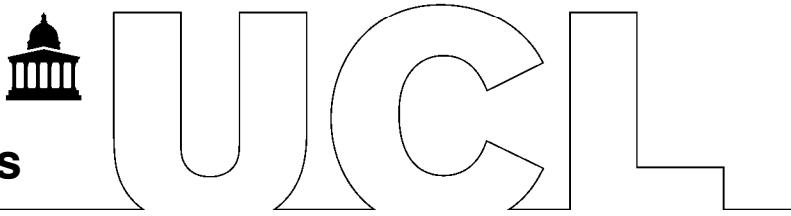
University College London
Centre for Transport Studies



Scoping study of the feasibility of developing a software tool to assist designers of pedestrian crossing places

Report to the Department for Transport

B G Heydecker
S A Robertson
R E Allsop

Centre for Transport Studies
University College London

Drawing on the report of IT Consultant

Simon Morgan

Buchanan Computing

Contents

Contents **2**
Contributors to the project **3**
Preface **6**
1. Background **7**
2. Objectives of the study **8**
3. Purpose of this work **8**
4. Output from the scoping study: **9**
5. Beneficiaries **9**
6. Summary of conclusions **10**
7. The way forward **11**
8. References **12**
9. Report of the IT Consultant **14**
9.1 Summary 15
9.2 Introduction 15
9.3 Project Brief 16
9.4 Software categories 16
9.5 Feedback from Steering Group 18
9.6 Alternative forms of guidance 19
9.7 IT platform 21
9.8 Data interchange and software compatibility 24
9.9 Maintenance and support 24
9.10 Development costs 25
9.11 Maintenance costs 29
9.12 Commercial issues 30
9.13 Recommendations 31
Appendix A: References 33
Appendix B: Project brief 34
Appendix C: Briefing document for Steering Group 35
Appendix D: IT Briefing note for Steering Group 41
Appendix E: Examples of software categories 45
Appendix F: Summary of Steering Group Responses 50

Contributors to the project

The following people contributed to the present scoping study in their various ways, as indicated by the grouping.

Steering Group Members

Suku Phull
Department for Transport
Suku Phull is currently working as a senior engineer in the Traffic Management division of the Department for Transport. He is responsible for providing the Department's technical and policy lead on all aspects of pedestrian crossing, traffic signal operation and traffic management. He has been responsible for commissioning a number of research and consultancy projects on new and innovative traffic signal control techniques and has been responsible for developing the new Puffin crossing concept. He also played a key role in taking forward some of the actions outlined in the Government's National Motorcycling Strategy, including published guidance on allowing motorcycles access to bus lanes.

Ray Yelland
London Road Safety Unit
Ray Yelland started his career in 1971, and was on the training scheme at the GLC. During this time he moved around different departments, including Highway Design, Traffic Management, and of course Road Safety Engineering. In 1979 he moved to the City of Westminster, as Senior Engineer in the then newly formed Road Safety Section. During the following four years, the team implemented 300 safety schemes which resulted in an overall reduction of 30% in PIA's. In 1984, he moved to the Works and Estimation Section, as Principal Engineer. This role involved the provision of estimated cost of Highway Projects, supervision of contractors and settlement of invoices. In 1992, he joined The London Research Centre (LRC) as Road Safety Engineer. The work for LRC was mainly Trunk Road safety studies and audits on a consultancy basis for the Highways Agency. In 2000, the LRC Road Safety Team was absorbed into TfL. He was Principal Road Safety Engineer in The London Road Safety Unit and in Jan 2008 became Team Leader for the North Team with responsibility for 14 boroughs.

Keith Hopper
Mouchel
Keith Hopper is an experienced highway engineer currently working as a Project Director with Mouchel in the London area. He has worked on the design and supervision of construction on many conventional schemes from rural motorways through to urban streets. For the last 17 years he has specialised in the design of traffic calming and town centre enhancement schemes. The challenges from these and his experience gained, have led to his involvement in the drafting of the publications "Home Zone Design Guidelines" and "Traffic Calming Techniques". The key issues of "Quality of Life" and "freedom of pedestrian movement" have been at the core of the work he has carried out.

Julie Dye
TfL. Walking and Accessibility Manager
Julie Dye heads the Walking team within TfL and is responsible for liaising with other departments and stakeholders regarding the role of the team in projects. Julie provides technical and policy input on walking and accessibility matters. Julie has a small team but their work is extensive. This can be broken into six main areas: Walking and accessibility on the Transport for London Road Network (TLRN), Walking on Borough roads, Consultation and development control work , Legible London delivery, Promotion and training, and Research and auditing

Research team

Simon Morgan
Buchanan Computing
Simon Morgan is a chartered civil engineer specialising in traffic and transportation and a chartered information technology professional. He has over twenty-five years' varied experience, much of which has been concerned with the development and support of computer systems for traffic engineering and transport planning. He also specialises in the analysis and reduction of road accidents, and is a nationally recognised expert on traffic signing and signing policy. He is frequently called upon to bridge the gap between the disciplines of software engineering and transportation, and is an experienced business manager, being managing director of Buchanan Computing and a non-executive director of Colin Buchanan, the transportation and planning consultants.

Sandy Robertson
Centre for Transport Studies, UCL
Sandy Robertson is a Senior Research Fellow at UCL. He has worked on a wide variety of projects looking at road user behaviour and road safety over the last 20 years. This work included the USAPED project which investigated the usability of pedestrian crossings with a user centred approach. Sandy's research interests include road safety, road user behaviour, and motorcycle ergonomics.

