Interpretation of the Concepts of Enterprise-wide and Best of Breed IT within the New Zealand eHealth Community

Rebecka Janols
Department of Information Technology
Uppsala University
Box 337, SE-751 05 Uppsala, Sweden
Rebecka.Janols@it.uu.se

Karen Day, Martin Orr
National Institute for Health Innovation
The University of Auckland
Private Box 92019, Auckland 1142, New Zealand
Karen.Day@auckland.ac.nz, Martin.Orr@waitematadhb.govt.nz

Abstract

**Purpose** The New Zealand eHealth landscape is diverse with hundreds of systems ‘wired together’ in a complex puzzle. The purpose of this paper is to explore the current debate about selecting and using Best of Breed (BoB) or Enterprise-wide (EW) eHealth systems.

**Method** Strategic eHealth documents were analysed and 14 senior IS executives from health and IT organisations were interviewed.

**Findings** There appears to be agreement about: (1) what the concepts mean, (2) the problems caused by the mix of BoB and EW, e.g., the strong influence of clinicians on IT decision making, and (3) a possible solution to the complex puzzle lies in changing the mix to emphasise patient-centric eHealth. However, when discussing to what degree IT systems should be customised and/or centralised disagreements become visible.

**Discussion and conclusions** There is a trend among decision-makers towards patients’ needs rather than the physical context in deciding system use and design, with an emphasis on what is considered to be ‘best practice’. In this process the preferred systems are EW, however it is important to remember that it is not the only option. There is a risk that if the IT system is too generic (centralised) it might be an unsupportive tool for clinicians and undermine its purpose.

1. Introduction

In New Zealand healthcare is publicly funded and free at the point of care, except for primary care which is subsidised [1]. Patients register with Primary Healthcare Organisations (PHOs) for primary care services delivered by general practice physicians and associated private services. Secondary care and tertiary care (usually hospital and specialist services) are delivered by publicly funded District Health Boards (DHBs) [1]. IT systems from five vendors are used in PHOs – a primary care practice usually uses one of these systems for clinical, management and billing purposes. Within the DHBs the IT landscape is diverse with hundreds of Best of Breed (BoB) systems and applications that are integrated by translation engines and portals. Even though the same systems are used in different services, each organisation has its own instance that is configured and customised to support its needs. Two consequences of the complex IT landscape are that it is difficult for IT systems to communicate and it is difficult to upgrade and/or develop new IT systems. Today the information flow between primary care and DHBs is extremely limited [2, 3].

In order to guide future eHealth development the National Health IT Board launched a National Health IT Plan in 2010 to “set priorities for regional and national IT investments over a five-year period” [3] (p.7). The vision that the plan aims to achieve is that “each patient will have a virtual health record, with information stored electronically and accessible regardless of location by linking to: existing systems run by health care organisations (e.g. general practice, hospital-based systems), a regional clinical result repository and shared care record” [3] (p. 7).
The National Health IT Plan emphasises a shared care record that focuses on the patient and is shared between the patient and involved care providers. The plan also aims for consistency so that different DHBs in the same region need to come together and agree on a common platform (i.e. a standard set of software that is used within the region) [3]. Within computer science the terms enterprise-wide (EW) and Best of Breed systems (BoB) are commonly used to describe different kinds of IT strategies [4]. The aim of this paper is to unbundle how the concepts EW and BoB IT are interpreted by eHealth stakeholders in New Zealand.

1.1. Defining Enterprise-wide and Best of Breed IT

The vision of integrated information systems (i.e. EW systems) has its roots in the problems caused by loosely coupled information systems among computer-using organisations in the 1970s. During that time new information systems were developed in isolation and the loosely coupled integrations between the systems resulted in difficulties of sharing and accessing detailed data, the same data was found in multiple systems and the organisations consumed much of their funds on coupling the information systems together instead of building new ones [5]. An integrated system is a generic solution that is built to solve the fragmentation of information in organisations. According to Marcus and Tanis [5], “enterprise systems are commercial software packages that enable the integration of transactions-oriented data and business processes throughout an organisation” (p. 176).

