improved Scale, Scope, Speed and Migration so that reporting systems will be quicker and more comprehensive by volume and variety.

- ◦ *Economy of Scale* comes from many clients served under the same architecture and run in the same application. The Local Hub ensures that all users of local systems have access to all content in other local systems and access to the central services as well.
- ◦ *Economies* of Scope are the number of different functions you perform within the one organisation to produce cheaper products because you are using the same resources. The HVSA model enables many disparate systems to be catered for economically in the same software methodology. Health organisations have a great variety of Scope, that is, local departments with different needs, and so need IT that caters for that variety. The Hub and Virtual Spoke model lowers the cost of building and maintaining the multiple local systems.
- ◦ *Economies of Speed* are the gains obtained by changing work practices as

quickly and cheaply as possible. The HVSA model provides Economy of Speed from an ability to build local systems in the first instance and change them in the second instance more quickly than centralised technologies. Building virtual local systems under a universal architecture increases their speed of introduction and response to changes in the workplace. This makes staff more efficient and introduces improved work practices sooner and so lowers risks to staff and customers sooner. Secondary activities such as research and investigations are also able to be brought on stream sooner and executed more speedily. Staff are more readily able to adopt policies of continuous Improvement.

◦ *Economy of Migration* is the economies created by migrating from legacy systems to modern systems by staged component based changeover. As a technology ages especially with software systems there is a need to migrate the application to more contemporary technology. However the functionality of incumbent software is so complex that IT departments and vendors are loath to touch the code, and the cost of rebuilding the code base from scratch runs to hundreds of millions of dollars and has a high risk of failure or only limited success. The HVSA model enables:

    i. Incremental expansion of the legacy system with new functionality;

    ii. Gradual retreat of the legacy system into a data warehouse role, especially if the HVSA takes over the user interface functions.

These four maxims put together lower the unit cost per service for multiple local systems, increases the data, in volume, accuracy and variety available to a central system and in effect adds value to the central system not otherwise attainable. When the organisation is devoid of a central system then the local systems can be effective operationally. When the Central system comes on stream then the local systems become Local Clinical User Interfaces (LCUI) to the central system with local redundancy for local management and analytics.