Richard Allsop
Centre for Transport Studies, UCL
Richard Allsop has over 40 years' experience of research, training and advisory work on traffic management and road safety. He has made fundamental contributions to the theory and practice of traffic signal control, including the provision of safe crossing opportunities for pedestrians, and to modelling of the effects of area-wide traffic management. He led the production of the IHT guidelines on urban safety management and some of the research on which these were based, and took an active part in the production of the later complementary guidelines stemming from the Gloucester Safer City project. He was grant-holder and an active contributor to Sandy Robertson's USAPED project which has led on to the work reported here.

Benjamin Heydecker
Centre for Transport Studies, UCL
Benjamin Heydecker is professor of transport studies at UCL, and has over 30 years experience of research on traffic management and control, transport planning and road safety. He has a particular interest in provision for non-motorised modes and public transport within urban transport systems. He has had technical and managerial involvement in the development and practical implementation of novel methods for traffic signal control, which can be used to make provision efficiently for several different kinds of road users – including pedestrians – together at signal controlled road junctions. He is the principal investigator on the project that is reported here.

Preface

This report is the outcome of a scoping study of how guidance can be provided for practising highway engineers in designing informal pedestrian crossing facilities. The main component of this report is an analysis by an IT consultant of a range of mechanisms for delivery of this. The study was informed by the opinions of a group of practitioners who have a direct interest in the provision of pedestrian facilities. These results are placed in context and their consequences are explored in the first part of the report.

1. Background

In the Government's White Paper on Integrated Transport (DETR 1998), quality of life has been identified as being dependent upon transport. Within this, walking has been identified as a key form of transport that is to be encouraged through local transport plans that include strategies to promote walking and cycling. Provision of routes that are safe, convenient and comfortable is expected to increase the modal share of walking. But however successful these routes are in reducing conflict between pedestrians and other road users, crossing the road will remain for the foreseeable future a key element in journeys on foot, so that improving the usability of crossing places to make walking more convenient and comfortable as well as safer will help remove barriers to walking.

Formal pedestrian crossings in the UK are traditionally either zebra crossings which in principle provide pedestrians with immediate right of way, or signal-controlled crossings which provide it only after a period of delay which depends on traffic conditions. At zebra crossings vehicles must stop once a pedestrian has put a foot on the crossing (DETR, 1998), and vehicle drivers are recommended to slow down and let pedestrians claim their right of way. Pedestrians are told to stop at the kerb and if necessary to put one foot on the crossing to make traffic stop. Less formal crossing places include infrastructure such as pedestrian refuges and humps that are profiled with flat tops to encourage pedestrians to use them. These types of crossing places are likely to be of increasing importance as the scope for further use of formal crossings becomes more fully exploited and the possibilities for informal pedestrian crossings become more fully developed. In this report, signal controlled and zebra crossings will be referred to as crossings and the locations where informal facilities are provided to help people cross will be referred to as *crossing places*.

Local Transport Notes 1/95 and 2/95 (DOT 1995a,b) give extensive advice on the choice of type of crossing and their siting, and this advice has gained widespread acceptance among local authorities. However, there is no counterpart for crossing places. Because the use of crossing places depends more strongly on the choices and judgements of the users, it will be important for such advice to be informed by a user-centred understanding. The advice in the relevant guidelines by the IHT (2000) extends to crossing places and some parts are user-centred, but it primarily sums up pre-existing information. In this context, the present report investigates the prospect for guidance on application of the user-centred approach within the coming decade. This approach offers the prospect of new insights that will prove useful in practice for considering novel as well as the current kinds of solution. The ultimate intention of this is to help highway authorities that are seeking fresh possibilities for providing accessible and inclusive facilities for pedestrians.

A 30-month Engineering and Physical Sciences Research Council (EPSRC)-funded study, called USAPED, of the usability of mid-block pedestrian crossing places was carried out by UCL in partnership with 5 local highway authorities and Living Streets, and in consultation with the DfT in 2002-2005. This work concentrated on less formal mid-block crossing places where help can be provided for pedestrians by provisions such as refuges, dropped kerbs or flat-topped road humps. A user-centred study was undertaken of attributes of such crossing places in relation to those of formal crossings. This work has provided the research basis for a tool to assist designers of

crossing places. A tool of this kind could help them to use site-specific data in choosing from options ranging from simple informal provision to a signalised crossing, and in proceeding to a detailed design, documenting the decisions they make during the design process.

2. Objectives of the study

The present report describes a review by a software engineer who is familiar with the use of software by highway authorities and their consultants of the concept developed in the USAPED project and described at

http://www.cts.ucl.ac.uk/usaped/UWRPART7.pdf

and illustrated in part at

http://www.cts.ucl.ac.uk/usaped/frameworkpagesv4.html .

