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To cite this version:

Alan Strickley, John Bertram, Dave Chapman, Michael Hart, Roy Hicks, et al.. A National Single Indicator for Schools in England: Helping Parents Make Informed Decisions. Don Passey; Arthur Tatnall. IFIP Conference on Information Technology in Educational Management (ITEM) and IFIP Conference on Key Competencies for Educating ICT Professionals (KCICTP), Jul 2014, Potsdam, Germany. Springer, IFIP Advances in Information and Communication Technology, AICT-444, pp.331-345, 2014, Key Competencies in ICT and Informatics. Implications and Issues for Educational Professionals and Management. <10.1007/978-3-662-45770-2_28>. <hal-01342718>

HAL Id: hal-01342718
https://hal.inria.fr/hal-01342718

Submitted on 6 Jul 2016

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A National Single Indicator for Schools in England: Helping Parents Make Informed Decisions

Alan Strickley, John Bertram, Dave Chapman, Michael Hart, Roy Hicks, Derek Kennedy and Mark Phillips

Software for Data Analysis Limited, London, UK
alan.strickley@sda-ltd.com

Abstract. With an ever-increasing measurement of pupil and school performance and presence of resultant statistical tables and indicators, parents are faced with a sometimes overwhelming plethora of data and information when monitoring the performance of their children's present or prospective school. The authors are part of a company that has developed a parent/carer-accessible site to attempt to address issues and needs for parents/carers. Anecdotal evidence indicates that a single portal where parent/carers can find all the relevant data about schools in England would be an invaluable tool for monitoring and choosing a school. It was decided that such a site would be built around a National Single Indicator (NSI). The indicator is formed from an amalgam of expected progress measures: the main threshold level; pupils' average points score; and the value added measure. By changing the weight attributed to each of these measures, the website allows parents to modify their relative importance according to the value they place on them. This dynamically alters the overall result to give users their own "personal indicator", which means they can compare schools in a list tailored to their own specification.

Keywords: School performance tables, national single indicator, Ofsted, NSI, parents

1 Introduction

The data held in schools and shared with local and central governments in England has increased since the advent of computerised Management Information Systems (MISs) in the 1970s up until the current time [2]. In particular this has concerned:

- Electronic replacement of the admissions' register [3].
- Electronic recording of attendance [3].
- The National Curriculum [4].
- Electronic examination entry and results [5].
- End of Key Stage (age-related) entry and results [6].
- Common transfer file (an interoperable file format used to transfer selected pupil data when that pupil moves from one school to another) [7].

- Pupil level census (a central government electronic return by all schools which includes selected individual personal and performance data about pupils) [8].

With an increase in parental access to school admission procedures and the coordinated admission process which includes equal preferences [9], the choice of school is seen as a critical factor. With much of the data about schools being available in the public domain, school selection has become an important social and political concern within England at secondary and more recently at primary levels.

Data about schools is available in a plethora of formats and locations, from league tables (ranking of schools by government-agreed rating measures), attendance levels, Key Stage (age-related) results and value added from central government, the British Broadcasting Corporation (BBC) and newspapers are amongst those that publish this information [10,11,12,13]. For many parents the information is disparate and often in a format that is confusing and complex to understand (as supported by [14]).

A decision was made by the authors to compile all of the available data from the various sources (but mainly the Department for Education in England - DfE) into a website which could be accessed by the public to help choose a new school or evaluate the performance of existing ones. The site would be underpinned by a fundamental value which was defined as the National Single Indicator (NSI) for each school. This would have a value (A-E) together with a less granular star rating, calculated on a set of key performance criteria (described in the next section) but could be fine-tuned by the user adjusting the weightings for each of these criteria. The result was the School Performance Tables [15] website which is described in detail later in this paper.

This paper looks at the basis of the NSI for schools, the fundamental design of the web interface, together with initial user reactions and considerations for further work.

2 Background

Performance tables have been published by the DfE [11], and its previous incarnations, since 1992 for Key Stage 4 (KS4) (aged 14 to 16 years) and 1996 for Key Stage 2 (KS2) (aged 7 to 11 years). The main aims of publication were to assist parents and carers in selecting schools for their children and to encourage school improvement by providing objective indicators against which schools' performance could be measured.

The current performance tables provide over 200 separate data items per school from which interested parties are expected to make judgements. This may be well within the capabilities of local government authority staff and others familiar with education performance data, but for parents and carers it can be a daunting task.

