

# Business Improvement Approaches in the Public Sector in Wales

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**Report Authors:** Ann Esain, Sarah Lethbridge, Simon Elias

**Other Contributors:** Ceri Davies, Barry Evans, Brendan O'Donovan, Kaveh Sarmad, Keivan Zokaei

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## Executive Summary

### Research Background & Aims

- This report has been produced by the Lean Enterprise Research Centre (LERC) for the Welsh Assembly Government and Wales Audit Office and provides an analysis of the state of adoption of current business improvement (BI) approaches within Welsh public services.
- The research focuses on the approaches which are currently being used by Welsh public services and more specifically the impact of such approaches.
- In addition, the report discusses the applicability beyond transactional services of various tools and techniques for improvement, the role of project management and presents a model which guides users as to which approaches should be used in which conditions.
- Definitions of key concepts used: Service Improvement - 'a closer correspondence between perception of actual and desired standards of public service' (Boyne, 2003). This definition implies that a gap of operational delivery exists and hence improvement is necessary. The term 'business improvement techniques' (BI) is used in this report to describe activities that aim to innovate and improve service delivery - for example, citizen value enhancement, to create better process flow, increased quality, capacity creation, waste removal. Underpinning this is the concept of organisational learning. Note that LERC uses **lean thinking** as an overarching term that encompasses a variety of approaches, many of which are rooted in the **systems thinking** philosophy.
- This exploratory study combined semi structured interview with subject experts (managers from across Welsh public services) involved in BI, questionnaires and a literature review. For reasons of access, a historical analysis of national programmes for improvement was undertaken, consisting of 8 separate initiatives detailing 78 activities.

### BI Approaches Used

- BI techniques are widespread across most public services in Wales. Much activity has been initiated within the past 2 years, although there are examples that date back to 1999 (Esain, et al., 1999). Defence and healthcare (Burgess et al, 2009) are considered the earliest adopters systematic service improvement in UK public sector organisations<sup>1</sup>. With Royal Bolton NHS Trust and HM Revenue and Customs (HMRC) being cited as the most complete implementation of the lean philosophy in UK public service (Radnor, 2010), although earlier reports suggested there was still a long way to go (Radnor and Bucci, 2007).
- The maturity of BI programmes in Wales is generally at the early stages in organisations and there are fears that the progress to date may be eroded due to shifting objectives from improvement to cost reduction and insufficient resourcing.
- There is good awareness of different BI approaches, but knowledge is relatively superficial and incomplete (for example, PRINCE2 was referred to as a BI technique by some). **Lean thinking** was quoted as the most common approach used, followed by **systems thinking**.
- The analysis suggests that implementation of BI in the public sector is largely at 'point' level rather than the 'end-to-end' level (Esain, 2011) and indicates that the existing BI initiatives predominantly follow a 'tools based' mind set, where the focus of the improvement is on waste elimination at activity level, rather than addressing the wider systems issues. 'Point level' is akin to a 'task and complete' activity where the focus is on a small geographical area where the system boundaries are most likely constrained to within an organisation and does not take into account the complete horizontal journey/service which the citizen experiences.

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<sup>1</sup> The systematic service improvement refers to organisations within the sector not the sector as a whole

### Effectiveness of BI Approaches Used in Public Services (excluding healthcare)

- Many organisations reported that gains had been made as a result of BI activities and there was evidence that improving service effectiveness had been a prime focus, though a pull towards cost reduction was also evident.
- Lean thinking was reported as the most effective BI approach used, though only by just over half of respondents and is in line with current literature (Radnor, 2010). Other approaches were considered by the respondents as not effective.
- There was little evidence to suggest that the BI approaches used were integrated across organisations (eg either strategically or with other initiatives). Nearly 60% of respondents in the semi structured interviews agreed that “BI activities are piecemeal and ad hoc in the organisation”.
- In the semi structured interviews, an equal number of respondents agreed and disagreed with the statement that “BI activities initially led to some improvements but the benefits are not sustained”.

### Healthcare Specific Findings

- There is much enthusiasm directed towards improvement initiatives for the common good. This is illustrated by accounts of individuals and groups working in their own time in support of improvement. One motivation is the breaking down of professional barriers as a consequence of good team selection and management.
- Lack of measurement of quantifiable improvement at whole system level was an emergent theme. This related to differences in discipline and time for data entry, definitions of measures, units of measure, systems integration, etc.
- There is a broad range of BI activities within healthcare, with some that are reasonably well established. Though programmes tend to be generally discontinuous, with little evidence of spread and measurable sustainability.
- Organisationally, the NHS BI supportive structure has multiple organisations/agencies promoting improvement approaches (18 were identified in a search of Google and HOWIS). The number of organisations and their differing objectives make it difficult for the service to know where to seek help and decide what approaches might be appropriate in different circumstances. An overarching framework for support would provide clarity, advice and evidence regarding direction and fit for change agents in the service

### Strategic & Organisational

- Measurement of outcomes was generally poor and there appeared to be a lack of ‘joined up thinking’ in terms of application of different BI approaches and in terms of learning and sharing of knowledge. This suggests that there was little capability development in BI approaches at all levels of the organisations.
- The analysis suggests that BI in public sector is largely at ‘point’ level rather than the ‘end-to-end’ level and indicates that the existing BI initiatives predominantly follow a ‘tools based’ mind set, where the focus of the improvement is on short term impact e.g. waste elimination at activity level, rather than addressing the wider systems issues needed for suitable BI.
- Attitudes towards BI among practitioners were generally positive. Only around one fifth thought their organisation was not committed to BI and 80% thought BI would be part of their organisation’s plans within 2 years.
- It is clear that BI application is gathering momentum in the public sector and the impression gained is that the current public sector funding situation is a driver of change towards greater adoption and application.

- Much positive enthusiasm towards BI can be discerned among practitioners and while there are mixed results in effectiveness and some confusion regarding which BI approaches are appropriate, the sector as a whole is at a relatively early stage of understanding, so this would not be unexpected. Furthermore, it can be argued that positive progress has been made in developing BI knowledge and capability and there is evidence to suggest that BI initiatives have had beneficial impacts, both tangible and intangible.

#### A Framework for Using Business Improvement Approaches

- In addressing the question of which BI approaches should be used for different process types, the report proposes that the Bicheno (2008) **Service Systems Analysis Model** offers a framework for segmentation by both organisational and process level, thus enabling improvement techniques to be matched to the need. Additionally factors such as strong leadership, visible support from management (behaviours), training and development, alignment to strategy, etc. have been identified in literature (Radnor, 2010; Hines et al, 2008). Maturity of implementation also requires consideration.
- This approach takes a *system perspective* to improvement, which emphasises the importance of 'big picture' system understanding when approaching change, otherwise there is a risk of too much of a 'point' and tool focus that tends to lead to a piecemeal approach, a risk of sub-optimisation and lack of spread and sustainability. The term **lean light** can be used to describe the latter, while the term **system lean** can be used to describe the former preferable approach (Bicheno, 2008).
- The **Service Systems Analysis Model** (Bicheno, 2008) offers a framework around which BI can be developed, providing direction and focus for the practitioner. It aims to offer a **contingent** approach, which emphasises the importance of selecting improvement techniques that are appropriate to a given environment or situational context (in other words, opposite to a **prescriptive** approach). The model therefore integrates concepts and techniques drawn from several BI approaches and contemporary project management.

#### Improvement Network

- A key recommendation of the report is that WAG should promote the creation of an action learning forum that could leverage collective knowledge and stimulate experimentation with new forms of service improvement - a **Public Sector Improvement Network**.
- The overall aim of the network would be to accelerate Welsh public sector adoption of citizen centred services and related improvement science, focusing on activities related to key policy priorities, emerging issues from front line service provision and those relating to new thinking in the broader field of improvement
- The network could facilitate learning through knowledge and experience sharing, enable the development and adoption of a service system analysis framework and develop a common BI vocabulary for the public sector.
- Key activities of a network could include: knowledge transfer across different public service domains, dissemination of improvement within the network, the promotion of local networks of mutually supportive groups and special interest groups, research to support evaluation and development, establishing a skills matrix and the provision of a reference knowledge base.

## Section 1 - Introduction

### 1.1 Context

This research has been commissioned by the Wales Audit Office (WAO) and the Welsh Assembly Government (WAG) to inform of the facilitation and the transfer of good practice and increased shared learning promoting the delivery of citizen-centred public services and ensuring that these services provide value for money to Welsh taxpayers.

During the past decade public services have benefited from growing government spending while witnessed an increasing tendency to rely on 'management by targets' (Francis, 2010; Buxton, 2009; Hood, 2006; Bevan and Hood, 2006). The recent evidence published by the Office of National Statistics show that each extra pound spent has been working less hard than the previous one (CBI, 2010) indicating that the public sector faces a significant productivity challenge. In its recent study the CBI argues that if public service productivity had only improved in line with productivity in the rest of the economy, between 1997 and 2007, spending on those services could have been £31bn lower in 2007-08 without loss of quality (CBI, 2010).

This study was commissioned against a backdrop of increasing pressures on public sector spending and a growing desire to cut the waste of resources as reported by the CBI (2010). The recent WAO 'A Picture of Public Sector' report predicts that, over three years from April 2011, there could be a total cut in funding for Welsh public services of around £1.5 billion – half a billion every year. Moreover, the WAO clearly states that "the Welsh public sector had made only limited progress in achieving, measuring and demonstrating efficiency gains. The overall level of efficiency gains for 2005-06 and 2006-07 was certainly overstated and we concluded that at the rates of progress exhibited at the time of our review, the overall national efficiency target of £600 million in savings by 2010 would be missed by "some considerable margin" (WAO, 2010).

### 1.2 Research Objectives, Definitions & Scope

Three research questions posed by WAO and WAG were:

- i. What is the baseline range and impact of business process redesign techniques (and related approaches) in use within the Welsh public service?
- ii. Is the application of systems thinking (and related approaches) limited to transactional services and in what organisational conditions could it be applied successfully to improve public services in:
  - a. delivering reductions in cost and improvements in outcomes for cross-cutting public service delivery in Wales?
  - b. improving the cost and effectiveness of public sector project management?
- iii. What types of business streamlining approaches should be used in which circumstances or conditions?

A brief analysis of the literature indicates that terms such as 'business streamlining', 'business process redesign', 'business improvement' and 'service improvement' are used interchangeably and even inconsistently in public sector literature. In this research all approaches that are being deployed to deliver more efficient and effective public services have been looked at. For the sake of consistency, all such approaches, tools and techniques are referred to as '*business improvement approaches*'. (BI)

In terms of the scope, this research covers a wide range of public services in Wales, including the NHS, local government, central government, government agencies, emergency services and the Third Sector. In order to answer the first research question, healthcare has been separated from other public services. The study of the health system was based on secondary research, which was

mainly driven by the practical considerations in obtaining ethics approval from NHS bodies for collecting primary data. Moreover, BI in the health sector have been sufficiently different to warrant a separate investigation.

### 1.3 Definitions

The term 'business improvement techniques' is used in this report to describe activities that aim to innovate and improve service delivery - for example, to create better process flow, increased quality, capacity creation, value enhancement, waste removal along with organisational learning.

Appendix 2 contains a brief description of BI approaches referred to in the report.

Note that LERC uses **lean thinking** as an overarching term that encompasses a variety of approaches, many of which are rooted in the systems thinking philosophy.

### 1.4 Report Structure

This report consists of four sections. Following the first Introduction section, Section 2 contains the results of the research and data collection activities; section 3 discusses a framework for the adoption of BI approaches in the public sector, while section 4 contains the conclusions and recommendations.

Note that the second aim of the research (relating to the applicability of systems thinking to transactional services) is effectively addressed in section 2.

## Section 2 - BI Approaches used in Welsh Public Service

### 2.1 Introduction

This section consists of an analysis of the findings of a literature review and the survey, interviews etc. of public sector BI approaches. The NHS is considered separately at the end of the section. The rationale behind this distinction is that the approaches, techniques and tools adopted within the health sector are radically different in nature, context and terminology.

A summary of the literature analysis is contained in Appendix 1.

The remainder of this section will discuss the findings of a questionnaire based survey, in depth semi-structured interviews and secondary data. This research design was conducted to capture the existing levels of adoption of various BI approaches across public services Wales. The key challenge in conducting the questionnaire based survey was the lack of a central database of the main BI contacts within the public sector in Wales. Therefore, the research team developed a database of some of the key BI contacts within the public sector as presented in the following.

### 2.2 Questionnaire Survey

#### 2.2.1 Introduction

A questionnaire was designed to capture the existing level of adoption of various BI approaches in Wales (see Appendix 2).