This review has assessed what would be involved (in terms of workload, timescale and cost) in implementing these concepts in the form of a piece of software. Requirements for this software include that it

1. is robust, user-friendly and usable by designers and in the context of consultation and decision-making by other participants in the design process
2. provides basic capability at the outset and is capable of development in the light of experience and new understandings (both technical and in terms of policy and procedures)
3. sits comfortably and has the potential to interface with other software that is in use or is likely to come into use by highway authorities and their consultants, including the capability to interface with relevant databases

The software engineer charged with this work identified and advised on issues that would need to be resolved before full-scale software development could be undertaken. In particular, they

- identified the forms in which the software might be developed and considered the forms most likely to achieve widespread use in the light of user requirements;
- identified how the software could best relate to relevant existing and foreseeable software and systems;
- considered how the software in the recommended form would lend itself to future adaptation and enhancement in the light of changing requirements;
- estimated the workload, timescale and cost of developing the software in the recommended form to yield a marketable product; and
- estimated the annual cost of subsequent maintenance and updating.

3. Purpose of this work

Taking this forward entailed undertaking a feasibility/scoping study to identify an appropriate software solution for design guidance. In outline, this software would provide design guidance and information on regulations relevant to the design of pedestrian road crossings. This would be applied to site-specific information provided by the user to support them in identifying appropriate designs for that site: depending

on its specification, the software could record decisions and the rationale for making them, thus providing material for an audit trail. This could be used by those who design, select and implement crossings and by others who have an interest (e.g. user groups). Use of this software would benefit the local authorities by helping their design team and or consultants employed by them to design crossings that will better meet the needs of the users. The use of a systematic approach that is implemented in accessible software could help to achieve consistent designs through a decision process that is repeatable and transparent, and so can readily be audited.

Experience gained from working with this tool would help to build a set of case studies that identify successful designs and indications for their use. This information could then be assessed from time to time and incorporated into the literature as appropriate.

This final report describes the work undertaken, the results and conclusions together with detailed recommendations for consideration in any the subsequent work, presented in a form that will enable them to be used as the basis of a further study.

4. Output from the scoping study:

The present report constitutes the main output from this scoping study. This identifies what would be involved in implementing the concepts stemming from USAPED in various forms, including paper-based advice and guidance, electronically linked computer text files (for example, in pdf format) and as a piece of software. It then identifies the key steps that would be entailed in developing, delivering and maintaining a software solution, including specification of any further research that will be required. It considers the following aspects:

Usefulness in practice
Practicality of developing such a tool
Workload in development of the tool
Timescale
Costs
Workload / costs in maintaining the tool up to date.

Full details of this output from the study are given in the IT Consultant's report which is reproduced in full as Section 9 of this report.

5. Beneficiaries

The beneficiaries of the software tool that was envisaged as the end product of the study to be scoped in this work will be:

- The community at large and the individuals that make up that community. These would benefit from improvements to the walking environment.

- Local authorities would benefit from having a tool that would be useful for their design team with the potential for financial savings from making the design process faster, and by having an auditable process to demonstrate that due care has been taken in the design and process of design to reduce the likelihood of a successful legal action against them.

- Central government as a whole would benefit as it would be anticipated that improvements to the walking environment would encourage walking. Hence benefits such as modal shift and reduction in carbon emissions might be obtained.

- DfT in particular would benefit with a tool that will help local authority engineers to implement its policies.

6. Summary of conclusions

This study considered initially various systems for pedestrian crossing usability and design, which were:

a. Static document with hyperlinks

b. Flowchart system

c. Flowchart with storage of options

d. Full process recording and reporting

e. Custom-built fully interactive design assistant

We consulted with a panel of expert practitioners on these options, and in particular asked them through the medium of a self-completion questionnaire to identify aspects that they viewed to be likely to be practicable in the next decade or so. After considering the responses to this questionnaire, attention was focused on a, d and e from this list, denoted respectively as Option 1, Option 2 and Option 3. The merits of Options 2 and 3 were assessed relative to Option 1.

Having analysed the benefits and costs of developing these three options, the following conclusions were drawn. We found that neither Option 2 nor Option 3 is likely to deliver sufficient benefit to justify its development and maintenance cost as a commercial investment, even after the costs of compiling new guidance and necessary updating of existing guidance have been covered. Under Option 1, the latter costs would in themselves be largely sufficient to enable guidance for informal pedestrian crossings to be developed as a document to be available in printed and PDF form. This could initially be a stand-alone document referring to existing versions of other guidance, notably that for formal crossings. As the latter come up for revision, guidance on informal crossings could be usefully combined with the updated guidance for formal crossings.

Many of the external links in the PDF should be to pages of the Traffic Advice Portal Portal (IHT and DFT 2008) (subject to the necessary consent and co-operation) to avoid the burden that would otherwise arise in maintaining those links. Maintenance of external links would thus be confined to keeping up to date the address of the Traffic Advice Portal and the addresses of any links to other sources.

7. The way forward

7.1 Immediate steps

On the basis of this study, recommendations for immediate steps to follow on from this are to:

- Update and unify guidance on provision for people to cross roads at formal pedestrian crossings
- Formulate guidance on informal crossing provision
- Consolidate these two sources into unified guidance for provision for pedestrians to cross roads
- Develop this as a hyperlinked document for users with automatic reference to background documents

This will require existing documents to be reviewed, revised and extended where necessary so that they reflect current understanding, techniques of engineering, junction design and control, and best practice. As a complement to revision and unification of previous material, this will require new guidance to be established for informal crossing places. This guidance will consider where these crossing places can be provided, which design components are available, how they can be used in conjunction, and how facilities can be developed using them to good effect. On the basis of this, new guidance can be developed for practising engineers.