The use of single vendor-based EW systems has increased since the 1990s. EW systems sound great in theory but in practice there is a high failure rate for system implementations [6]. The processes on which an EW system is based are an expression of the vendor’s assumptions and/or understanding of how the business operates in general. Vendors often argue that the systems are based on best practice. According to O’Leary [7] best practice is the better or best ways of performing a particular process. This often means that the best practice that the vendors base the system on are based on laws, regulations, a powerful group of actors and/or a theoretical model of the care process. This does not necessarily mean that it is the preferred process according to the health professionals. This indicates that defining best practice is contentious, e.g., clinical best practice and IT best practice may not align well [6-10]. An EW system manages the entire company/organisation in the same direction and it solves the information fragmentation within the organisation. However, users of an EW system often complain that the system force them to work in a ‘new way’, a way that they do not consider to be according to their view of what best practice is [4]. When implementing EW systems some degree of customisation is usually possible, in that the customer can select which modules to implement. In order to succeed with an EW implementation an organisation frequently needs to redesign working processes to align with the processes upon which the EW IT system is built [5]. Customisation of software is often expensive and may hinder achievement of seamless information flows within an organisation [6].

An alternative to the EW is the BoB approach. According to Bradley [10], “in the ‘best of breed’ approach, the organization picks and chooses ERP [11] modules which best support its business processes from various vendors.” (p. 234) In other words, instead of letting one vendor define best practice the organisation selects different EW systems and/or in-house developed legacy systems that align with their best practice [4, 10, 12]. An advantage of BoB is that different services, e.g. emergency, renal and maternity care, can have different systems that are developed to support each clinical process, instead of one IT system that supports all processes within a healthcare organisation. However, using a BoB approach often results in a fragmented IT landscape, where the different systems can be great for their purpose but there are major issues with e.g. accessing and sharing detailed data [4]. Previous research shows that both approaches have their pros and cons [4, 5, 10-12].

The New Zealand National Health IT Plan aims for consistency and a common software platform, thus indicating that central forces are pushing health IT development from a BoB tradition towards using EW systems.

2. Method

In order to unbundle how eHealth stakeholders in New Zealand interpret the concepts EW and BoB IT, key documents were reviewed to gain an understanding of the New Zealand health care context and in preparation for the interviews. These documents included the National Health IT Plan [3], a review of the Ministry of Health website regarding the New Zealand health system structure [1], and other relevant documents [2]. A literature review was conducted regarding BoB and EW strategy and implementation. Ethics approval was granted by the University of Auckland Human Ethics Committee on 30th of March 2012, reference number 7973.

People with key roles in the NZ New Zealand eHealth development, who were also involved in an on-going debate about the different value contributions of BoB and EW systems, were invited to participate in the research study.

1 Marcus and Tanis definition of enterprise systems includes Enterprise Resource Planning (ERP) software and such related packages as advanced planning, scheduling, sales force automations, customer relationship management, and product configuration.
Potential participants were selected to represent different roles: researcher, clinicians, decision makers and managers, and different organisations: DHB, primary care, clinicians, managers, vendors, service organisations. Fourteen people were invited to participate. One person did not reply despite several reminders, leaving thirteen who were willing to be interviewed. The final number of participants was not set at the outset. Instead, those interviewed were asked to nominate another person for an interview, which could provide another viewpoint. During the interviews twelve were nominated. Five were already on the initial interview list (four who had accepted the invitation to participate plus the person who did not respond to the initial invitation). One person from the nomination list was invited and consented to participate. The rest of the nominated participants (six individuals) were not asked to participate because of three reasons, they fell out of the research scope, including them would result in too many interviews from the same organisation and after fourteen interviews were completed the authors considered the topic to be saturated, i.e., no new points were being raised in the interviews. Table 1 provides information about the participants, showing the spread of interviews in relation to type of organisation. Five interviewees are marked ‘(x)’, which means that they have a background as clinicians, but are now having another role. Table 1 illustrates that even though having a clinical education was not in the selection requirements, eleven of the participants are educated clinicians.