#### 2.2.2 Survey Findings

A summary of the survey findings is shown below. Note that this is based on data from 14 organisations, which is not statistically significant, so the findings cannot be generalised. Moreover, the research has captured the subjective perceptions of respondents, rather than any objective measures of success.

Spread of BI Activities

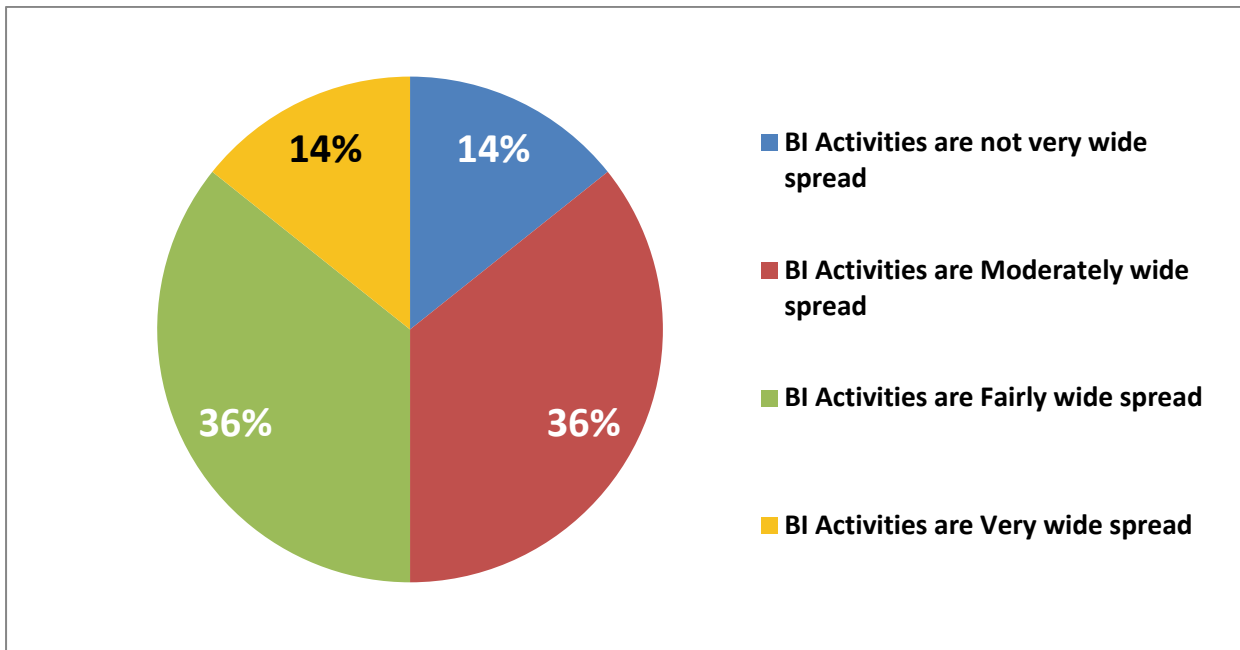


Figure 2.1 Spread of BI activities across Welsh public sector

Figure 2.1 suggests that BI activities are reasonably widespread across Welsh public services, with 72% of respondents claiming they are fairly or moderately widespread.

Strategic Alignment of BI Activities (ex NHS)

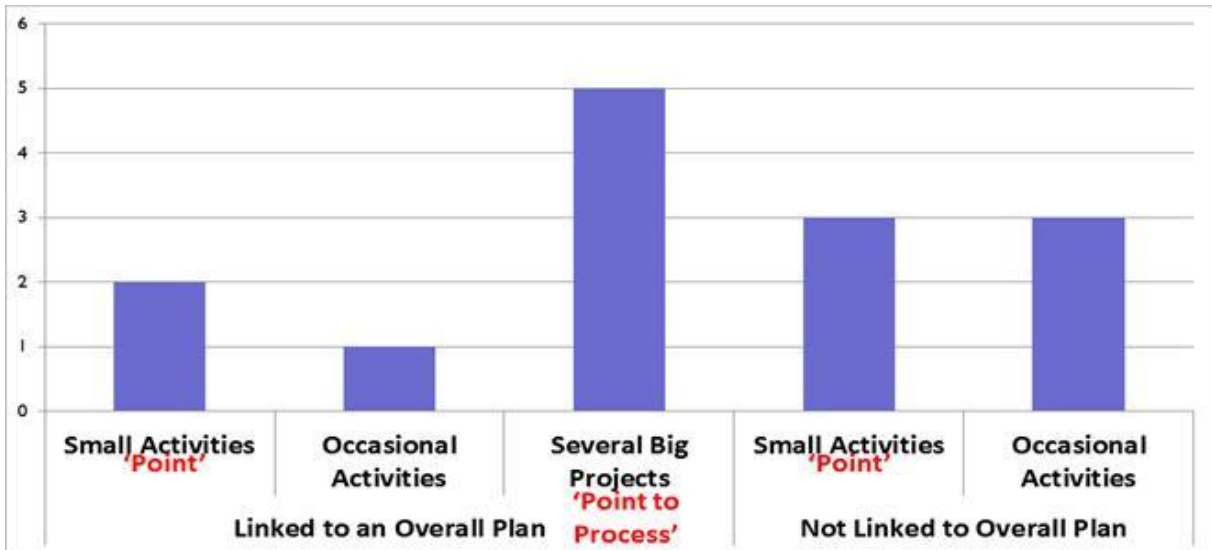
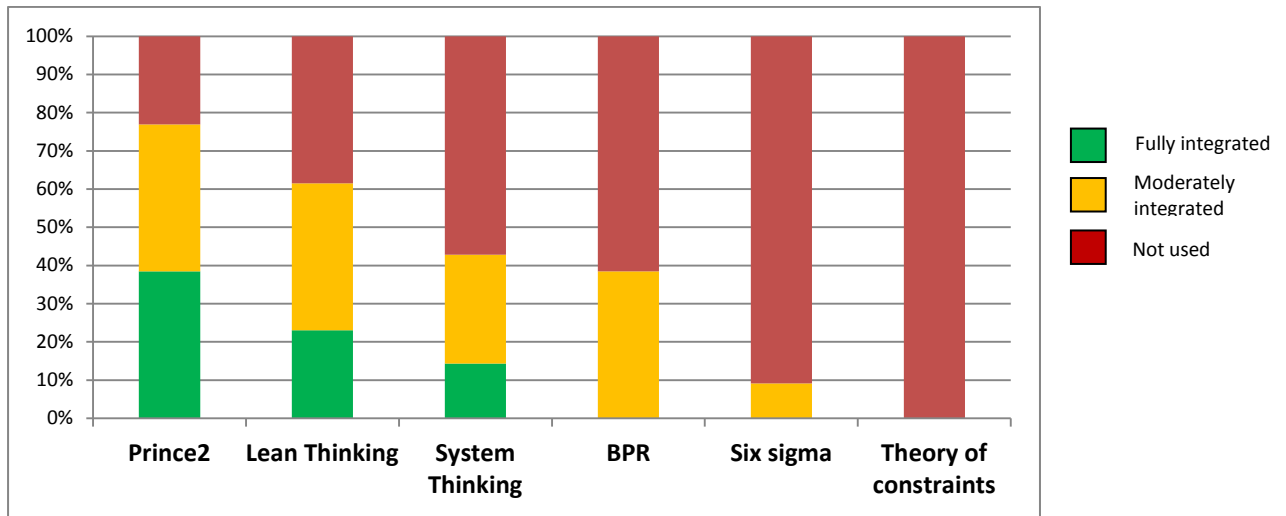


Figure 2.2 Strategic alignment and size of BI activities

Figure 2.2 shows that just under half of respondents (43%) think BI activities are not linked to an overall plan and suggests that BI approaches vary in terms of the size and number of projects carried out at any time.



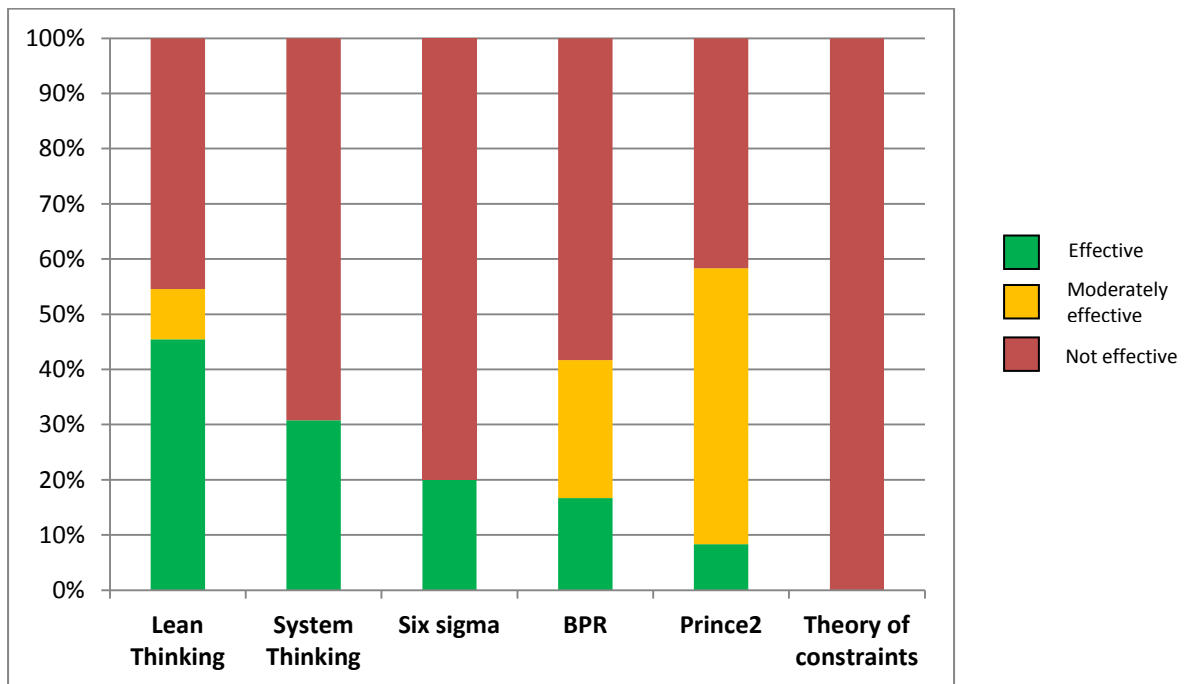
**BI Approaches Used**



**Figure 2.3 Level of adoption of BI approaches in Welsh public services**

Figure 2.3 illustrates the level of adoption of various BI approaches. Interestingly, Prince2 had the highest level of adoption amongst all BI approaches. Nevertheless, as illustrated in Figure 2.4 below, is perceived to have the lowest level of effectiveness amongst the BI approaches familiar to the public sector.

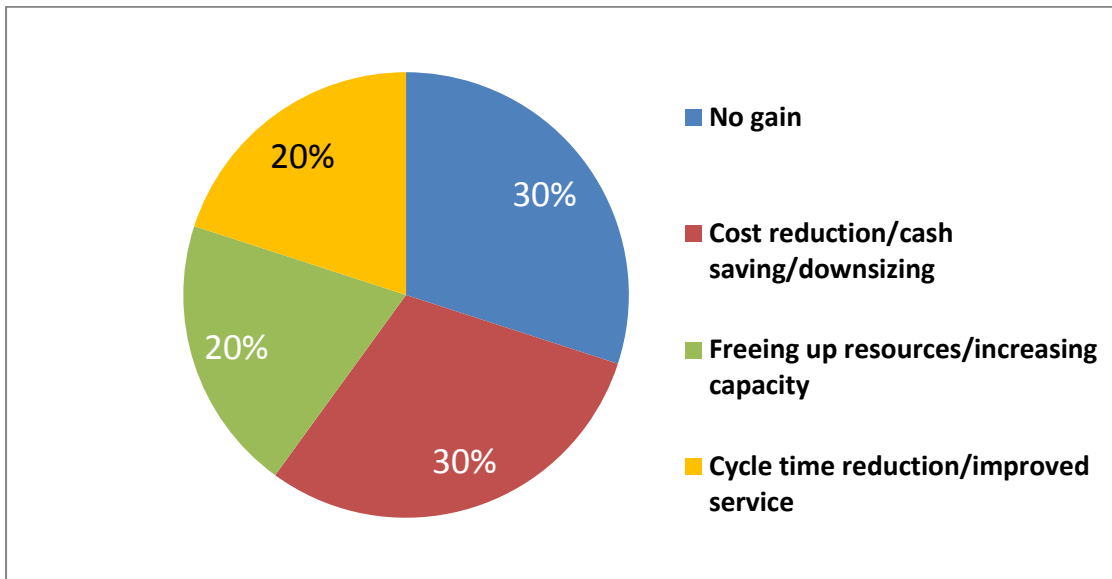
**Effectiveness of BI Approaches**



**Figure 2.4 Effectiveness of BI approaches**

It should be noted that this represents the perceptions of respondents and several factors need to be taken into account in interpreting the data - for example, not being effective does not necessarily mean that the respective BI approach is not appropriate, as it may have been applied inappropriately. Nevertheless, the chart is useful in suggesting that no single BI approach is considered to be 'very effective'.