In order for this to happen, a working group will be needed. This will draw upon leading expertise of authorities that are responsible for provision of pedestrian facilities in settlements of sizes varying from villages to metropolitan boroughs. This will complement the systematic identification of design issues for crossing places that was an outcome of UCL's work on the USAPED project. The working group will likely comprise representatives of some or all of

- The Department for Transport
- The Highways Agency
- Local highway authorities that are oleaders in this field
- Local highway authority associations
- Road users
- Professional institutions
- Road safety organisations.

One way of achieving this would be for the working group to be constituted by the Department for Transport in consultation with the Institution of Highways and Transportation. The Chairman and Technical Secretary could be provided by the

Centre for Transport Studies at UCL under contract to the Department for Transport, thus drawing upon the CTS experience in this field. In any case, the CTS would hope to contribute to the activity of this working group.

7.2 The longer term

In the course of this scoping study, several issues were identified that will in the longer term require investigation and resolution in order to take full advantage of the possibilities provided by current knowledge and prospective computing technologies. Provided that these can be addressed, computer-based approaches can be used more effectively in the design and provision of pedestrian crossing facilities. In the longer term, this more strongly ICT-based approach could be developed further than is currently practical or in immediate prospect. An approach of this kind is likely to be advantageous provided that the requirements of the end users are addressed, and the computer-based component undertakes work – typically of repetitive calculations and drawing on connections to diverse sources of information and data – in a way that is complementary to the cognitive and other work of the users.

In order for ICT to fulfil its potential within traffic engineering design systems of this kind in the longer-term future, the following developments will be required:

- Well maintained on-line internet accessible sources for current and historical documentation
- Greater availability of relevant information on road network including construction methods, maintenance history, signs and markings
- Greater availability of relevant information on utility systems, including location of equipment in the highway
- Convenient remote access to relevant and up-to-date information in GIS databases of common formats.
- The use of common, agreed formats and protocols for communication between ICT systems used by the designers and providers of road infrastructure, and those organisations whose work overlaps theirs.

8. References

DETR (1998) A new deal for transport: Better for everyone. The Government's White Paper on the future of transport. TSO London. [Available online] http://www.dft.gov.uk/about/strategy/whitepapers/previous/anewdealfortransportbetterfo5695

DOT (1995a) *The assessment of pedestrian crossings*, LTN 1/95. London.

[available online]
http://www.dft.gov.uk/pgr/roads/tpm/ltnotes/ssessmentofpedestriancro4033.pdf

DOT (1995b) *The design of pedestrian crossings,* LTN 2/95. London: HMSO. [available online] http://www.dft.gov.uk/pgr/roads/tpm/ltnotes/esignofpedestriancrossin4034.pdf

IHT (2000) Providing for journeys on foot. Institution of Highways and Transportation, London

IHT and DFT (2008) Traffic Advice Portal , Web resource [online] http://www.tap.iht.org/

9. Report of the IT Consultant

Pedestrian crossing place design: Scoping study of the feasibility of developing a software tool

for the
Department for Transport

Report of the IT Consultant

Simon Morgan
MA, MSc, CEng, MICE, MBCS, CITP
Buchanan Computing

January 2009

9.1 Summary

This report examines the feasibility and benefit of introducing an IT tool for those deciding on the location, type and design of pedestrian crossings, including informal crossing facilities. It notes that this is unlikely to be feasible for one type of crossing alone, informal crossing facilities being in particular need of published guidance. Following input from a small Steering Group, two IT options of differing complexity and features are examined in detail, with budget costings produced. These are compared with the 'low tech' option of providing guidance in printed and PDF format. It is concluded that this simpler solution is likely to be the most practical way forward.

9.2 Introduction

The selection and design of suitable types of pedestrian crossing is vital to a number of important objectives. These include safety for vulnerable road users, avoidance of severance to communities and general amenity. Those involved in the provision of crossings therefore need ready access to comprehensive current guidance covering all the options, allowing them to select and design crossings wisely by taking into account the accumulated experience of others together with information about the location being considered.

The Department for Transport has published a number of detailed guidance documents on formal mid-block pedestrian crossings[3,4,5], and a 4-part advisory leaflet on pedestrian facilities at traffic signals[10]. However, a 30-month study by UCL involving local authorities, Living Streets and others considered the need for a more structured approach to the issues, especially in relation to informal crossings. This EPSRC-funded study, referred to as USAPED (USAbility of PEDestrian crossing places)[1] included consideration of a Framework to assist the designers of crossings, containing tools for handling, processing and summarising the relevant data and having regard to usability by pedestrians, drivers and riders. The form of the framework was left open for discussion – both paper-based and software solutions were mentioned, depending upon users' needs.

In addition to noting the existing guidance for zebra and light controlled (pelican or puffin) crossings, USAPED, completed in 2005, recognised a further need for guidance. Informal crossing places had become increasingly used on low speed roads and in traffic calmed areas with significant success. However there was and is no official guidance on the situations where an informal crossing might be more suitable than a formal one, nor on their actual design. In view of this, the DfT has asked for particular emphasis to be placed on informal crossings in this follow-up study as it was in the previous work.

This study looks in detail at the alternative forms that a software tool might take, considers the cost and other implications and compares the benefits with those of a simpler document-based solution. It thus builds upon the work of USAPED whilst introducing new considerations concerning IT options. It is intended to help a

decision to be reached on whether to proceed with the specification and development of a software tool or whether to provide another form of guidance to practitioners.