The aim of the National Single Indicator (NSI) is to provide a simple, but robust, method for parents and carers to be able to view schools' relative performance without needing to view multiple screens of data and without having to perform offline calculations.

It is important to note that the NSI does not aim to be a tool to aid school improvement – there are many available tools for this purpose and much expertise in schools, local authorities and support organisations focuses on this issue. As it stands,

the NSI does not integrate with school MISs in any way; however, the option for schools to add context-sensitive information onto the site is a feature that will be added in the future.

The NSI is a single indicator describing school performance at KS2 and KS4. The indicators at both of these Key Stages are closely aligned, sharing expected progress, value added and average points scores as common components and differentiating only on the key indicators used to assess performance of Level 4+ (average expected attainment) at KS2 and 5A*-C (expected public examination attainment) at KS4.

The components at KS2 or KS4 (average points score, value added and expected progress) are given equal weighting with a default, notional, value of 2. This value can be varied between 0 and 4 in increments of 1 according to personal choice, or perceived importance, that users place on it. For example, it may be that a parent places more store by a school's ability to "add value" to their children's education than the school's performance measures.

3 What Data are used for the National Single Indicator?

The developers intended the NSI to be a well-rounded and justifiable indicator of a school's performance. This section explains how the indicator is calculated. The NSI is based on the following base components.

3.1 Key Stage 2

The following performance indicators are taken from the DfE's published Performance Tables data [11] (where the precise definitions of each may be found):

- Progress measure, comprising:
    - Percentage of pupils making at least 2 levels of progress in a nationally prescribed mathematics test.
    - Percentage of pupils making at least 2 levels of progress in a nationally prescribed reading test.
    - Percentage of pupils making at least 2 levels of progress in teacher assessment of writing.
- Percentage of pupils achieving Level 4 or above (where Level 4 is the average expected standard) in reading and mathematics tests and teacher assessment of writing.
- Average points score.
- Overall value added measure (a single measure of the added value that the school has provided).

3.2 Key Stage 4

The following performance indicators are taken from the DfE's published Performance Tables data [11] where the precise definitions of each may be found:

- Progress measure, comprising:
    - Percentage of pupils at the end of Key Stage 4 achieving the expected level of progress between Key Stage 2 and the national General Certificate of Secondary Education (GCSE) examination in English.
    - Percentage of pupils at the end of Key Stage 4 achieving the expected level of progress between Key Stage 2 and GCSE mathematics.
    - Percentage of pupils achieving 5 or more A*-C (or equivalents (the national expected standard) including A*-C in both English and mathematics GCSEs.
- Value added measure based on the best 8 GCSE and equivalent results (a single measure of the added value that the school has provided).
- Total average (capped) points score per pupil (an average value based on the best 8 GCSE results for each pupil in that school).

3.3 Calculation methodology

In generating a NSI, the following exception classes apply (i.e. no NSI score is calculated or provided) and are allocated as follows.

- New school: no results data are provided in the Performance Tables, so it is unclassified – as a New School.
- A school without data in one or more of the measures: will normally be either an independent school or a school with very small cohort numbers, so it is unclassified – with Insufficient Data.
- Special school: schools where all (or the vast majority) of pupils have special educational needs and cannot fairly be compared to mainstream schools, so it is unclassified – as a Special School.

For schools not allocated an exception class, the following general methodology is used for both Key Stage 2 and Key Stage 4:

- Normalised scores are calculated: each of the performance measures described in sub-sections 3.1 and 3.2 above is normalised to provide a score between 0 and 1. This is done by taking the actual values and calibrating them into a single scale from 0 to 1.
- Weightings are allocated for the purposes of calculating the NSI: each of the 4 main performance measures is given equal weighting. For the component measures of the main progress measure, equal weighting has been given to English and mathematics.
- A single indicator score is calculated: an NSI score is calculated by multiplying each normalised score by its respective weighting and then divided by the sum of the weightings (4 for the NSI).
- A single indicator band is calculated: the mean and standard deviation of NSI scores are determined. An NSI band is allocated depending on the number of standard deviations from the mean of each individual NSI score.

- Single indicator ranking within the band is calculated: for each ranking, the minimum and maximum normalised scores for each of the performance measures are determined and, consequently, the score range. Each NSI score is allocated an NSI ranking within each NSI band based on the difference between NSI score and the band's minimum score and that difference's proportion of the score range.