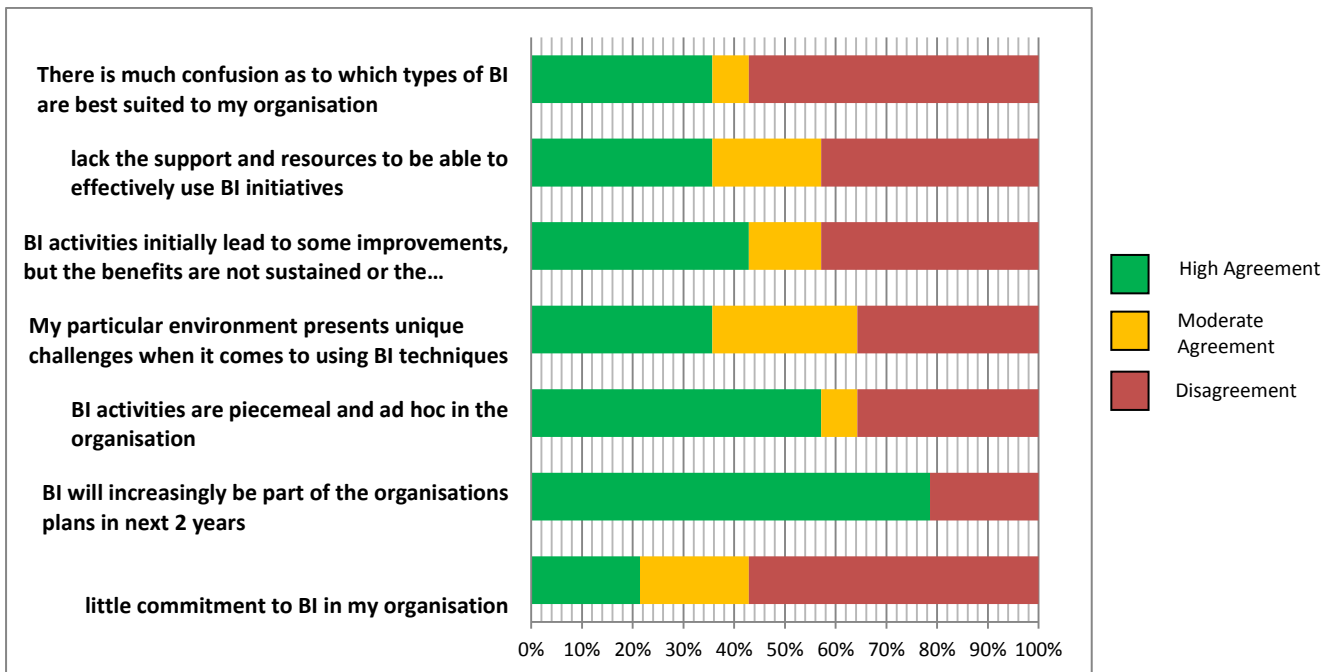
**Main Efficiency Gains**



**Figure 2.5 Main efficiency gains from BI approaches**

In terms of the perception of efficiency gains of BI activities, (figure 2.5 above) only one third claimed there had been no gains, while a similar proportion claimed a cost reduction oriented saving. Interestingly, 40% stated gains that had a positive connotation (e.g. value enhancement, capacity creation).

**Issues Around the Adoption of BI**



**Figure 2.6 Issues around BI adoption**

Respondents were asked to state their level of agreement or disagreement with a series of statements about BI (Figure 2.6 above); observations of the results are as follows:

- Just over a third thought there was confusion over which BI approach to adopt and that there was a lack of support and resources for BI
- Nearly 60% agreed that there were improvements from BI activity, but they were not sustained
- Around two thirds thought their environment presented unique challenges and that the approach was piecemeal or ad hoc in their organisations
- Nearly 80% thought BI would be part of their organisation's plans soon
- Nearly 60% disagreed that there was little commitment to BI in their organisations

## 2.3 Semi Structured Interviews

### 2.3.1 Sample

Twenty three semi-structured telephone interviews were conducted to ensure an in depth understanding of the issues faced by public sector managers in the adoption of BI approaches. The interviews aimed to capture the insights of individuals about BI adoption, e.g. the barriers, benefits, lessons learnt, etc.

All those interviewed were either senior public sector managers/leaders or in senior BI roles. Twelve were from government departments/agencies, one was from a housing association, seven were from local authorities and three from emergency services.

### 2.3.2 Topics

The following questions were asked during the telephone interviews:

1. Has your organisation carried out any BI in recent years and if so when?
2. What words/phrases/terms do you use to briefly describe your present or past BI?
3. Briefly, what did this BI involve?
4. What quantifiable gains has the BI achieved?
5. What non-quantifiable gains has the BI achieved?

### 2.3.3 Summary of Findings

The following summarises the interview findings.

- As this was a *purposive* sample (i.e. respondents were selected as they were in a position to provide relevant information), each stated that their organisation engaged in some kind of BI activity, though every organisation described a different approach.
- In one organisation, BI activities were stated to have commenced in 2002-2003. However, most organisations stated that their efforts were no more than 18 months old, indicating that most organisations are in the early stages of BI change and fairly new to BI concepts. Many respondents stated that this was obviously in response to the economic climate. Notably a few stated that they appreciated that the emphasis of BI was changing from a focus of enhancing service at the outset to now cutting costs.
- Several respondents were very enthusiastic about their improvement efforts and it was clear that some were investing a great deal of hope in the programmes in order to help them to meet future challenges. There is a good will for change, though there is a danger that if improvement activities fail to reap the promised benefits (repeatedly), people will eventually become cynical towards such endeavours. There is evidence to suggest that this has already become an issue in the private sector.
- The focus of BI approaches seems to be on activity and efficiency measures such as standardisation of activities, time compression at activity level, capacity release, etc. This

poses a challenge to the future of BI, in that there was little evidence of BI manager awareness regarding the view that programmes should begin with effectiveness rather than efficiency. The current economic climate and the emphasis to cut costs are likely to increase focus on cost cutting.

- It was interesting to note that even though the respondents were focused on activity and efficiency measures, some respondents found it hard to state what these actually constituted. Indeed, the measurement of the benefits seems to be a contentious issue amongst the respondents. There were no common criteria or method for measuring the tangible or intangible benefits.
- The respondents favour contextual and practical approaches rather than common / general methodologies. Several respondents indicated that they used local knowledge to inform and adapt BI methods for use in their respective organisations.
- Lean and systems thinking approaches were commonly stated as influencing their BI methodology although (with a few exceptions) there was little indication that this involved a systemic analysis and understanding of their problems. This type of implementation approach could be termed therefore as somewhat 'tools based'. Our research indicates that this latter approach rarely produces sustained results without there being an evolution into a wider system focus. The necessary ingredient of developing capability within the total organisation to help drive sustainability is conspicuous by its absence from the majority of interviews. However, there are organisations that understand this need and are making provisions to address this as they progress.
- There is evidence of agencies trying to work together to realise efficiencies – partnership boards tend to be the vehicle to bring about such work. Some respondents noted that an effective partnership was brilliant, but that it was often quite difficult to make the partnership work together as much as it needs to in order to bring about substantial gain (the assumption is that partnerships will and should have the capability to take an end-to-end view).
- There was little evidence regarding joined up thinking in terms of application of different BI approaches. Similarly there was little evidence regarding joined up learning and sharing of knowledge between Welsh public sector organisations.

#### 2.3.4 Conclusions

- Overall, the findings suggest reasonably good awareness of BI approaches - particularly lean (over 50%) and systems thinking. Most organisations contacted had placed emphasis on establishing a continuous improvement programme of some kind.
- Much of the BI activity had been initiated within 2 years (though there were several examples of 5+ years of implementation) so it could be interpreted that most were still in the learning phase, though there are concerns that much of the early good work will be eroded because of shifting objectives and lack of critical resource needed to maintain the momentum.
- It was clear from the interviews that that BI knowledge was incomplete, with evidence that some key concepts were missing from the practitioners vocabularies. Some respondents claimed that they used PRINCE2 for BI, though it can be argued that this is not strictly a BI approach.
- There is wide sub-sector spread, but anecdotal evidence suggests different sectors are at different stages of maturity. LERC believes that healthcare and defence were first to start using lean ideas, followed by UK Government agencies/departments (eg HMRC, DWP), the parts of the third sector (such as housing associations), some emergency services, local government and latterly higher education.

- 70% of those contacted reported that ‘gains had been made’ and there was evidence of a prime focus on improving service effectiveness, though the current pressure has resulted in a pull towards cost reductions.
- A positive feature observed was significant enthusiasm of practitioners, which many believing they were “making a difference”.
- Measurement of outcomes was poor (e.g. financial) and there was a lack of ‘joined up’ thinking in terms of the application of different BI approaches, or of learning and the sharing of knowledge.

## 2.4 BI Approaches in NHS in Wales: Review of Grey Literature

### 2.4.1 Summary

Predominantly NHS staff (involved in BI) are enthusiastic, with stories of individuals investing their personal time to pursue change for the common good. Motivation of staff is illustrated with people organising work to attend events to learn, apply and share learning. Evidence of breaking down organisational and professional boundaries (locally & nationally) though the process of BI emerges from the analysis.

Coherence of how support organisations that facilitate BI fit with NHS strategy is needed for the benefit of NHS staff, to build on the desire of staff to be supported to make improvement occur. Language consistency and links to evidenced research could be strengthened for the benefit of staff undertaking BI and management to support pump priming activity.

Analysis suggests that the involvement of citizens in BI is limited. The strength of focus on improved safety for patients could be more expressly linked and used as a platform to achieve BI reinforcing the link between improving quality of service at the same time.

Measurement systems which staff are trying to use (agreed by WAG and National Leadership and Innovation Agency for Healthcare) are often not conducive to both national and local measurement from the outset of a BI activity. Most existing measurement systems are designed for performance reporting rather than learning from improvement. Some cases illustrated the laborious manual systems and analysis which needed to be adopted to achieve feedback on BI. This then makes it difficult to capture the true nature of improvement and learn from the findings at both a local and national level. Most improvement is discontinuous and as such may have a tendency not to spread or sustain. Where a holistic platform was reported as part of a bottom up improvement anecdotal evidence suggests this has deteriorated in the face of new structures and hence may not have been joined up appropriately to strategy.

### 2.4.2 Introduction

This report is a summary of the analysis of grey literature (publically published literature not peer reviewed) and the purpose of this section is to gain an overview and understanding of the current activity in BI (this term will be used in this document to also mean Service Improvement) in the NHS (excluding standalone improvement activities in social care). The selection of grey literature for analysis brings with it some limitations. The first limitation that the information included is more likely to include a positive interpretation of results and themes from the results alone which could be misleading. This has been overcome through firstly the analysis of outcomes against improvement logic and secondly against the depth and spread of the improvement which when triangulated with results, is helpful in gaining a better picture of the BI activity being undertaken. Details of how this analysis has been undertaken are included in the method section below.

This report is structured to review the method employed to select and evaluate the grey literature, the themes emerging from the analysis and to conclude offer some suggested applications of the findings.

### 2.4.3 Method

An initial search for organisations supporting BI in healthcare was undertaken using the web search engine 'Google' and through public access of HOWIS. In addition LERC programmes of research were included where reports/public documents have been issued. The terms against which the search was undertaken was: - Service Improvement, Health and Wales.

Eighteen organisations were identified, which were facilitating or reporting a number of programmes or cases of BI. Some were offering web portals for case study outcomes rather than being actively engaged in facilitating or funding improvement.

Eight programmes, of which most were national, were identified as reporting findings (containing evidence either quantifiable or non-quantifiable) in the time frame 2007-2010. In addition a record of current programmes of BI has been recorded as these are not complete. Analysis of these programmes is either limited or has not been undertaken, as no evaluation of these has yet been completed. Other programmes were identified but were the subject of 'Leadership' or Capacity Building' rather than improvement and as such, were discounted.