### Table 1 – Participant backgrounds and organisations

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The semi-structured interviews were 60-80 minutes long. The first author performed all twelve interviews at a place that was convenient to the participants (i.e., their offices, Skype or telephone). All interviews were audio-recorded and notes were made during the interviews. The following subjects were discussed during the interviews:

- Background information and experience of health IT
- Interpretation of the terms EW and BoB health IT systems
- Pros and cons with EW and BoB systems
- Reasons for selecting/not selecting EW and BoB systems
- Identifying different user groups, and discussing their needs and requirements

These topics were deliberately broad because we wanted to explore what the participants considered to be important. The broad topics meant that each interview had a different character and focused on the participant’s experiences. After seven interviews were completed, the researcher’s summaries from the interview were reviewed in order to evaluate if the topics were useful or if the interview method and/or content needed improvement. This pre-analysis indicated that the participants had different user groups in mind (i.e., health professionals, patients, managers, researchers and administrative staff), while they referred to users, and that their interpretation of the concepts of BoB and EW varied. Some respondents had prior knowledge of the meaning of the concepts while others had not heard of them in an IT related context. These early findings resulted in a couple of changes in the last seven interviews. The changes was regarding more clarity about whom the users are, a discussion of the BoB and EW concepts according to the participants’ previous knowledge and what this means in practice, rather than the participants trying to find the ‘correct’ research definition of the two concepts.

Once all the interviews were completed a transcription template was constructed to make a first-pass broad data selection [13]. The categories in the template were the questions (i.e. the topics) and New Zealand eHealth today, where
New Zealand is heading and the participants’ vision of the future. The emerging themes were broad and unstructured and in order to cross-analyse the interviews and sort them into smaller themes the Nvivo 9-software was used [14].

3. Results

All participants, despite differences in background, role and organisation, argued that the current eHealth situation needed to change. The main reason given for the required change was that it is too complex and expensive to manage the health IT landscape. In order to be more patient-centred different health care organisations needed to be able to share information between one other and the patient. The concepts of EW and BoB IT were part of the thinking associated with this vision.

3.1. Enterprise-wide Systems

When the participants described EW systems they used phrases like “one system that does everything”, “one significant and large encompassing process program”, “single system...that does everything in a go” and that it “collects information from everybody and share it”. Even though participants appeared to understand the concepts differently in conversation, the same phrases were used by those who had prior knowledge of the concepts as those who were not familiar with them. One clinician, who had a vague understanding, combined the simple meaning of the terms with knowledge and experiences of the current eHealth situation, defined the concepts like this:

Enterprise sounds like you have one significant and large all-encompassing process/program/software. Best of breed you are going to have different parts of different programs attached to, maybe a central source. So you actually attach a skeleton, framework, as suppose to ‘one of everything’ is done by this particular program or software. – Clinician

Two hospital managers argued that it is not enough to define an EW system like integrated modules made by a single vendor. Instead, they emphasised that EW systems are based on ‘deeper thinking’ of what the healthcare system needs (i.e., best practice):

They have actually looked at: ‘what is health care?, what are we trying to do?, what are the basic sets?, how does medicine really work?’ That to me is an ‘enterprise-wide thing’. Not a whole lot of different modules where the vendor is just interlinking them, because we could have done that as well. - Manager

Although most participants chose to define EW and BoB IT as opposites, they argued in practice the future eHealth systems lies in both centralised and customised system solutions. In contrast, some participants argued that presenting EW and BoB as opposites creates a false impression of a clear division between the concepts. One of the researchers argued that the differences are regarding the ability to disaggregate and integrate IT systems. The EW systems “…present the ability to interface but you cannot disaggregate them [the IT systems]…the inability to disaggregate or disintegrate is the issue.”

3.2. Best of Breed and Best Practice

The participants agreed on that BoB means selecting an IT system that supports best practice for a specific need and/or process.

Best of breed systems, we look at all the different functions, that you have to carry out, as a health system, and each person responsible for that particular function chooses the computer software that best meets their needs to deliver to their function. – Manager at NZ service organisation

All participants appeared to agree that in the process of defining best practice, the clinicians’ needs and requirements had been crucial. All except one stated that this means that New Zealand has a BoB tradition. In contrast, one participant representing a service organisation claimed that New Zealand does not have a BoB tradition because “Best of breed suggests that it has gone through some form of evaluation and inspection as being the preferred option”. The who, how and what requirements for defining best practice in BoB systems indicates the need for a shared understanding of best practice. Disagreement was not about if clinicians had been involved in the decision-making. It was about if context, existing work processes and subjective thoughts should be considered when best practice is defined. All the participants, except those who still work clinically, argued that the clinicians’ involvement in the decision-making was the main reason for the complex IT landscape. They argued that the clinicians’ requirements had
been dominant when best practice was defined and in order to solve the complex puzzle a different approach is required. Instead of continuing to consider context and existing work processes the mantra “one process – one system” was launched to define best practice. For example, if you identify the best way of delivering maternity care and develop a system based on those requirements, that system will support all maternity care units at all hospitals. A participant from one of the other service organisations reconsidered the meaning of BoB during the interview.