The final NSI is either: (a) an exception class; or (b) NSI band plus NSI ranking, represented as a value A to E, augmented by a finer graduation of 1 to 5 stars, each with quarterly intervals (i.e. quarter, half and three-quarter star shadings).

Whilst there continue to be arguments and discussions regarding the validity of the performance tables and the individual indicators used [16, 17], such arguments are for the DfE to address. The NSI is provided on the basis that the DfE and Ofsted (the school performance inspectorate) consider the performance tables and individual indicators to be valid and fit for purpose.

As part of the pre-launch evaluation of the site, a large sample of 1000 schools was selected, and their NSIs compared to the individual performance measures. The result of this testing showed a very accurate match in most cases indicating that the algorithm used in the calculation of the NSI was producing its intended outcome.

4 Design of the School Performance Website

The website – www.schoolperformancetables.com – is intended to be a simple, straightforward means of comparing schools, at both primary (KS2) and secondary (KS4) levels by means of a single indicator. It goes further in being the first such site to provide a search facility that can offer a user-defined set of given subjects beyond the core curriculum. In addition, it will offer schools the option of subscribing to the site, allowing them to both advertise and brand their school and also provide commentary and context to the performance data presented.

In common with the intention to provide a simple and straightforward experience, the site attempts to be intuitive to navigate, with the minimum amount of information necessary to convey a given point, and that information to be provided, for the most part, graphically. More complex information, where absolutely necessary, (such as the description of how our indicators are generated), is available through links. In addition, the site is mobile reactive, enabling a better experience for the increasing number of smartphone and tablet users. It, therefore, differs in look and approach from the traditional performance tables delivered by the DfE. Plenty of clean space and economical instructions prevail, as opposed to dense sets of data and exhaustive instructions and guidance.

4.1 Home page

Figure 1 shows the home page, which is the one that parents will be directed to from any external link. It is considered that parents and schools will be the main users of

the site. Therefore, three main search criteria are invoked for the initial search, these being name, place and Key Stage. In addition, a subject search has been added for secondary schools.

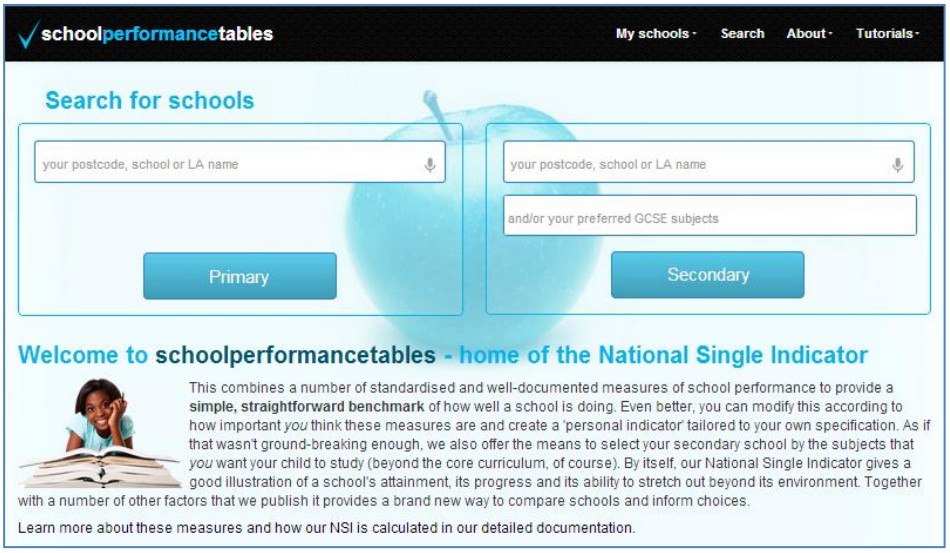

Fig. 1: Home page

The school search box is versatile, allowing multiple postcodes, abbreviated school names, regions etc., to be included. The subject search box allows for any of the examination board subjects to be input. This is designed to be particularly useful where a user requires a particular subject or specialism to be available at a school. The types of searches are illustrated in the Tables 3 to 6 below.

Table 1, below, shows how the program interprets various postcodes and names from the home screen.