These eight programmes along with the LERC research in the same time period have been further analysed in detail. The purpose of the analysis is to drill down to process level improvement and determine patterns at process delivery level. This was achieved by constructing worksheets for each of the newly formed LHB's. Within each worksheet the programmes are detailed and classified to a particular part of the organisation i.e. Hospital, etc. This has resulted in the review of seventy eight activities. It should be noted that some performance information was difficult to disaggregate from national performance. Conversely, some had more local impact measures as the structures to design aggregated performance at commencement of the programme required learning and time to put in place.

Analysis of these seventy eight activities against the case study information published has been used using two academic structures. The first is related to the focus of the activity (Rich et al, 2006) where a 'logic' has been proposed for evaluating the progress of improvement through 5 stages of focus. These being: **Safety, Morale, Quality, Delivery, Cost.**

The effect is intended to be cumulative and as such, a combination of these may occur against the activities detailed. It is expected that improvement activities will be designed to be cognisant of this logic and absence of stages may affect the sustainability of results. When analysing the results of the activities, words and terms used in the cases are the unit of measure to make this evaluation i.e. 'care bundles' are associated with patient safety.

The second is related to the depth and spread of the location of improvement. This has been undertaken against Liker and Meier's (2006) discussion of implementation strategies for improvement, as well as Spear's (2009) view of thinking or learning organisations. For the purposes of this report the operational definitions of this framework for evaluation is as follows.

- **Point** – where an improvement activity is being undertaken in a small geographic location and usually applying methods for small scale change (such as the Plan-Do-Study-Act cycle explained by Deming). These are more likely to be discontinuous improvement and PDSA is often absent, hence these issues continuously reoccur.
- **Point to Process** – where the improvement may have started as a small scale focused improvement, but is being spread along the process with the intention of improving a process (where a process cross-functional boundaries) as a whole but may have difficulties in influencing supporting services. Evidence is more likely to exhibit discontinuous improvement.

- **Process** – where improvement is focused on the process as a whole with a strategic alignment of improvement activities which may or may not be delivered through multiple PDSA type cycles. Evidence can exhibit both discontinuous and continuous improvement.
- **End to end** – where process improvement builds capacity in improvement across the whole process rather than PDSA cycles. Evidence exhibits continuous improvement.
- **Holistic** – where a complete bounded organisation is involved in improvement and is evidencing ‘systematic’ improvement (Spear, 2009) so that ‘improvement is what we do around here’. Evidence exhibits continuous improvement.

#### 2.4.4 Themes

The following section provides a summary of the themes which have emerged from the full review. One general observation is the limited reference in grey literature to citizen/patient involvement in improvement. This is the case when describing the project focus or when describing the team composition. The following themes contain the output of the grey literature analysis.

##### Alignment of BI

Grey literature refers to the ‘top down’ directives for involvement and support, which is unsurprising given the formal nature of the literature reviewed. Cognisance of the lack of analysis of internal organisation action for BI is required when reviewing these themes.

Significant activity in terms of service review and redesign is reported (78 activities) as part of this analysis, but still much is unreported and unpublished (based on the authors’ knowledge of the activity across the sector over the last 4 years in Wales).

1. Many organisations are providing assistance and support to all parts of the NHS to deliver service improvement.
  - a. The lack of an overall picture could confuse NHS staff generally, particularly in terms of who staff should be seeking assistance from, for what and when, etc.
  - b. These multiple sources could serve to reinforce old organisational boundaries via primary and secondary care, or could serve as a means of diversity.
  - c. The fit of the support organisations is unclear in relation to their role in deploying strategy and it is not clear what the overall linkages are (if any) between the programmes.
  - d. Programmes are generally discontinuous in their nature.
  - e. Support organisations websites are not always updated or complete.

##### Improvement Language

2. To the uninitiated in BI the grey literature on web pages, reports, etc. are difficult to understand. The following were noted:
  - f. Use of terms which are not fully explained.
  - g. Use of terms interchangeably such as Innovation, Service Improvement, Best practice which may not be appropriate (See Appendix 2).
  - h. Tools and techniques which interlink are delivered as separate packages at different times (e.g. Collaborative and Safer Patient Initiative).
  - i. Tools and techniques are used with ‘brand names’ making it difficult to relate to the theoretical underpinnings.
  - j. There is difficulty in linking actions to the outcomes from most case studies, most of which are intangible.

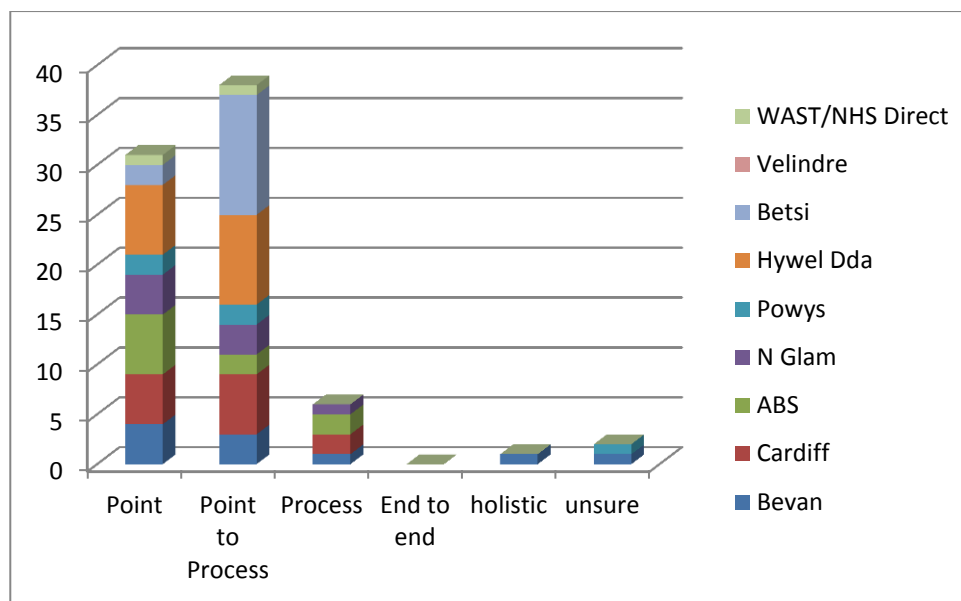
### Staff Impact

1. Staff report that a strength of improvement activity in large programmes is the fact that these make 'Wales a smaller place' and link likeminded individuals with common interests across boundaries and geographical locations.
2. Staff report they are empowered at the 'coal face' (frequently nurses) but discontinuous change affects the consistency of management support.
3. People being selected, or self-selecting, who are not suitable for the improvement – for example, managers who have no time, or representatives who have no interest. These tend to be *political* representatives, rather than *improvement* representatives and it might be that both are needed, but at different times for different purposes
4. Where the selection of personnel works, the breakdown in professional barriers is seen as a real motivator.

### Quantifiable and Non Quantifiable Improvement

1. The lack of quantifiable improvement seems to be related to issues around creating or capturing appropriate data to enact measurement systems which act as reliable feedback loops for improvement activity.
  - a. Reports suggest unity of the databases used needs to be improved as well as accessibility and reliability. An issue around designing national measurement systems for programmes as a constraint seems to be as a consequence of lack of knowledge and user friendly access/manipulation of current databases.
  - b. It could be that tangible evidence has been limited in the grey literature as the data is not positive and hence absence may detract from findings.
  - c. Data collection can be problematic regarding time to gather data outside the current systems which are designed for reporting.
2. More recent initiatives such as **Releasing Time to Care**, **Transforming Care at the Bedside**, **1000 Lives Campaign** and more latterly **Transforming Care** have not yet been evaluated. Evaluation of completed activity seems to rely more on stories rather than a combination of hard and soft outcomes.
3. Most improvement activity has been recorded as point (at a particular point in the patient journey) or point to process (from a particular point in the patient journey to the alignment of the steps which deliver the service) – see Figure 2.7 – while such an approach is important, it requires linking to organisational strategy. Where the one holistic programme had been developed (Figure 2.7), it has recently been affected by the reorganisation (used as a reference site for learning) and decoupling from strategy.
4. The Welsh healthcare review by site indicates less emphasis on safety than moral, quality and delivery. No reports talked about 'costs'.
5. The use of care bundles as a means to improve patient safety is not linked to all the programmes which is an area for improvement. It was encouraging to see the involvement of new research on safety being tested through the reliability research programme (WISER - Health Foundation).
6. Lots of references to spread rather than evidence of such and very little reference to sustainability (no exit strategy of facilitating organisations).





**Figure 2.7 Classification of site based activity by Service Improvement Type**  
 Note the volume of activity should not be compared as the number of different sites may vary significantly in different LHB's.

### 2.4.5 Healthcare Conclusions

Predominantly NHS staff (involved in BI) are enthusiastic, with stories of individuals investing their personal time to pursue change for the common good. Motivation of staff in terms of organising work to attend events to learn, apply and share learning is highlighted and breaking down organisational and professional boundaries though this process emerges from the analysis.

Coherence of the how support organisations that facilitate BI fit with NHS strategy is needed for the benefit of NHS staff, to build on the desire of staff to be supported to make improvement occur. Language consistency and links to evidenced research could be strengthened for the benefit of staff undertaking BI.

Reports of involvement of the citizens in BI are limited. Focus on improved safety could be more expressly linked with BI.

Measurement systems which staff are trying to use are often not conducive to both national and local measurement from the outset of a BI activity. Most existing measurement systems are designed for reporting performance rather than learning from improvement. This then makes it difficult to capture the true nature of improvement and learn from the finding at both a local and national level.

Most improvement is discontinuous and as such may have a tendency not to spread or sustain. Where a holistic platform was reported (and used as a reference site for other organisations) as part of a bottom up improvement anecdotal evidence suggests this has deteriorated in the face of new structures and hence, may not have been joined up appropriately to strategy. A linkage to bring these together to achieve continuous improvement seems to be required within an organisation. This may well require strategic alignment, citizen and managerial engagement and cooperation for learning.

These findings were similar to those reported in other public sector organisations. For example, there was a similar lack of quantifiable benefits from BI activity. Moreover, solid evidence has been provided from both health and non-health public services showing that the focus of BI is on 'activity improvement' rather than the 'end-to-end flows'. Also, it was identified that the focus of BI is on

efficiency (cost) rather than effectiveness (safety, quality, service improvement) posing a great challenge for the future BI decisions.

## 2.5 Overall Conclusions

While the sample size is insufficient to draw robust generalised conclusions about the state of adoption of BI approaches in the Welsh public sector, several themes and trends have emerged, many of which are corroborated by other studies, LERC research experience and anecdotal observation.

BI is relatively new in its application in the public sector – around 2 years old for many, though in areas such as healthcare, initiatives go back at least 5 years and around a decade in some specialised areas, particularly in central government linked functions. The current BI environment can be described as dynamic, as knowledge and experience is rapidly developing and becoming increasingly important in many organisations.

Current levels of BI knowledge can be described as relatively superficial and the effectiveness of initiatives is certainly mixed, as is the sustainability of improvements. There is some confusion over the nature and application of BI and an increasing focus on cost cutting.

In general terms, the public sector's approach could be termed as **lean light** as opposed to a **system lean** approach. The latter emphasises the need for a system perspective to improvement, and the importance a 'big picture' system understanding when approaching change. A **lean light** approach tends to be too focused on tools and techniques, is generally piecemeal (rather than strategic or linked to other initiatives) and does not lead to longer term sustainable change.

However, it can be argued that current level of adoption is not untypical, given how BI thinking tends to develop and evolve in a relatively unstructured way initially in many organisations/sectors (Brando DeSouza, 2009; Holm & Ahlstrom, 2010). The key task moving forward is to be able to capitalise on the progress made so far and create an environment that will facilitate the development and adoption of a **system lean** BI approach.

## Section 3 - A Framework for Using BI Approaches

### 3.1. Introduction

This section of the report is intended to address the research questions 2 and 3. Questions 3, '**What type of business streamlining approaches should be used in which circumstances and condition?**' will be answered initially and consequently this will inform question 2. Question 2 raises the perception that there are limitations of applicability of BI approaches to only transactional services and hence the validity of this perception will be assessed. Specifically, cross-cut public sector delivery and project management approaches will be discussed in a review of literature in this area.

A number of authors have promoted principles (Womack and Jones, 1996), frameworks (Rich et al, 2006; Harry and Scheroeder, 2000; Kobayashi, 1995), etc., for organisational improvement within industry. While informative, these do not address what improvement tools and techniques available to practitioners should be used in what circumstance.

It is the context in which improvement is desired (residing within systems) that are implicitly dynamic and subject to continual change, which makes such a prescription undesirable. Improvement of services are part of wider systems (including other organisations, actors within and outside those organisations, the political environment, etc.) hence the ability to be precise in all circumstances about what will work and what will not, becomes a much more complex task. Thus to answer the questions posed in this research a 'systems lean' (Bicheno, 2008) view is adopted.