So they [the health care organisations] have not really done a best of breed. It was always ‘my opinion’- rule…that is really silly, we don’t have the money to do that…there must be some logic why that one is better than that one. If you are in the same area, the same speciality, same process, then you need to agree what the best of breed is. – Manager at NZ service organisation

In other words, what the quoted participants are saying is that if the same function/process at different hospitals/DHBs/PMOs are supported by several IT systems they have not selected a BoB system. One clinician argued, “…best of breed works when the users are being considered, then you get a best of breed because they know the end-users. The problem with best of breed so far is that people buying products are separate from the people using them”.

3.3. Centralisation vs. Customisation – The Devil is in the Detail

On one hand the participants talked about EW systems as a future vision, because they assumed that it would solve many of the complex problems that they now experience. On the other hand they were worried that EW systems would be too generic, that it would fit the lowest common denominator, rather than being a particularly good support for anybody. The participants also emphasised the need for change management when implementing EW systems. Most of them had experienced that even though “one process – one system” sounds great in theory, agreeing on a shared, centralised process takes time and meets a lot of resistance. The participants’ belief in the strength of EW systems and their experiences of the health context resulted in agreement that the future systems are not pure EW systems.

…Maybe an enterprise-wide solution but it allows local adaptation for those users in different areas: ‘So this is the platform but you can adapt this and you can change this. You can add things here that you just going to use and we don’t need, but you can add them into the system.’…I think that they both [EW and BoB] have risks and they both have potentials in them. The devil is in the detail! – eHealth Researcher

During the interviews it became clear that participants thought that an EW system that could be customised towards different needs was the way to go. While discussing what detail could be centralised, and what must be customised disagreements became visible. Three of the clinicians stressed the need to be able to customise the system so that it better supports clinical practice. This indicates that they considered context and existing work processes to be important aspects during the procurement process. A few participants believed that processes that already are standardised could be supported by an EW system. One of the participants from a vendor said:

I guess that what you can say is that, the enterprise approach works in the non-clinical area…treating a patient, for example, and keep managing a ward, a theatre. Presumably they are relatively similar but clinical management, looking after people; it’s a lot more complicated. – Vendor

One participant who worked in a service organisation emphasised the need to look at healthcare from a patient perspective (i.e. what is best for patients?). The focus should be on identifying the core concepts of health care and not be limited by organisational borders. Processes that are tightly coupled should be supported by an EW system, while loosely coupled processes could be supported by several BoB systems. A couple of the participants emphasised the need for having customised interfaces that are profiled towards the specific users’ needs. A participant who worked for a vendor argued that the data should be in centralised repositories that focus around the patient, and that different vendors should provide applications to access the data, saying that

…a service based approach where the core aspects of data and functionalities are placed in an accessible location and they then feed some of those systems. Then, if it suits me to have an enterprise system, absolutely fine, go for it, my blessing, as long as when you access meds [medicine], do it over here. And then, I think that gives freedom to innovate around the edge. – Vendor
4. Discussion

Both EW and BoB systems are commonly used in different kinds of IT-supported businesses. EW systems aims for consistency and are delivered, by a vendor, as predefined software packages. Following a BoB approach means that instead of selecting vendor developed software packages; the organisation selects systems/modules that are interconnected by the organisation, instead of by the vendor. In New Zealand the eHealth tradition has been to select BoB systems that are interconnected with portals and translation engines. In 2010 the National Health IT Board launched a 5-year National Health IT Plan that aims for patient-centeredness, consistency and a common software platform [3].