Table 1: Search for schools using a postcode or name

Postcode or school name	**Results of search**
se1 1xw	Displays a list of all schools with distances from that postcode
se11xw	Displays a list of all schools with distances from that postcode. Note that the postcode need not contain a space
se1	Displays a list of schools within SE1
albion school	Displays a list of schools that match this name. Note that it is not case sensitive
Collège Français Bilingue de Londres	Displays the school with this name
waltham forest	Displays a list of schools in Waltham Forest LA

For schools in a local authority (LA), it is possible to enter a postcode (for example, a home postcode); the schools will be listed in order of distance (see Table 3).

Table 2: Postcode and LA search

Postcode or LA name	**Displays**
se1 1xw southwark Lewisham	Displays all schools in Southwark and Lewisham, with distances from the postcode se1 1xw

Table is a useful feature that lets you search for schools by subjects taken at GCSE. This is only available as a search for secondary schools.

Table 3: GCSE subject search

Law, Polish, Spanish and Statistics	Displays all schools where these subjects have been taken at GCSE

Table shows how to combine the school search and subject search so that, for example, it is possible to find out the nearest school offering preferred subjects at GCSE, or find out all schools in a local authority that offer them.

Table 4: Postcode, LA and GCSE subject search

se1 1xw (school search box) Law, Polish, Spanish and Statistics (subject search box)	Displays all schools where these subjects have been taken at GCSE by distance from se1 1xw

The results of a search take the user through to the “Summary Page”, comprising five tabs as shown in the next sub-section.

4.2 Summary page

Fig 2 shows the summary page based on search criteria.

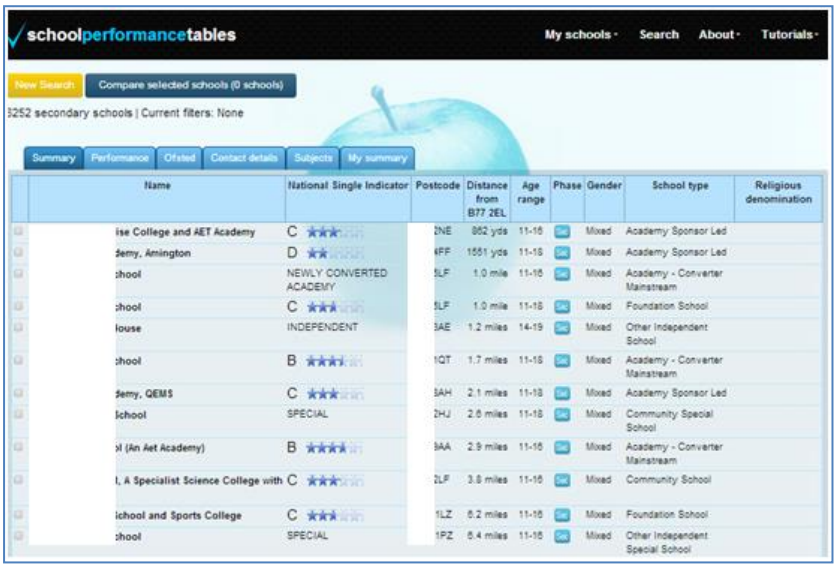

Fig. 2: Summary page

This summary page shows schools selected, together with their NSI (and less granular star rating incorporating quarter stars as described in section 3.3), the postcode, distance in miles and yards (from the search post code; blank if no postcode given), age range, primary or secondary phase, intake gender, school type and religious orientation. From this screen a new search may be initiated, or by selecting the appropriate checkboxes next to the school name, a subset of the list may be generated for comparison purposes.

Clicking on the school name takes the user to the NSI screen as shown in the "NSI" sub-section. Clicking on the various tabs gives more comparative information as described later.

4.3 Performance tab

Figure 3 shows the performance components screen which gives the ability to "weight" the various indicator components described in the "NSI" section according to the importance individuals place on them. The "dials" are set at the median value of 2 by default.