Radnor (2010) in her assessment of process improvement methodologies studied the UK public service and notes the need for 'organisational readiness'<sup>2</sup> citing common factors for success from literature which are given in descending order below: -

- Senior Management commitment and engagement in improvement.
- Leadership at the top and at every level.
- Linking improvement to organisational direction.
- Time to allow impact to occur.
- Good customer understanding and response.
- Good understanding of whole processes.
- Training and development.
- Proper measurement of current performance.
- Engagement of all of staff.

These reinforce the need to understand the interplay between the layers of an organisation, the context within which improvement is being made and the visible and invisible attributes which enable sustainable improvement (Hines, et al, 2008). In recent years the call to invest in research into implementation science has resulted in agenda setting (Eccles, 2009). Implementation is considered to be critical and yet, this aspect of improvement is not well understood. This affirms the need for study of the factors effecting successful implementation of evidence based practice.

As has been discussed earlier in this report there are negative implications for implementation of improvement when the focus is on the parts, rather than whole system. The most important of these is sub-optimal redesign of processes for point improvement (which impacts other parts of the system) to the detriment of citizen service performance as a whole. The concept of light lean (Bicheno, 2008) draws attention to action orientated improvement programmes focusing on mapping without considering the whole. Light lean can deliver results but often without the infrastructure (Esain and Rich, 2011) needed for either sustainability or spread (Found et al, 2007).

Yet many improvement programmes start as point activities, as referred to in section 2.4. Thus implementation strategies need to be carefully considered by managers to ensure that the balance of speed and sustainability of improvement delivers the intended outcomes (Bateman, et al, 2011).

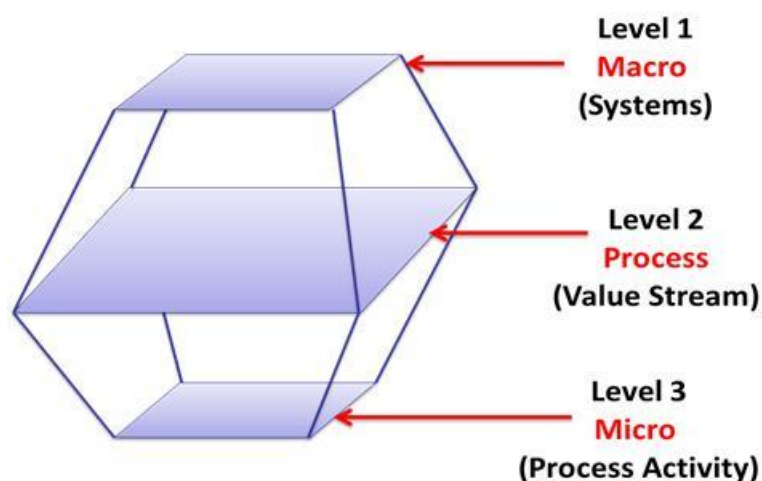
### 3.2 Service Systems Analysis Model Overview

In order to address research Question 3, the **Service Systems Analysis Model** (Bicheno, 2008) offers a three dimensional analysis of organisations, the contribution of which is to view the service provision as a system (macro), as processes (value streams) and as tasks (micro) - see figure 3.1 below. It is intended that all of these levels are considered when improvement action is desired – that is, a selective 'pick and mix' approach should not be taken.

At each of these levels specific tools and techniques can be potentially highly effective, (although other tools and techniques which may be useful in a particular context are not discounted). These should be thought of as a guide to the practitioner. The objective of the model is to enable organisations to critically challenge assumptions about the existing organisation design in the context of the dynamic environment of new public management. In particular, a user/citizen lens in conjunction with modern operational management practices should be considered, in order to remain relevant, contemporary and effective in the provision of public value.

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<sup>2</sup> 'Organisational Readiness' is defined by Radnor (2010) as 'improvement focusing on the organisation's awareness or realisation of the need for improvement, planning the change and developing an organisational culture which understands the customer requirements, has an organisational process view and data to drive improvement.'



**Figure 3.1: The three levels of analysis offering a three dimensional view to classify organisations (Bicheno, 2008).**

The purpose of considering all three levels is to understand the focus for improvement (level 1), the process flow (level 2) and the resilience of the system (level 3) - see table 3.1 for examples. A full account of the model can be found in Bicheno’s book **The Lean Toolbox for Service Systems** (see references for full details).

Organisation / Supply Chain/ Cluster	Level 1 (Focus)	Level 2 (Flow)	Level 3 (Resilience)
Local authority	Leisure Services	Swimming visit process	Reliability of Life Guard services
Healthcare	Planned Care (Health and Social Care Provision)	Dementia Pathway	Care Bundle for Central Line Infection
Housing Association	Estate Management	Voids Management	Kitchen refurbishment
Police	Traffic Enforcement	Motorway patrol	Speeding ticket issue
University	Teaching	Undergraduate admissions	Enrolment process

**Table 3.1: An example of the levels of consideration for public service systems (Bicheno, 2008 as amended by authors)**

BI approaches and more specifically tools, techniques and concepts are recommended for use at different levels of the organization. At level 2, a more detailed analysis is proposed which segments process to reflect the different types of service which organizations need to accommodate.

### 3.3 Level 1 Analysis

#### 3.3.1 Key Aspects

Briefly, the key aspects of the level 1 analysis are to establish system identification and clarification of a systems boundary. Public services may have multiple systems and this will become evident when determining the system purpose and the citizen value which the system is delivering. Due account of shared resources across systems, demand, etc., is taken, which in turn enables the appropriate measures (end to end) to be developed in order to understand and learn about the improvement process. This level is not to be confused with strategy development, which may or may

not arise out of the discussions and findings, but rather understanding the organisational system to then enable appropriate operational management.

### 3.3.2 Relevant Concepts & Techniques

At this level of analysis the issues raised by Radnor (2010), such as senior management commitment and engagement in improvement, leadership at the top and at all levels, linking improvement to organisational direction, good customer understanding and measurement, are most likely to be addressed.

The purpose of this level of analysis and the tools described are to focus the organisation on the ‘vital few’ actions necessary rather than the ‘trivial many’.

In commercial organisations some of these aspects are addressed as a matter of design i.e. where marketing functions exist, then segmentation and grouping of common processes and families of products and services may already be customer/citizen facing. Such designs are not so common place in public sector organisations. However, some of these tools and techniques are equally applicable regardless of public or private ownership.

The following table provides a list of examples of tools and techniques recommended for application at this level. Understanding the characteristic is the intention of the tools and techniques, rather than their slavish application.

Characterisation	Tool/Technique	Description and reference	How the tool helps
Understanding Value	Public Value	A means of replicating ‘shareholder value’ in terms of public service stakeholders (Mark Moore, 1995; Cole and Parston, 2006).	Provides an insight from an outward facing perspective.
	Value and Failure Demand	Value Demand – the demand that citizens want to be satisfied (Seddon, 2008).	Provides input into the organisation about what is important to the user of the service.
Understanding Demand	Value and Failure Demand	Failure Demand - which is created through a failure in the system either to do a task right first time or by not doing something at all (Seddon, 2008).	Provides insight into unnecessary work and has links to the concept of waste (Womack and Jones, 1996) but is important in the broadest sense rather than the detailed level, which would be applied at level 2.
	Runners, Repeaters and Strangers	A means of segmenting demand by volume and type so that operations are developed as service families.	Enable focus on high volume, repeatable tasks to gain small scale improvement to achieve capacity gains, to then focus on more complex organisational issues.
Understanding Purpose	CATWOE (Customer, Actors, Transformation Process, World View, Owners and Environmental	A means of creating a root definition of the essence of the organisational system which is part of Soft Systems Methodology (Checkland,	Helps the organisation decide on its core purpose(s).

Characterisation	Tool/Technique	Description and reference	How the tool helps
	Constraints)	(1987); Jackson, 2003).	

**Table 3.2: Esain and Bicheno (2011) as amended**

This level of analysis is to ensure that organisations do not leap into detail before the issues are identified. Preparation at level 1 analysis enables discussion on where a system boundary may begin and end, what is the purpose of the system, and if there are multiple purposes - how can these be operationally managed most appropriately. The impact of current strategy might be addressed as the impact of stakeholders and that which citizens value. While this process is presented as a step wise activity it may be that following level 1 analysis, the level 2 or 3 analyses will inform level 1 and hence, this stage should be seen as iterative.

### 3.3 Level 2 Analysis

#### 3.3.1 Overview

The level 2 analysis provides a means of classifying processes and types of customer experience. The relationship between the degree of customer involvement and the level of repetition of working practices form the axis of a two by two matrix (see figure 3.2 below). These process types enable practitioners to draw upon more effective tools and techniques which help to develop improvement plans, providing direction and focus.

It aims to offer a **contingent** approach, which emphasises the importance of selecting improvement techniques that are appropriate to a given environment or situational context (in other words, opposite to a **prescriptive** approach). The model therefore integrates concepts and techniques drawn from several BI approaches and contemporary Project Management. Techniques at this level are designed to understand the way in which processes work or more explicitly; do not work. Tools and Techniques at level 1 are designed to understand how the organisational systems works and it is assumed that processes make up the parts of the system.

#### 3.3.2 Key Aspects

The model recognises the wide range of possible processes that exist in services (and especially in public services).

It uses two key dimensions for categorising different service types:

- Repeatability - Repetitiveness of customers/transactions through the value stream
- Customer involvement - Frequency that front line workers come into contact with customers

The Idealised type (see figure 3.2) of process is more likely to reflect innovation in service e.g. through the introduction of new services, etc., and hence tools and techniques related to the standardisation of activities which enable the new products to be launched successfully are more appropriate in this environment. Hence, project management techniques drawn from Four Fields mapping would be appropriate to this situation.

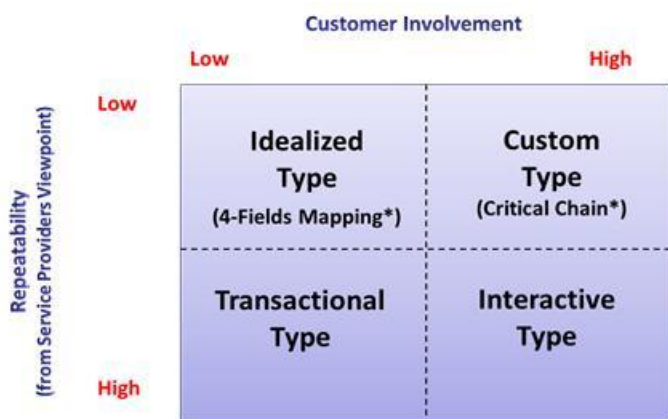
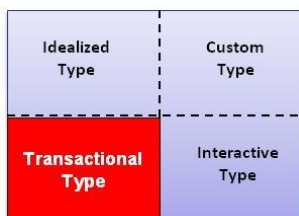


Figure 3.2: Two by two matrix for segmenting process types (Bicheno, 2008)

The Custom Type of process is also better addressed through the application of project management techniques drawn from Goldratt’s ‘Critical Chain’ (1997) approach.

The remaining two process types are discussed below.

### 3.3.3 Transactional Type



Low customer involvement, high repeatability, e.g. repetitive office tasks, order processing, some maintenance tasks.

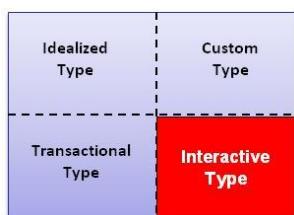
Some relevant tools & techniques that MAY be appropriate are shown in the following table along with the rationale for potential use of the tool or technique:

Characterisation	Tool/Technique	Description and reference	How the tool helps
Diagnostic	Brown Paper Model	A temporary visualisation of a process which enables a collective view of the work flow in a selected process, and the collation of issues associated with the process. (Hines and Rich, 1997; Bicheno, )	Helps those involved in the delivery of processes to create a shared mental model of the work process. In addition it highlights the volume of issues which show and where these effects are most obvious, This then enables discussion about where these issues originate, enabling a focus on what the next actions are.
	Learning to See	A single picture of a process flow including both information and service tasks. (Rother and Shook, 1998)	This helps highlight imbalance in the system.
Implementation mechanism for learning system	5S	A technique to enable the organisation of the work place for high performance and a platform for staff to learn problem solving approaches – if adopted in combination with 5S. (Womack and Jones 1996;	This helps remove the sources of variation from an environment, making it easier to see when problems arise and reduce the probability of failure –due to clutter- in a processing action. The issue of e-mail clutter is also addressed in the BMJ article by Cooke, et

Characterisation	Tool/Technique	Description and reference	How the tool helps
		Rich et al, 2006; Esain, et al 2008; Cooke, et al 2010)	al (2010).
	Standard Work	A detailed, standard way which is intended to be the basis of improvement. (Bicheno; Rich, et al, 2006)	This helps in the planning of work, staffing, etc. In combination with demand analysis -undertaken at level 1- this is used to help in determining the most appropriate means of undertaking the task (for training as well as improvement purposes).
	Cell Design	Is the way in which a work area can be designed to enable the least waste in relation to standard work and demand patterns? (Nicolas, 1998; Bicheno and Holweg, 2009)	Helps in providing flexible facilities, resources etc. to cope with differing demand patterns, seasonality, etc.
Measurement Approach for learning system	Takt Time	Is the beat of demand for the process (as determined at level 1). (See Liker and Meier, 2006)	This helps in determining patterns of work, seasonality etc. for work management as well as providing a feedback loop against the standard work which has been developed (see above).