9.3 Project Brief

The initial brief (Appendix B) was refined at project meetings as the initial stages study progressed. The tasks identified to be undertaken prior to the first Steering Group meeting on 27 October 2008 were:

1. Categorise the forms in which the software might be developed.
2. For each of those forms provide a brief written description to be expanded into a fuller explanation at the Steering Group meeting.
3. Provide an example of an existing software application that fell into each category.
4. Write a document introducing the IT aspects of the project and a questionnaire on the key decisions for Steering Group members.
5. Provide general advice to other project team members on software developments of this nature.

As a result of the feedback from the Steering Group meeting, it was agreed to progress a limited number of options along the lines proposed in the original brief in order to study:

1. The form(s) of software most likely to achieve widespread use.
2. How the software should relate to other systems and e-GIF considerations.
3. How the software would be maintained and kept updated.
4. The estimated cost and effort of developing the software.
5. The estimated annual cost of maintaining the software.

9.4 Software categories

There are many hundreds of development methodologies and platforms upon which software can be created and made available. However, the needs of this particular project, the fact that the proposed tool will be principally for decision support by individual professional users, and the requirement for it to be understood by occasional users without significant training, allow many of the possibilities to be eliminated without further consideration.

Those that remain can be grouped (from the users' perspective) broadly under five headings:

a. Static document with hyperlinks
This option does not require the creation of new software, but it makes use of existing software, such as Internet Explorer or Acrobat Reader, for viewing, searching and printing. It is a computer-based approach that is highly likely to be familiar to potential users, and therefore an excellent 'base case' IT

solution. The guidance would be presented as web pages or a PDF, with contents, index and internal and external hyperlinks. The internal links would facilitate rapid access to different parts of the document from the index, table of contents, and wherever another section is referred to. Any external links would refer to documents located DfT, HA and other web sites, and would thus need maintenance when those web pages were updated or moved.

b. Flowchart system

This option involves locally stored or web pages implementing a chain or flowchart. That is to say, for each separate aspect of the decision process, a sequence of questions needs to be answered, the answers given dictating which further pages are displayed in that section. Whilst the order in which questions in each section would be determined by the software (otherwise it could not hide irrelevant subsequent questions), users would be able to retrace their steps and change their answers with *Next/Back* buttons.

This is similar to how many on-line opinion surveys and other questionnaires operate. At its simplest level, storage of the data entered for subsequent review and summarisation would not be provided as the storage and retrieval processes would add significant complexity, particularly if old data might need to be to be retrieved after the decision processes had been subject to amendment. For this reason, the user input would comprise almost entirely ticking boxes and selecting options. It would be wasteful of their time for users to type free format text if this was not to be stored.

c. Flowchart with storage of options

This option would add to the above option the necessary processes for users to store, identify and retrieve partially or fully completed assessments. It would also provide a printed summary (in a fixed structure) of the inputs and decision processes.

As the data would be stored, it would be practical for short free-format text strings to be entered, but the fixed structure of the report would not facilitate variable length or more wordy text responses.

d. Full process recording and reporting

This option envisages allowing text responses of unlimited length to explain or justify each stage of the decision-making process, and providing full report production in Word or PDF format on completion or at any stage of the process. Creating a Word format report would facilitate its incorporation into another document and the adding of specific formatting.

e. Custom-built fully interactive design assistant

This option involves creating bespoke software from scratch very closely tailored to the needs of pedestrian crossing designers. In addition to all the above facilities, it would allow the facts to be entered in any order. It could include data import from other systems and various types of calculation. In addition to a full report of the options and text entered, it could provide some simple guidance on possible pedestrian crossing types ranked by their suitability.

In addition, it was decided to compare these IT-based solutions with traditional paper guidance, so in the questionnaire, 'option a' was split into web-based and PDF-based, and two 'low-tech' choices added:

- Printed guidance and advice document
- Printed document also available as downloadable PDF (with internal links)

It should be noted that this document does not deal with the preparation of the guidance, only with the form in which that guidance should be presented and made available. The eventual method of presentation should be borne in mind by those writing the guidance, but the authorship, editing and consultation costs are likely to be similar for any option, and no attempt is made to estimate these costs in this paper.

A document prepared for the Steering Group explaining the project, its background and objectives is reproduced (without its questionnaire) as Appendix C. A summary of the IT options, with a feedback questionnaire for the Group is at Appendix D. In addition, Steering Group members were given illustrated examples of existing or mocked-up systems that fell into each of these categories. These were explained in full at the meeting and are illustrated in Appendix E.

9.5 Feedback from Steering Group

The response of Steering Group members and those they consulted following the first meeting on 27 October 2008 was collated and summarised by Dr Sandy Robertson (Appendix F).

From this the project team deduced:

- The system should be designed for a minimum life of 10 years, which would require its contents to be updated several times during that period. Some guidance (such as Local Transport Note 1/95[3]) was considered to be already in need of some updating in places, but that the consideration of that work was outside the scope of this project. However, developing such a system would provide the opportunity to produce guidance on both formal and informal crossings in one place.

- The was need to be cognisant of the DfT/IHT Traffic Advice Portal (at www.tap.iht.org)[6] to avoid significant duplication of the effort involved in setting up and maintaining that site.

- Whilst acknowledging the main focus of this study is on guidance for informal crossings, the Steering Group clearly indicated that it was only worth developing a software tool if it covered all types of pedestrian crossing and thus helped to select the most appropriate type for the location in question.