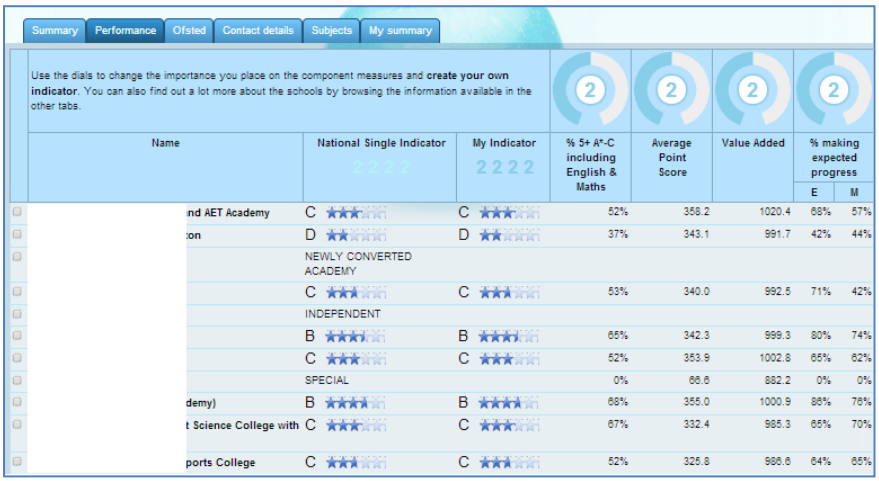

Fig. 3: Performance tab

The "dials" above each of the performance indicators (as described in the NSI sub-section) allow the user to weight each, resulting in a value in the "My Single Indicator" column. Fig. shows an example where the user has selected "% Level 4+ in reading, writing and mathematics" as the only and full weighted indicator. This makes a significant difference to the NSI for some of the schools shown.

4.4 Ofsted tab

Clicking on the Ofsted tab shows the selected schools' most recent inspection results in terms of overall, teaching, achievement, behaviour and leadership scores. Clicking on the inspection date takes the user to the appropriate full inspection report at the Ofsted website.

4.5 Contact details

The contact tab displays the various contact details of the school: address; telephone number; and website unique resource locator (URL) are included on this screen. Clicking on the website address takes the user to the school website.

4.6 Subject tab

Clicking on the subject tab gives the current subjects offered at GCSE. Note that if a primary school search is chosen, then this tab will not be available.

4.7 My summary

Fig. shows the "My Summary" tab which enables the user to put their data into a single screen.

Fig. 4: My summary tab

By using the dropdown menu, various columns may be added, which will contain data shown from the tabs described in the previous sub-sections. For example, performance data, Ofsted information, contact details, subjects etc. may be appended to the right of the NSI column.

4.8 National single indicator

Fig. shows the NSI screen for the school selected from the summary screen.

Fig. 5: NSI tab

This screen gives the breakdown of the NSI for the school with the individual percentages below the weighting "dial". The percentage making up expected progress is split into the component parts, reading, writing and mathematics. As with the performance tab (Fig.) these "dials" may be moved to change the weightings which create the NSI.

4.9 School page

Fig. shows school information that is presented, including a map and various contact details.

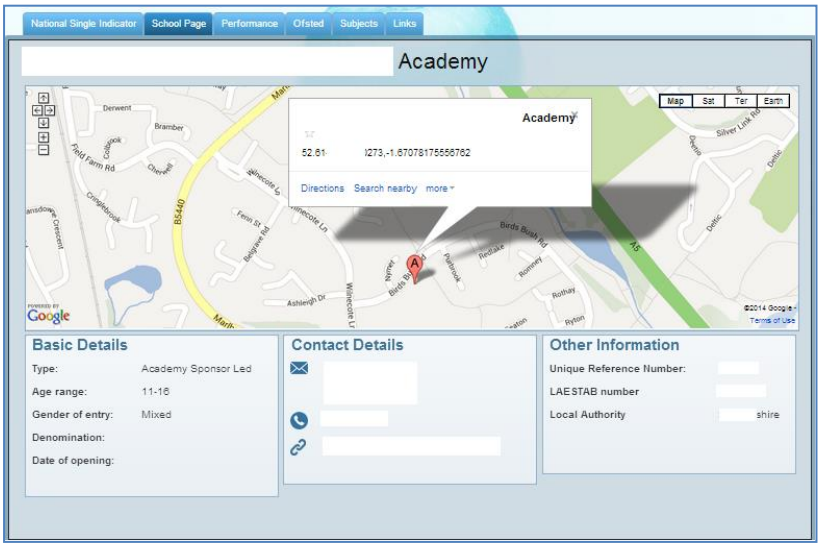

Fig. 6: School page

This tab displays a map, with the school selected marked with a "pin" ('A' in Figure 6). A speech box contains the options to view directions from a specific location, to search nearby and other "Google" options. In addition, the screen displays basic details about the school, contact details and other useful information about the school.

4.10 Performance

This tab shows detailed performance about the school, including numbers on roll, number of free school meal (FSM) pupils, and Key Stage information pertaining to the school.