Esain and Bicheno (2011) as amended

### 3.3.4 Interactive Type



High customer involvement, high repeatability, e.g. Hospital visit, Student registration, complex benefit claim

Some relevant tools and techniques that MAY be appropriate are shown in the following table:

Characterisation	Tool/Technique	Description and reference	How the tool helps
Diagnostics	Service Blueprint (swim lane)	A means of visualising the process flow which includes the iteration points with the customer/user of the service, and what is normally referred to as front and back office activities. (Zeithaml, et al, 2006)	This visualises the process from multiple perspectives and provides a means of challenging how each part of the service interacts. It helps to provide a common mental model and initiates dialogue about the whole process as opposed to a point on the process – as with the Brown



Characterisation	Tool/Technique	Description and reference	How the tool helps
			Paper Model, issues and their causes can be discussed.
	Cycle of Service (Moments of Truth)	This is a combination of two techniques which are designed to put those who deliver the service in the shoes of the users of the service. (Shostack, 1984)	The cycle of service provides a view of the point of interface between the customer and the service provision. Moments of Truth are a means of judging the impact of such an interface point.
	Kano Analysis	A means of determining the relative weight which users/customers attribute to 'value' (as determined in level 1).	Helps in the design and redesign of service to continually strive to understand the dynamic nature of customer/user value.
Implementation mechanism for learning system	Layout and Visual Management	These tools and techniques enable the purposeful design of facilities and work to enable effectiveness in both work and management.	These tools challenge the assumptions of the layout of work and link implementation of improvement and measurement/communication through a series of visual mechanisms, as appropriate to the work place. Thus, making it clear to those who do the work and those who manage the work what is happening and when (and more importantly when a problem exists in the process so these can be resolved at the place of work).
Measurement approach for learning system	Failsafe	A means to stop defects i.e. 'results when a mistake reaches the customer'. (Shingo 1986; Hinckley, 2001)	This helps classify mistakes and encourages approaches to avoid the occurrence of mistakes reaching the customer. This technique should be considered in two ways: The first is a short action cycle – where an immediate shut down or warning is given; and the second, a long action cycle where reasons for the defect occurring in the first place are investigated.

Esain and Bicheno (2011) as amended

### 3.4 Level 3 Analysis

The micro level analysis reflects the need for resilience in systems. It focuses on the need to do the right things, right, every time. At this level the analysis and tools and techniques are designed to

focus on point problems which can occur anywhere in a system or process. Point problems are defined as those occurring in a small geographic location or a limited scope or task. The focus is at this level because this point will have an effect on the overall performance of the organisation (and could be described as a pinch-point in terms of customer/user value).

This analysis is particularly appropriate for transactional processes. It is also key where transactional processes are safety or quality critical. The **Safer Patient Initiative** and **Saving 100,000 Lives** campaign are examples of the application of evidence-based practice in safety critical practices. The use of care bundles focusing on the correct sequence and adherence to protocols for small number of steps in a task have been proven to save lives.

Some relevant tools and techniques that MAY be appropriate:

Characterisation	Tool/Technique	Description and reference	How the tool helps
Diagnostics	SIPOC (Supplier, Input, Process, Output, Customer)	A complete record of the steps within a task (process), the inputs and the outputs, as well as a description of those other parties who have a part to play in completing the task.	To achieve resilience of processes, the capability of the organisation to perform tasks is essential – hence this helps diagnose issues within a task which effect consistency and reliability of work.
Implementation mechanism for learning system	Much of the Six Sigma Tool Kit (Bicheno and Catherwood)	The six sigma tool kit contains a range of tools and techniques (some of which overlap with Lean Thinking) which are specifically designed to deal with quality issues that occur at points in the process. This tool kit has the added benefit of a strong project management emphasis.	The use of these tools is to gain resilience within tasks so that the performance of these tasks is reliable and repeatable.
Measurement approach for learning system	Check Sheets. (Rich, et al, 2006; Bicheno and Catherwood,)	A check sheet is a means of gathering information about variables as well as a means of monitoring such variables. (Bicheno and Catherwood,)	This helps in identifying and monitoring high frequency and potentially high risk tasks. Through identification the six sigma tool kit can be implemented and then this tool can be used to monitor the long term success of the intervention.

Esain and Bicheno, 2011 (as amended)

### 3.5 Summary

The Service Systems Analysis Model (Bicheno, 2008) provides a means of selecting tools and techniques from various BI approaches (including contemporary project management) which are more likely to be appropriate in the circumstances described. Its strength is its levels of analysis

which are intended to limit the sub-optimisation which can be caused by focusing on processes (level 2) alone.

The model is also cognisant of sustainability through the alignment of the different levels of the organisation. The contextual factors raised by Radnor (2010) and Hines, et al (2008), are not explicitly referred to but the model could be further developed to draw upon the concepts, tools and techniques relevant to these below the line factors.

## Section 4 - Key Conclusions & Recommendations

### 4.1 Key Conclusions

#### 4.1.1 BI Approaches Used

- BI techniques are widespread across most public services in Wales. Much activity has been initiated within the past 2 years, although there are examples that date back to 1999 (Esain, et al., 1999). Defence and healthcare (Burgess et al, 2009) are considered the earliest adopters of systematic service improvement in UK public sector organisations<sup>3</sup>. With Royal Bolton NHS Trust and HM Revenue and Customs (HMRC) being cited as the most complete implementation of the lean philosophy in UK public service (Radnor, 2010), although earlier reports suggested there was still a long way to go (Radnor and Bucci, 2007).
- The maturity of BI programmes in Wales is generally at the early stages in organisations and there are fears that the progress to date may be eroded due to shifting objectives from improvement to cost reduction, as well as insufficient resourcing.
- There is good awareness of different BI approaches, but knowledge is relatively superficial and incomplete (for example, PRINCE2 was referred to as a BI technique by some). **Lean thinking** was quoted as the most common approach used, followed by **systems thinking**.
- The analysis suggests that implementation of BI in public sector is largely at 'point' level rather than the 'end-to-end' level (Esain, 2011) and indicates that the existing BI initiatives predominantly follow a 'tools based' mind set, where the focus of the improvement is on waste elimination at activity level, rather than addressing the wider systems issues. 'Point level' is akin to a 'task and complete' activity where the focus is on a small geographical area where the system boundaries are most likely constrained to within an organisation and does not take into account the complete horizontal journey/service which the citizen experiences.

#### 4.1.2 Effectiveness of BI Approaches Used in Public Services (excluding healthcare)

- Many organisations reported that gains had been made as a result of BI activities and there was evidence that improving service effectiveness had been a prime focus, though a pull towards cost reduction was also evident.
- Lean thinking was reported as the most effective BI approach used, though only by just over half of respondents - which is in line with current literature (Radnor, 2010). Other approaches were considered by the respondents as not effective.
- There was little evidence to suggest that the BI approaches used were integrated across organisations (e.g. either strategically or with other initiatives). Nearly 60% of respondents in the semi-structured interviews agreed that "BI activities are piecemeal and ad hoc in the organisation".

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<sup>3</sup> The systematic service improvement refers to organisations within the sector not the sector as a whole

- In the semi-structured interviews, an equal number of respondents agreed and disagreed with the statement that “BI activities initially led to some improvements but the benefits are not sustained”.

#### 4.1.3 Healthcare Specific Findings

- There is much enthusiasm directed towards improvement initiatives for the common good. This is illustrated by accounts of individuals and groups working in their own time in support of improvement. One motivation is the breaking down of professional barriers as a consequence of good team selection and management.
- Lack of measurement of quantifiable improvement at whole system level was an emergent theme. This related to differences in discipline and time for data entry, definitions of measures, units of measure, systems integration, etc.
- There is a broad range of BI activities within healthcare, some that are reasonably well established. Though programmes tend to be generally discontinuous, with little evidence of spread and measurable sustainability.
- Organisationally, the NHS BI supportive structure has multiple organisations/agencies promoting improvement approaches (18 were identified in a search of Google and HOWIS). The number of organisations and their differing objectives make it difficult for the service to know where to seek help and decide what approaches might be best, in certain circumstances. An overarching framework for support would provide clarity, advice and evidence regarding the direction and fit for change agents in the service

#### 4.1.4 Strategic & Organisational

- Measurement of outcomes was generally poor and there appeared to be a lack of ‘joined up thinking’ in terms of application of different BI approaches, or of learning and sharing of knowledge. This suggests there was little capability development in BI approaches in all levels of the organisations.
- The analysis suggests that BI in the public sector is largely at ‘point’ level rather than the ‘end-to-end’ level and indicates that the existing BI initiatives predominantly follow a ‘tools based’ mind set, where the focus of the improvement is on short term impact e.g. waste elimination at activity level. This is rather than addressing the wider systems issues that have to be addressed for suitable improvement.
- Attitudes towards BI among practitioners were generally positive. Only around one fifth thought their organisation was not committed to BI, and 80% thought BI would be part of their organisation’s plans within 2 years.
- It is clear that BI application is gathering momentum in the public sector and the impression gained is that the current public sector funding situation is a driver of change towards further adoption and application.
- Much positive enthusiasm towards BI can be discerned among practitioners and while there are mixed results in effectiveness and some confusion regarding which BI approaches are appropriate, the sector as a whole is at a relatively early stage of understanding, so this would not be unexpected. Furthermore, it can be argued that positive progress has been made in developing BI knowledge and capability and there is evidence to suggest that BI initiatives have had beneficial impacts, both tangible and intangible.

#### 4.1.5 A Framework for Using BI Approaches

- In addressing the question of which BI approaches should be used for different process types, the report proposes that the Bicheno (2008) **Service Systems Analysis Model** offers a framework for segmentation by both organisational and process levels, thus enabling improvement techniques to be matched to the need. In addition, factors such as strong

leadership, visible support from management (behaviours), training and development, alignment to strategy, etc. have been identified in literature (Radnor, 2010; Hines, et al, 2008). Maturity of implementation also requires consideration.

- This approach takes a *system perspective* to improvement, which emphasises the importance of ‘big picture’ system understanding when approaching change, otherwise there is a risk of too much of a ‘point’ and tool focus that tends to lead to a piecemeal approach, a risk of sub-optimisation and lack of spread and sustainability. The term **lean light** can be used to describe the latter, while the term **system lean** can be used to describe the former preferable approach (Bicheno, 2008).
- The **Service Systems Analysis Model** (Bicheno, 2008) offers a framework around which BI can be developed, providing direction and focus for the practitioner. It aims to offer a **contingent** approach, which emphasises the importance of selecting improvement techniques that are appropriate to a given environment or situational context (in other words, opposite to a **prescriptive** approach). The model therefore integrates concepts and techniques drawn from several BI approaches and contemporary project management.

## 4.2 Recommendations

### 4.2.1 Public Sector Improvement Network

The issues raised by this report regarding:

- The maturity of application of BI techniques both in terms of duration of experience and depth of application (Light Lean rather than System Lean).
- The increasing importance of BI techniques as part of the public sector plans in Wales for the next two years.
- The call for greater understanding in the field of implementation science.

These confirm that it is important to identify and implement mechanisms to develop knowledge and capability amongst the growing cohort of those responsible for the delivery and implementation of the Welsh public sector improvement agenda.

Given today’s political context, the speed and robust nature in which BI improvement will need to be conceived, planned, delivered, spread and sustained requires the use of all appropriate learning channels across all levels of organisations and networks of organisations. In order to ensure such a platform for action is ready, those already leading the way in this field require recognition, thus creating an aspiration to follow in their footsteps and reinforce the public sectors commitment to the competence of the implementation of improvement.