In general the participants have a shared theoretical understanding of the two concepts BoB and EW IT. When discussing implications for practice, and get effective and efficient solutions all argued that both customised and centralised functionalities are required. The respondents point out that both EW and BoB systems have pros and cons. The cons with BoB are often solved in the EW and the cons with the EW are often solved in the BoB. Therefore, when selecting future eHealth systems the key is to not just base the selection on what problems the system solves. Instead, plans on how to solve the problems that are caused by the selected system are required. In the process of identifying what processes can be shared and what processes must be customised, disagreements became evident. The conflict was between the participants who still worked clinically and those who did not. All participants emphasised that in the process of defining best practice, the clinicians’ needs and requirements had been, and still are, crucial. The participants who did not work clinically expressed that the clinicians focus too much on personal needs instead of having a ‘patient-centred’ view. They argued that the complex IT landscape was a consequence of “too much clinicians’ involvement”. The participants who still practiced as clinicians agreed on the complexity, but they did not consider the complexity caused by following their requirements. Instead they argued that “dominant forces” within the organisations (i.e., tradition and powerful individuals), had defined best practice, instead of using a user-centred methodology to define the clinicians’ needs. As earlier stated both EW and BoB have pros and cons and what systems that are procured decide where most customisation must be (i.e., the IT system or the clinicians work processes). When developing eHealth it is important that focus is on supporting a new way of working. To reach this goal both clinical practice and the IT system must change and improve.

In the process towards “one process - one system” one question remains unanswered: Will the different DHBs have the same instance of the system/s or will they have separated implementations? Having the same system but different implementations that are customised towards the different departments’ needs indicates that existing context and work processes actually are important to consider when defining best practice. Customisation is, however, expensive and too much of it may lead to the inability to share information. On the other hand, sharing the same instance among different hospitals is going towards an EW system. If choosing that path, it is crucial to rework and change processes to the best practice that the system is based on. Without that it is impossible to achieve the benefits.

The limitations of this research relate to the small number of interviews and possible bias in selection of interviewees. This was mitigated by the strategy of inviting participants to nominate additional interviewees. The resulting duplication of names and bias to specific organisations supported the initial selection of interviewees. Saturation was achieved before the final interview was conducted, strengthening the selection of those who were interviewed. Another limitation is that it is only focusing on one country. In the future studies a comparison between New Zealand and Sweden will be performed. This comparison is particularly interesting because both countries have many similarities. Examples of similarities are size, healthcare is tax financed and “free” for all residents and in Sweden a national health IT plan with similar goals as the NZ strategy was launched in 2010. The main difference that makes a comparison interesting is that eHealth development in Sweden has in the last ten years moved towards implementing region-wide Electronic Health Record systems that are shared between all publicly founded primary, secondary and tertiary care services within the same region, meanwhile New Zealand are still struggling to find the future eHealth path.

5. Conclusion

Our research indicates that discussing EW and BoB as opposites are a “false dichotomy”, because it is possible to customise an EW and centralise a BoB system. However, customisation of an EW is hard to succeed with because the vendor often just want to deliver and support one version of the system, the strategy and hospital management wants to centralise processes and too much customisation makes it harder for data to flow through the organisation. When discussing what detail should be customised or centralised, disagreements appear. The participants emphasised that in the process of selecting eHealth systems, the clinicians’ needs and requirements are crucial. But, in the process towards consistency and a patient-centred view arguments like; ‘there can just be one BoB for each process’ and “best practice need to be evaluated in order to be referred to as BoB”, appear. This indicates that defining best practice goes from considering the clinical context and existing work processes towards a more objective view. In this process clinicians and other stakeholders’ (i.e., governmental, researchers, patients, managers and clerical staff) requirements become
equally important. Although all stakeholders’ requirements are important, it is important to consider that if the systems are too generic/centralised they risk being unsupportive in clinical practice, something that will undermine a patient-centric purpose.

This paper contributes to research as well as for practice. Examples of implications for research are that a ‘pure’ EW system might work in a streamlined and hierarchic organisation. Healthcare services in general are, however, not streamlined. Instead health care is often delivered by several organisations that are separated both traditionally and financially. Implication for practice are that when discussing future eHealth development it is crucial to be aware that there is not a shared understanding on what consequences it has for different stakeholder groups to move towards consistency (an EW system). The trend towards excluding context and existing processes when defining best practice means that organisations must rework processes in order to gain any benefits. When the participants are stating EW against BoB it gives a false impression of that these are the only options. In reality, however, the future system lies in both centralised and customised eHealth systems.

6. Acknowledgments
We would like to acknowledge the fourteen respondents that participated in this research study.

7. Reference