- It was considered that guidance in both printed and PDF form was both preferred by the Steering Group consultees and likely to be the most practical solution. However, the study would not be complete without comparing this

option with possible IT solutions, particularly in view of the previous USAPED work. Therefore the options to be studied in more detail are:

1. Printed document, also available as a downloadable PDF.
2. Full process recording and reporting (previously option d)
3. Custom-built fully interactive design assistant (previously option e)

These alternatives will now be referred to as **Option 1**, **Option 2** and **Option 3**.

9.6 Alternative forms of guidance

This section examines the three options selected for a more detailed consideration of their ease of dissemination and use and the extent to which they would be likely to achieve widespread use.

Option 1, a document available in both printed form and as a PDF downloadable from the Internet, is the traditional way in which standards and guidance relating to traffic and highway engineering is made available. This method allows wide dissemination in two alternative forms and provides immediate access to the current version for anyone with Internet access. A PDF document offers the facility to search for topics and phrases, and can provide both internal and external links. Internal links should be provided from the table of contents, index and wherever another part of the same document is referred to. External links (to web sites) should only be provided if the resource is available to maintain them. Otherwise, broken links or links to superseded references detract from the authority and immediacy of a document and certainly slow down users rather than assisting them.

Option 2 provides for a series of questions to be presented permitting the information requested to be supplied and recorded (where it is relevant to the location under consideration), and with links to the relevant sections of the guidance material. This material would be much the same guidance as might otherwise be provided in paper or PDF format, including illustrations, but organised into short sections to be presented in appropriate situations.

Development tools intended for creating forms and surveys would probably be suitable for the bulk of the work in creating the pages of questions, and linking them so that only relevant pages were displayed. This would avoid the need for any significant amount of formal programming and would very much reduce the development time. Tools that may be suitable include: OmniForm Premium and Quask FormArtist (web-based), and PocketSurvey, SmartDraw and Victoria Forms (suitable for either local or web use)[7]. With these types of tool, most of the pages of questions could be set up and linked by a competent technician, rather than by a computer programmer.

Option 3 involves a bespoke computer program to be created specifically for the task in hand. This would provide the most flexibility and provide the best user experience, but it would also be the most costly. This would be the only option that permitted the software itself to do calculations, filter out unsuitable options based upon the data supplied or to make suggestions for the type or design of crossing. However it is

noted that the Steering Group did not consider this type of automation or inbuilt intelligence to be a high priority, nor did they identify any significant need for calculations that are feasible to be performed.

In either of Options 2 or 3 there would be a need to display or have a link to guidance appropriate to the question being answered or the page displayed. Providing links to appropriate websites would be easy to add to either option (although it would lead to a maintenance issue of keeping these up-to-date if the sites changed). But if the system was to be used without an Internet connection, it would need its own locally-stored guidance. Providing appropriate guidance is very similar to the task of providing context-sensitive help in any computer program. Therefore, this guidance would be provided in HTML help format, either compiled into a Microsoft CHM file for local use, or left as separate HTML pages for use on a web server. Tools available in all the envisaged development environments provide methods for addressing particular pages of information stored in this way.

Computer software can accomplish a great many things, and it can make us humans more efficient and spare us the drudgery of repetitive and boring tasks. But, if not designed or chosen wisely it can also be a burden, for example by forcing tasks to be done in an illogical way or requiring the entry of data that is not subsequently needed. It is therefore wrong to assume that using a computer will necessarily improve the efficiency with which tasks are carried out, the quality of the results produced or the user experience in obtaining them.

What computers are good at is repetitive work that follows a similar pattern each time it is done, the management and retrieval of large quantities of data, complex calculations, and the production of documents. It is not clear that pedestrian crossing appraisal and design fits into any of those categories, being a decision making process guided (but not absolutely determined) by a large number of different factors and inputs. There is no algorithm for arriving at the correct type and location of crossing, even if all possible inputs were known – it is a matter for human judgment, needing an experienced engineer to weight the pros and cons, making use of knowledge of the location, which he may not even be aware that he is doing, and his previous experience. The task is not dissimilar in complexity or how it breaks down to any other design process affecting the highway, or the built environment generally. If computer software could significantly assist with pedestrian crossings, then it could also be applied to roundabout design or improving the safety of a junction, to pick two random examples.

But it is far from clear that any of these tasks is amenable to computerisation. The best a computer could do is to act as a personal assistant, reminding the designer of each of the aspects of design that should be addressed, having the data and other information to hand and summarising and typing up the final report.

The development of computer software is undertaken in stages, for which there are many different possible models and methodologies. Traditionally, a system is specified in full at the outset, and then given to developers to provide software that implements it, as a single deliverable. This approach generally results in disappointment for several reasons. Not many end-users understand a formal specification well enough to spot potential problems, flaws and omissions. And no

formal specification can cover every detail, so much is left to the discretion of the developers, who may not be the people best placed to make these decisions.

Most successful developments therefore involve representatives of the end users at several stages during the process, often by providing them with prototypes or mock-ups of the system as it progresses to enable them to better visualise it. With a variety of different categories of possible users identified there is a possibility that there would be no shared vision and that different participants might tend to pull the project in different directions.