4.11 Ofsted

This tab shows the Ofsted information about the single school selected which gives details about the latest Ofsted inspection such as Overall Effectiveness and summary of the key findings for parents and pupils. This is a more detailed view than the information presented in section 0.

4.12 Links

The links tab shows useful links that are pertinent to the evaluation of the school, such as DfE performance tables, DfE statistics about the area, Office for National Statistics about the neighbourhood statistics, school details from the national database EduBase, Ofsted parent view and Ofsted inspection reports.

4.13 Menu

Fig. shows the menu system that is available at the top right of all screens. These have the following functions:

- My schools: brings up a list of schools that have been selected by the user from the comparative screens.
- Search: returns the user to the main search page as shown in Fig. .
- About: gives details and documentation about the single indicator.
- Tutorials: help and advice on using the website.

Fig. 7: Menu

5 Research Methodology

The purpose of the work described in this paper was to ascertain the value, usage and feedback of a site which used the NSI as a basis for school selection and evaluation. As such this was considered to be action research.

Whilst the major target audience was parents, other appropriate groups were also informed of the launch, including all maintained schools, ministers for education, educationalists, academics and other interested parties.

As well as conducting beta tests with various parental groups, the site encouraged feedback via the contact email address and a continuing Twitter, Facebook and other social media promotional process is ongoing.

All responses were welcome in order to include every possible feedback and this, together with statistical data collected from the web site, will enable a more complete evaluation to be documented.

6 Results So Far

The site launched on schedule on 23rd January 2014. The quotation below offers an example of the type of responses received as a result of all maintained school head teachers being informed of the launch.

> *"The idea of a single, graded indicator, applied to a school, is nonsensical. Schools are complex and multifaceted, and cannot be reduced to a single grade. What is the point of doing this?" Primary Headteacher*

This reply does not surprise. Schools do not like the idea of league tables or performance measures particularly when they do not score highly and for the reasons given in the quotation and accepted by the authors. However, these measures are currently the only available data that parents can use to judge a school by and the NSI attempts to make a simplified indicator that can then be used to look at more detailed information about the school. Indeed, if a parent were to look at the league tables available in much of the media, then finding more information would be a considerable task. A less critical view from a secondary school tends to support the view that a simplified approach has merits.

> *"It certainly is a very interesting idea and I have to applaud your desire to "to cut through the noise and get to the point." Deputy Headteacher, Secondary School*

A quotation showing a different perspective follows. Parents are not necessarily expert in statistics and although the NSI is not a complete picture of a school's performance it does act as a benchmark for parents to begin their evaluation.

> *"This is a really useful tool for parents to help them selecting their children's school. It is easy to use and informative." Parent of a child applying for a place in September 2014*

Another very encouraging comment, which confirmed the testing applied, regarding the reliability of the NSI and the general usability of the website, follows.

> *"I have checked the schools' website against the local schools here and I would say that it is very clear and helpful: it also ties in with what I know about these schools." Professor of Education*

The Open Data Institute [18] is a key body encouraging and fostering the use of openness and transparency in data and information. Their endorsement of the underlying principles of the website follows.

> *"interesting and highly relevant example of good practice in the data meets education sphere." Open Data Institute (ODI)*

Other comments have noted the speed that the results are generated in real time when adjustments are made to the various weightings of the components of the NSI. This was achieved even though the developers worked to very tight timescales and complex design specifications.

The site has received 5,157 visits since its launch, peaking at 1,713 on a single day, with an average 265 per day. These figures are expected to increase exponentially as word of mouth and publicity expands the user base.

Since the launch of the website, the government has indicated its intention to require schools to present "easier-to-understand" [19, 20] information on its performance and a group consisting of the Association of College and School Leaders (ACSL), National Association of Head Teachers (NAHT), United Learning and PiXL (an online resource company for schools) are intending to launch a new performance site in the autumn of 2014 [21, 22, 23]. It would seem that others, including the government, feel that the current system is over complex and confusing for users.

7 Future work

It is intended to enable schools, parents and other appropriate persons or bodies to add contextual information to the site that will help put the information into perspective. It is also hoped to add more information such as admissions policy, more detailed performance measures supplied by the school, behavioural data, homework policies, etc. The creation of an application for smart telephones is also a possible development with the added advantage of possible funding by users. Funding for the site is to be considered and such options as advertising and premium versions are to be considered.

Feedback from schools, parents and other relevant establishments is to be closely monitored as will the use of the site. These will feed back into the future developments and structure of the site.

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