Experience and knowledge sharing of peer groups engaging in BI improvement currently occurs as a matter of coincidence rather than design (e.g. Cardiff University, Cardiff and the Vale LHB and Ministry of Justice came together to ‘show and tell’ stories of improvement with the purpose of gaining new insights, mutual learning and providing reassurance).

It is suggested that a **Public Sector Improvement Network** would provide the vehicle necessary to achieve the goal to reinforce, recognise and support those involved in service improvement. At its heart would be an *academy* recognising the needs at all levels of organisations in the public sector.

#### **Network Objectives**

A network’s objectives could be to:

- Increase capacity of those with capability and competence, i.e. increase the take up of skills and action,

- Bring together those public sector staff with the competency and competence (currently seen as a disparate group) in BI methodologies, to leverage collective knowledge, enabling cross cutting work to be stimulated and accelerated for the benefit of citizens,
- Build on this capacity and competence which is already available to enable evidence building, experimentation and innovation,
- Identify reoccurring themes which require research.

### ***Network Design & Operation***

The 'network academy' would be differentiated from other networks which are currently available to public sector staff in Wales, as membership would be conditional on demonstration of involvement in improvement activities. This emphasis on action is designed to engage with and support those who will drive the improvement agenda forward as the objective of the network is to accelerate adoption of citizen centred improvement.

The network academy would consist of different groups, reflecting the various levels of organisation, where a common level of knowledge and application will be required, but also the consequent need to understand in-depth, different ideas, concepts and principles related to the context within which improvement is being applied. From this it will be possible to create a skills matrix for improvement which then can be matched with competencies such as leadership, strategy development, behaviours, etc. It is proposed that membership of such an academy would be aspirational and hence link with appraisals etc., to ensure appropriate rewards and recognitions are available to this group.

**Special interest groups** would develop and be encouraged (particularly to add to the body of evidence to be shared within the network). The network could also look to global trends and evidence to inform practice in Wales.

The network would provide a **reference knowledge base**, identify **emerging trends** in improvement and provide network events, forums, and courses, etc. It would use various channels to access knowledge through website portals, blogs, twitter, e-newsletters, etc., as is deemed most applicable and useful to the community of users. Access to qualifications, international collaborations and the broader improvement community would also be sought.

This network concept presents an opportunity to build a group to assist in delivering the citizen centred 'big picture' for quality public services and address the service improvement gap as defined by Boyne (2003). It would connect interested and action orientated individuals to capture and share good practice with an intention of accelerating improvement. Those who participate in the network would be involved in design and implementation, which is vital to achieving high quality cross cutting citizen public services for the future.

### **4.2.2 Other Potential Future Research**

The current literature regarding BI methodologies in the public sector recognises that this is an emerging area. Hence it is recommended that there are areas for future research which would inform those engaged in BI methodologies. Indeed the phrase **BI** may in itself be misleading suggesting that it is only business processes which require improvement rather than specialist processes e.g. adherence to evidence-based practice by clinicians, etc.

#### ***Pilot and evaluation of the application of the Service Systems Analysis Model***

Given the proposal for the application of the Service System Analysis Model (see Section 3.00), it would be pertinent to validate the model through pilot testing. This could include a sample of typical and similar organisations, or those which represent the extremes of application where this model may prove useful. The intended outcome would be to add some subtlety to what works in what conditions and why.

### ***Whole System Measurement***

The literature and the results of this study have identified issues with measurement systems for improvement. This is an area which requires further investigation to enable robust evidence of improvement to be recorded, applied and evaluated.

### ***Implementation theory***

Implementation theory is noted as under researched, in particular the question 'what works, for whom, in what circumstance?' - related to the work of Radnor (2010) who suggests that organisational readiness and context are particular areas for further research. In addition, the service systems analysis model proposed in this report partly answers the research questions posed but is in need of greater refinement for public services.

### ***Evaluation of Emerging Initiatives***

The integration of the financial system with improvement has been an area of concern and subject to research in industry. This aspect along with measurement of improvement is worthy of future research and should include the emergent initiative known as **results based accountability**, which has had some exposure in the public sector in Wales, but has not been formally evaluated.

### ***Review of the Impact of a Professional Workforce on operational change for effectiveness using the Service System Analysis Model***

For some parts of public service provision, the impact of professional groups and their influence suggests that this should also be a theme of future research, as the operational model has been developed without due consideration of this particular facet.

### ***Retirement of Practice/Process (challenge layered policy)***

A further area for research could be the 'layering' of policy, which has an associated body of literature. However, there is little literature on the de-layering of work activities. The implications related to operational delivery, given policy change and alignment of such change across the levels of the organisation is disconnected. While this is reported to be the case, the underlying assumptions which lead to this outcome require greater investigation.

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## Appendices

### Appendix 1 – Literature Analysis

(NB - excluding NHS)

Recently the WAO published a key report – **A Picture of Public Sector (2010)** – outlining its predictions about the potential size of the gap in the public sector budget in Wales. The report predicts that over three years from April 2011, there could be a total cut in funding for Welsh public services of around £1.5 billion – half billion every year. This means a total gap of around £5.5 billion over three years between where public services would have gone had they continued with the existing rates of increase in public funding and where they are likely to end up.

Not only are public services facing the prospect of major spending cuts, they are also likely to see increased demands being placed on them as a result of rising unemployment and an aging population. The public sector across UK (not just Wales) is simply facing its biggest challenge for at least a generation and needs to work in radically different ways if it is to sustain the level of services. The WAO reported “over the past decade, spending on public services has risen substantially. Naturally, with this increased spending, the public can reasonably ask the question: ‘have public services got any better?’ Our audit and inspection work has pointed to areas of improvement across public services, but also identifies areas where considerable progress is still required. In general, public services have adopted an incremental approach to improving services, rather than fundamentally reviewing the way services are planned and delivered and making radical changes” (WAO, 2010).

The WAO was very clear stating that “the Welsh public sector had made only limited progress in achieving, measuring and demonstrating efficiency gains. The overall level of efficiency gains for 2005-06 and 2006-07 was certainly overstated and we concluded that at the rates of progress exhibited at the time of our review, the overall national efficiency target of £600 million savings by 2010 would be missed by some considerable margin”.

The analysis identifies a number of key studies into the implementation of various BI approaches within the public sector in the UK where only one focuses exclusively on Welsh public sector.

- Radnor, et al (2006) look into the implementation of BI approaches on behalf of Scottish Executive making positive assertions about the potential value of lean thinking.
- Radnor and Bucci (2007) review the adoption of a lean BI approach within HMRC and conclude that lean is transferable to the public sector and that the approach has been beneficial to the system.
- Radnor and Bucci (2008) carry out a thorough study of the existing BI approaches within the UK on behalf of the National Audit Office, again concluding that lean provides a suitable framework for improving public services. This report, along with the more recent Advanced Institute of Management Research Report (Radnor, 2010) are the most comprehensive literature reviews report that have been identified in the search. There has been a further report into HMCS in May 2010.
- Jackson, et al (2007) and the Office of the Deputy Prime Minister (ODPM, 2005) carry out studies looking at the adoption of the ‘Lean Systems’ approach by public services pointing to considerable improvements by three Housing Association organisations.
- An extensive study of BI approaches in Wales has been carried out by CRG Research Ltd and the LEED centre at Cardiff University on behalf of the Welsh Assembly Government in 2008, which identifies the current levels of BI activities and expertise within Welsh public services as well as developing a directory of BI methods currently in use in Wales (CRG Research, 2008).

- The Confederation of British Industries has carried out one of the most recent studies into the public sector efficiencies stating that *“public services face a significant productivity challenge. The story of the past decade was one of decline. While benefiting from hugely increased levels of investment, the productivity of the NHS, education and other important public services edged downwards – a stark contrast with rising trends across the wider economy”* (CBI, 2010). In their study, the CBI provide evidence on the increasing productivity gap between the public sector and the rest of the economy, outline potential areas for action to improve efficiencies, and provide ten case studies from organisations that increased efficiency and raised productivity in a variety of public services and identify a number of key principles for responding to the challenge. They suggest *“while the market sector – manufacturing and services alike – grew productivity fairly steadily, the productivity of key public services declined during the decade to 2007. If their productivity had risen by 1% a year – broadly in step with the market sector – the cost of public services by 2007-08 would have been £31bn a year lower”*.

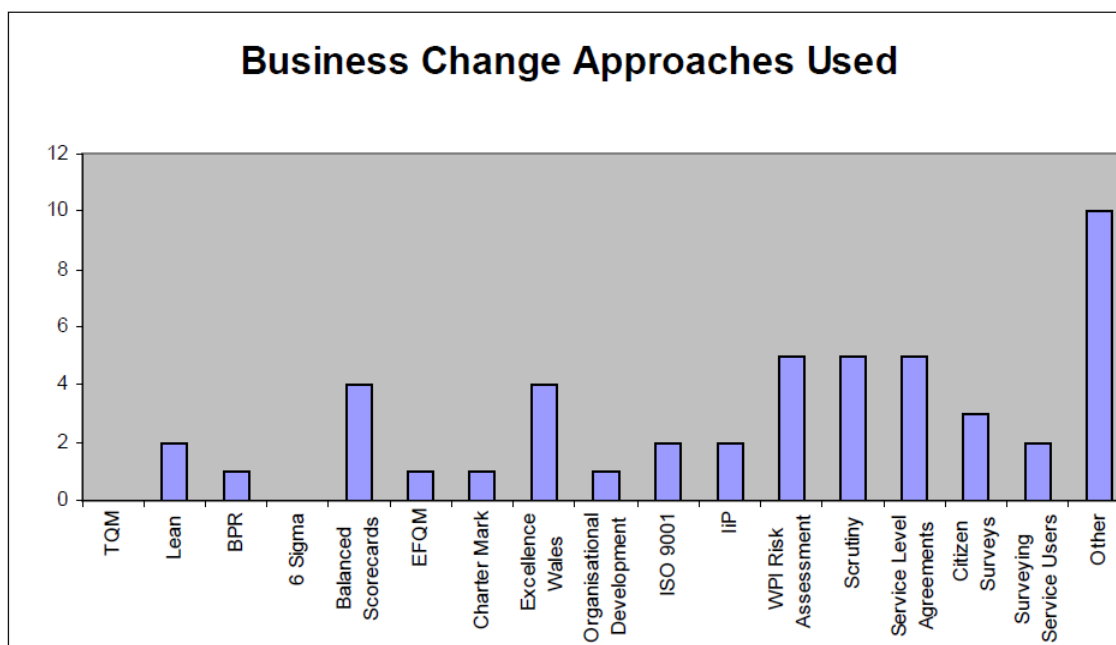
The existing literature on BI in the public sector is categorised in the following table, based on the level of pattern recognition applied by the respective researchers.

No.	Contribution(s)	Level of pattern recognition
1	Radnor, et al (2006); Radnor and Bucci (2007); Radnor and Bucci (2008), Radnor (2010).	<p>BI practices and toolkit</p> <p>For example these studies discuss and emphasise:</p> <ul style="list-style-type: none"> <li>• Waste elimination</li> <li>• A number of improvement activities</li> <li>• Types of practices (such as 5S and control charts), their relative appropriateness and staff engagement</li> <li>• Activity measurement and monitoring</li> <li>• Awareness of tools, techniques and approaches</li> </ul> <p>One of the key characteristics of this level of recognition is that researchers tend to emphasise the distinctions between different BI approaches and often attribute success or failure of improvement initiatives to the approaches deployed. At the same time, researchers might touch upon issues such as sustainability of improvements, staff engagement and cultural factors. However, the core emphasis is on tools and practices.</p>
2	Jackson, et al (2007); ODPM (2005); CRG Research (2008); CBI (2010); Radnor (2010)	<p>BI concepts and principles</p> <p>These studies place greater emphasis on:</p> <ul style="list-style-type: none"> <li>• The role of underlying principles for successful continuous improvement, such as seeing the end-to-end processes, pull, understanding purpose and value, and problem solving</li> <li>• The importance of good strategy deployment as well as high level policy effects.</li> </ul> <p>In this level of pattern recognition researchers go beyond attribution of success to tools, to emphasise the key principles that underpin success, such as focusing on the purpose and the importance of seeing the whole. Moreover, researchers acknowledge the potential contribution of various BI approaches and recommend a contingent approach.</p>
3	Seddon (2005, 2008); Zokaei, et al (2010)	<p>Underlying thinking and BI routines</p> <p>This level of pattern recognition goes beyond identification of key principles for successful BI, to address the role of understanding human psychology in managing change and the essential (improvement and learning) routines in continuous improvement, such as the scientific method. This level of analysis could borrow from areas as diverse as systems science, clinical psychology and even brain research. At this level, specific solutions and the associated techniques have secondary importance, while behavioural patterns and the underlying system conditions are the focus of improvement. The role of</p>

No.	Contribution(s)	Level of pattern recognition
		management is to constantly mobilise peoples’ ingenuity to overcome organisational obstacles. The role of management is assessed in terms of acting on the system rather than controlling the outcomes.