Even more important than user representation, therefore, is the vision and leadership of the project manager or champion. That person needs to be an enthusiastic communicator who has a clear grasp of the benefits of the project to steer it in a direction that maximises those factors. That person needs to chart a difficult course: listening to and being open to the views of others where these can add value, whilst avoiding the project being diverted unduly from its main objectives.

It is widely known that a significant proportion of software projects end in failure, with the system never going into full use or achieving its main purpose. One of the reasons for this is a lack of communication between those specifying and designing a system and those who will use it. This risk can be mitigated with good leadership, which ultimately must be embodied in a single person: good software was never designed by a committee. Such a person needs to be on the 'client' side of the project if it is to be a tendered exercise, as a contactor's interest is simply to fulfil the project brief, not to stretch or challenge the goals, nor to set requirements or strategy. It cannot therefore be overemphasised that such a person needs to be identified for an IT solution to be successfully developed for this project.

9.7 IT platform

This section relates only to the 'IT solutions': Options 2 & 3. It is not relevant to Option 1, as a PDF document is by definition portable and capable of being accessed on almost any computer. Either of these IT solutions could be developed as a web-based system located on a centrally maintained server or as a local application to be installed on an individual computer or network. The initial development effort would be similar in either case, but it is useful to consider the availability and ease of use of each option, and on their ongoing maintenance and support issues, which would differ markedly.

A centrally-hosted web-based system would be available immediately to anyone with access to the Internet. A standard web-browser would be used so that no local installation process would be required. However, anyone temporarily or permanently without Internet access would not be able to use the system. This would include people travelling, using notebook computers away from a WiFi connection they are authorised to use, and a significant number of local government staff who do not have full internet access at their own computer.

There is also the issue of the availability of the server and its associated communications links. This is largely a question of cost. For highly critical systems

downtime can be almost totally eliminated by providing mirrored servers and even utilising two physically separate data centres. However, to keep the costs within reasonable bounds, a single server hosted service should be assumed to have about 5% downtime.

There are several different Internet browsers available, and each of these has several versions currently in use and is regularly updated. This causes problems for the development, testing and deployment of web-based software, as minor differences between these browsers often result in a web application failing to run correctly on them all. Testing therefore needs to cover a wide range of currently available browsers, but cannot take into account any new versions that might be automatically or manually installed on user's computers in the future. There tends to be a trade-off between usability and compatibility. A simple application using only a well-defined sub-set of features available in modern browsers is likely to be totally compatible with them all. But the user experience is vastly improved by taking advantage of more recently added browser features and 'plug-ins', at the expense of losing universal compatibility.

The local application, by contrast, could still be initially obtained from the Internet (subject to any necessary licensing formalities), but would installed on the user's own computer or on a local area network in the user's office. It could also be installed from a CD or USB key. Once installed, the software would run without the need for an Internet connection and could thus be used on isolated notebook computers.

The local application would need to be developed for a particular operating system family (almost certainly Microsoft Windows) so, unlike a web-application, would not be available to the small number of potential users with Apple Mac, Linux or Ubuntu as their operating system. All other important traffic engineering software requires a Windows-based PC, so such computers are universally available in local authorities and consultancies. This limitation on operating system would thus only affect a small number of those wishing to use their own computer at home or whilst travelling.

There are very minor issues with different versions of 32-bit Windows (which started with Windows 95), but Microsoft has taken great care to ensure that each new version of the operating system can run software written for previous versions unchanged. The number of application programs that cannot run satisfactorily under subsequent releases of Windows is very small indeed, and the problems generally relate to failing to follow Microsoft documentation and good programming practice in the original development.

Local software would not be automatically updated when standards or guidance changed. In these circumstances it would be sensible for the maintaining organisation to contact everyone who had obtained the original software advising them how to obtain and install a revised version of the software. It would also be possible to have the software itself check for updated versions on computers connected to the Internet, but it would be wise to ask the user before installing them. Experience at Buchanan Computing is that around a quarter of users do not immediately install upgraded software even when it has been posted to them. There is therefore a danger that some users might continue to use outdated versions of the guidance, a problem that local software has in common with a printed reference document.

Web-based software is gaining prominence and market share over local software, but mainly in areas where the same data needs to be accessed by a number of users, particularly when those users are not in the same building. It offers flexibility for remote working and working at home, whilst allowing data to be shared with colleagues. It also offers the benefit of central maintenance: the software and associated data may be updated and reconfigured when necessary by a central maintenance team without any action being needed on the part of individual users. But this could also present problems to users if the software is changed significantly whilst they are in the middle of a project – they may have to spend time understanding the changes, possibly re-learn aspects of the software and check that data already entered has been correctly interpreted and is complete in the revised system. The central team will also make regular back-ups of the data and restore it in the event of any loss or malfunction, whereas data on a local computer may well be lost if the computer fails or is mislaid.

The main disadvantage of web-based software is speed. Even with the very best broadband connection it is impossible to create systems that respond immediately to users' selections and requests. This leads to user frustration and inefficiency. A second problem is printing. The web application cannot know what type of printer is installed locally or what size paper it has loaded in order to format reports and other printouts correctly. Therefore is has to guess, with the result that some text may be missing or too small. Applications written to run locally can be much more responsive to users and have more options for communicating with them, such as toolbars, right-click local menus, drag-and-drop editing and dialogue boxes that are dynamic and intelligent. In web-based software, a user has to specifically click on an option or button and then wait an appreciable number of seconds for anything on the display to be updated. On a local application, the user interface is generally continuously updated to reflect, for example, that a particular option is no longer applicable, and immediate feedback can be given if an incorrect value is entered into a box.