It should be noted that the above categorisation is not a value judgment, but rather different levels of analysis. Amongst the studies reviewed in the above, the study by CRG Research (2008) is important in that it answers certain aspects of the first research question. Some of the key findings from this study are listed below:

- The researchers interview a number of key informants, many of whom express concerns over the effectiveness of imposing change from the centre. There are assertions such as “new policy documents such as *Making the Connections* are published and it is assumed that policy changes will follow automatically. This is not the case and these policies need clear drivers and support mechanisms”.
- The report concludes that there is a perception that the Welsh Assembly Government has limited understanding of the complexities involved in initiating change within local government, does not acting as an exemplar and is slow to support authorities through this process and / or reward innovation and change.
- The interviewees express concern over top down approaches to driving change in Wales. “Change is often made more difficult by over-prescriptive ‘guidance’ and a proliferation of process orientated instructions from Welsh Assembly Government, which do not assist in delivering outcomes for citizens”
- The research reports on a number of approaches adopted in Welsh public sector, as illustrated below. Moreover, the researchers make the distinction between methodologies, techniques and standards for BI in their directory of methods.



BI Approaches deployed in Welsh Public Sector

(Source: CRG Research, 2008)

Another key study reviewed is the recent CBI report (CBI, 2010) which looks at ten case studies and identifies a number of key lessons on how to improve productivity and efficiency in public services as follows:

1. Clarity about purpose(s) and intended outcomes
2. Having the right managers in place with explicit accountabilities
3. Generating a positive climate for change
4. Engaging and empowering staff
5. Readiness to rethink processes and jobs
6. Using new technology effectively
7. Managing performance actively and helping employees develop their skills
8. Using measures that improve processes rather than relying solely on targets
9. Recognising small changes can make a big difference
10. Protecting outcomes, not budgets

Some of these principles and concerns have been echoed by authors such as Hood (2006), Buxton (2009), Radnor (2010) and Francis (2010). One of the key features of this study is its focus on lean as an overarching BI approach. Moreover, the critical role of harnessing human potential within the organisation could provide a significant engine for improvement. To do so requires the appropriate nurturing and support for improvement as a valid contribution, which is both recognised and rewarded.

Arguably this study verges into the third category in the above table since it does go beyond identification of principles to address the learning organisation and the underlying (improvement and learning) routines.

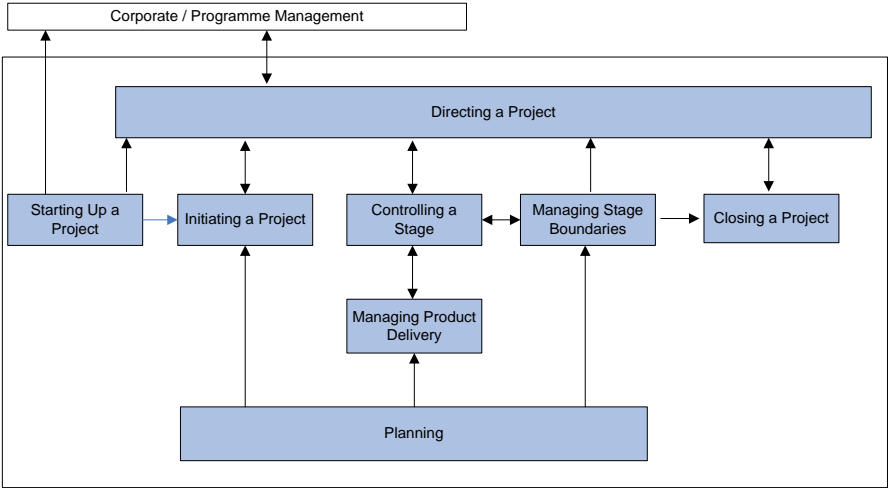
## Appendix 2 - Description of BI Approaches

The table below provides a description of different BI approaches in order to provide some context to the research.

BI Approach	Description
Systems Thinking	<p>There are many ideas as to the origins of systems thinking. Ludwig von Bertalanffy tried to bring science and systems together. He avoided the common practice of breaking scientific study into investigation of small parts (reductionism). His study of plants included all the interactions that are seen by studying the whole.</p> <p>In hard system methodologies, such as the Vanguard systems thinking approach (Seddon, 2005), the boundaries of the system begin and end with the customer.</p> <p>The customer is given primacy in these systems – it is assumed that by meeting the needs of the customer, this is also the best way to satisfy the needs of the other stakeholders in the system. Seddon argues that the Toyota Production System takes a similar approach in using customer value to set the boundaries of the system.</p> <p>This is different from the ideas of other systems thinkers such as Checkland and Ackoff. Checkland’s “Soft Systems Methodology” (Checkland, 1981) and Ackoff’s “Idealized Design” (Ackoff, 2006) address managerial problem-solving for many stakeholders in a consensual manner.</p>
Lean Thinking	<p>Lean thinking was the term given by Womack, Jones and Roos (1990) to their study of the BI approach used by Toyota (and companies like them). Over the last 20 years this approach has spread into many manufacturing and service sectors. Inevitably some of these applications have been misused – for example those using Lean “tools” in the wrong manner to achieve little sustainable improvement.</p> <p>Sustainable improvement arises from holistic use as described in “Systems Thinking” above. Bicheno and Holweg (2009) describe the constituents that make the “holistic philosophy” of sustainable lean thinking improvement –</p> <ul style="list-style-type: none"> <li>• Lean seeks an “Ideal Way”</li> <li>• Lean is not tools – or even a set of integrated tools!</li> <li>• Muda (waste), Muri (overburden) &amp; Mura (unevenness)</li> <li>• A Formula for “Lean”    <math>LOAD - CAPACITY = GAP</math> <ul style="list-style-type: none"> <li>○ If gap is negative – understand why and correct</li> <li>○ If gap is positive – is there “Muri” or overburden?</li> </ul> </li> <li>• Lean is “System”</li> <li>• Lean is Continuous Learning – mistakes are seen as “opportunities to improve”</li> <li>• Lean is both <i>revolution</i> and <i>evolution</i></li> <li>• Lean is “Distributed Decisions”</li> <li>• Two analogies <ul style="list-style-type: none"> <li>○ “The Orchestra” is more than the sum of the parts</li> <li>○ “Fitness” is built over a long time – some every day. Self-discipline is required</li> </ul> </li> <li>• 14 “Fs” – Frugal, Fast, Flexible, Flow, Focused, Flat, Feasible, Fit, Forthright, Factual, Firm but Fair, Forgiving, Faithful, Far-sighted</li> <li>• Five Lean Principles <ul style="list-style-type: none"> <li>○ Specify Value</li> <li>○ Identify the Value Stream</li> <li>○ Create Flow</li> <li>○ Produce by Pull</li> <li>○ Pursue Perfection</li> </ul> </li> <li>• 25 Characteristics of Lean – Customer, Purpose, Simplicity, Waste, Process, Visibility, Regularity, Flow, Evenness, Pull, Postponement, Prevention, Time, Improvement, Partnership, Value Networks, Gemba, Questioning &amp; Listening, Variation Reduction, Avoiding Overburden, Participation, Thinking Small, Trust, Knowledge, Humility</li> </ul>

BI Approach	Description																					
	<ul style="list-style-type: none"> <li>• The Toyota Way (Liker, 2004) identifies 14 principles arranged into 4 groupings                             <ul style="list-style-type: none"> <li>○ Long-term Philosophy</li> <li>○ The Right Process will produce the right results</li> <li>○ Add value to the Organisation by developing your people</li> <li>○ Continuously solving root problems drives organisational learning</li> </ul> </li> </ul>																					
Theory of Constraints (ToC)	<p>Developed by Eli Goldratt (1985), ToC is based on the application of sound physics to operations management. Though it is sometimes seen as being in conflict to lean, there are significant synergies between the two approaches, albeit with some differences. ToC has been applied to various managerial problems at different levels. The most renown applications are in manufacturing operations using a “Drum, Buffer, Rope” technique. The “Drum” is a constraint process with other processes either side of the “Drum”, therefore producing idle periods. Thus to ensure the “Drum” always has a body work to be worked through, it is protected with a “Buffer” in front of it. If the buffer is maintained the line will be working at its maximum throughput. The “Ropes” are signals that connect the buffer(s) with the work centres and thus, the whole operation from raw materials to finished goods despatch is harmonised. Moreover, the ToC way of thinking has been applied to project management environments in the form of “Critical Chain” management.</p>																					
Six Sigma	<p>The sigma level is about the level of variation expected in any process. In other words, how many defects expected in a process on average. This way of describing performance can be applied to any type of process both in manufacturing and service. The following table shows - assuming a normal distribution - the number of defects to be expected associated with varying sigma levels.</p> <table border="1" data-bbox="547 992 1246 1341"> <thead> <tr> <th>Sigma level</th> <th>% Good</th> <th>Defects (parts per million)</th> </tr> </thead> <tbody> <tr> <td>1 <math>\sigma</math></td> <td>37%</td> <td>632,120</td> </tr> <tr> <td>2<math>\sigma</math></td> <td>69.1%</td> <td>308,7</td> </tr> <tr> <td>3<math>\sigma</math></td> <td>93.3%</td> <td>66,803</td> </tr> <tr> <td>4<math>\sigma</math></td> <td>99.4%</td> <td>6,210</td> </tr> <tr> <td>5<math>\sigma</math></td> <td>99.98%</td> <td>23</td> </tr> <tr> <td>6<math>\sigma</math></td> <td>99.9997%</td> <td>3.4</td> </tr> </tbody> </table> <p>Six Sigma is used as a structured problem solving technique to reduce the number of defects and also reducing variation or spread. The six sigma DMAIC method (Define, Measure, Analyse, Improve, Control) is typically applied project by project.</p> <p>Lean and Six Sigma approaches are commonly combined:</p> <ul style="list-style-type: none"> <li>• Lean to create focus on the social side of change management and to remove the non-value adding activities</li> <li>• Six Sigma to control the variation within the value adding portion of the process</li> </ul>	Sigma level	% Good	Defects (parts per million)	1 $\sigma$	37%	632,120	2 $\sigma$	69.1%	308,7	3 $\sigma$	93.3%	66,803	4 $\sigma$	99.4%	6,210	5 $\sigma$	99.98%	23	6 $\sigma$	99.9997%	3.4
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4 $\sigma$	99.4%	6,210																				
5 $\sigma$	99.98%	23																				
6 $\sigma$	99.9997%	3.4																				
BPR - Business Process Re-engineering	<p>Business Process Re-engineering (often used interchangeably with BP Improvement) consists of a 7 stage methodology</p> <ol style="list-style-type: none"> <li>1. Understand business needs</li> <li>2. Understand the process</li> <li>3. Model and analyse process</li> <li>4. Re-design the process</li> <li>5. Implement new process</li> <li>6. Assess new process and methodology</li> <li>7. Review new process</li> </ol> <p>BPR has become associated with staffing reductions in the private sector which some believe was the motivation to use the BPI term instead. Supporters believe that BPR can deliver cost-savings at the same time as improving customer service.</p>																					



BI Approach	Description
	It works on a project by project basis and lacks the holistic context of the continuous improvement culture that helps achieve sustainable improvement in Lean and Systems Thinking.
Prince 2	<p><b>PRINCE2</b> (Projects IN Controlled Environments) is a process-based method for effective project management. It is debatable whether it should be classified as a BI approach. The methodology is as shown in the diagram below</p>  <p>The diagram illustrates the PRINCE2 methodology. At the top is 'Corporate / Programme Management'. Below it is 'Directing a Project'. The main process flow consists of five sequential stages: 'Starting Up a Project', 'Initiating a Project', 'Controlling a Stage', 'Managing Stage Boundaries', and 'Closing a Project'. 'Managing Product Delivery' is a sub-process that feeds into 'Controlling a Stage'. 'Planning' is a foundational process that feeds into 'Initiating a Project' and 'Managing Stage Boundaries'. Bidirectional arrows indicate communication and feedback loops between 'Corporate / Programme Management' and 'Directing a Project', and between 'Directing a Project' and each of the five stages. Horizontal arrows show the sequential flow between the stages.</p> <p>In essence, it is aimed at how to make change rather than a methodology to help understand the underlying drivers of the need for change. It is used on a project by project basis – the antithesis of continuous improvement. It also implies a professional project-management cadre which is at odds with the CI culture of improvement at the workplace by the workforce on self-generated knowledge and ideas.</p>