Theoretically the same development tools can be used for an application that might run locally or be web-based. In particular the Microsoft Visual Studio.net[8] range of development tools encourages this approach. However, for the reasons outlined above, a successful application needs to be optimised for the environment in which it is to run, so there is currently very little software that can be ported without modification from local installation to a web-server or vice versa.

In the application under consideration for pedestrian crossing selection and design, the sharing of data amongst users is not required, so the main advantage of a web-based solution would not be utilised. If the development is to be undertaken using software designed for surveys, since most of this software is designed to create web-based forms, a web solution might be the most economic. Otherwise, for this particular application, the disbenefits of web development outweigh the benefits. The system should therefore be designed to run on locally on individual computers.

9.8 Data interchange and software compatibility

The Steering Group has indicated that required connectivity to other systems is limited to linking to websites and general guidance documents, case studies, etc. There was no request for importing data into the tool, a possibility which this question was intended to elicit. That is just as well, as there is no standard format in which authorities hold traffic and pedestrian survey information or general traffic flow data. To link the system to different authorities' databases (where these exist) would therefore have been a bespoke project at each authority, and therefore probably prohibitive on cost grounds.

Equally, the Steering Group did not favour linking the system to GIS or CAD within the intended timescale of the project, so there would be no general mapping facility or location plan display within it.

The study also requires the consideration of government e-GIF requirements. e-GIF defines the technical policies and specifications for information flows across government and the public sector and covers interconnectivity, data integration, e-services access and content management. As the proposed system is not likely to exchange information with any other system, nor be available on a public website, e-GIF is not relevant to it and need not be considered further.

Software compatibility issues include ensuring that the user interface is designed in accordance with accepted principles, to make the software easier to use by those familiar with other computer applications. As this system is likely to be implemented on computers running Microsoft Windows, the user interface guidance and standards published by Microsoft Corporation[9] should be followed in designing its 'look and feel'.

9.9 Maintenance and support

The maintenance and support functions that need to be provided to facilitate effective use of a software system fall into 7 categories:

1. The supply of the software to new users.
2. Technical support to assist users with any questions or problems.
3. Training in the use of the software.
4. Fixing any errors or problems in the software (and procedures for reissuing it).
5. Changing the software to cover changes to the underlying standards and guidance that it implements.
6. Changes to the software to enhance its functionality, usability and compatibility with other systems.
7. Changes to any links or references to external documents needed as a result of documents being revised or withdrawn or web locations changing.

In addition, a web-based solution would involve the services associated with its hosting. This would best be done centrally for all users in the UK. The alternative

would be for an individual user to set up a local web server or to add the system to an existing one, but this would require an ongoing high level of local IT expertise, making it unsuitable for many organisations.

In order to carry out the above operations efficiently, they would need to be carried out by a company already involved in software support that had the necessary infrastructure and technical support staff in place. The volume of support needed for this one system alone would be unlikely to justify a full-time member of staff and would therefore be difficult and costly to provide in isolation from the support of other related products. For a company already involved in technical support, adding another product to their portfolio would involve ensuring that sufficient capacity existed for the additional work, training staff, and adding the relevant technical and customer information to their databases. Much support is nowadays provided by email, but the support centre should be equipped to deal with telephone calls, faxes and personal requests. Remote logging into the users' computer, to resolve installation and configuration issues, should be considered as an optional service, possibly at additional cost. Support would probably only be needed during normal office hours, and whilst an instant answer should always be given whenever possible, for this type of system that is not mission-critical, support costs should be minimised by not guaranteeing minimum response times.

A user group would be a useful addition to the support services, either involving formal meetings or using a 'talk list' or web forum. Such a group would be essential if the project was to be supported wholly or partially by public funds, and would need to be a formal steering group or project board able to assess the cost benefit of each proposed change and the overall value being delivered by the project, in order to be able to advise on the appropriate level of spending.

Depending upon the complexity of the system, it may be necessary to offer training courses in its use. Those attending software training are often new to the task that the software is designed to aid. Therefore the training should be designed to introduce the subject of pedestrian crossing selection, location and design as well as explaining the use of the software. Training should be offered at central venues well-served by public transport, in addition to being provided at regional centres and authorities' own premises. The company providing the support services should therefore be one accustomed to providing this type of training and which has access to the necessary facilities.

9.10 Development costs

Regardless of the form in which it takes, the preparation of new and revised guidance, best practice, etc. will involve a significant amount of time to prepare. There will need to be research on what is currently recommended or used in pioneering schemes, and case studies will need to be identified it they are to be included. Existing sources of information will need to be checked to ensure that those to be referred to are current and likely to remain so and are consistent with current thinking on best practice. The guidance will need to be drafted and edited by individuals or a task group, and photographs, diagrams and other illustrations sourced or prepared. It is

likely that a consultation with other industry experts and relevant trade bodies will then be needed to ensure that no aspect has been overlooked or misstated.

As the brief for this study relates only to the IT aspects, estimation of these authorship, editing and consultation costs is outside the scope of this paper. However, this does not preclude a meaningful comparison of the different forms that the guidance might take, as the difference between the costs of the various approaches is what matter in evaluating their relative merits, the authorship and associated costs being largely the same for all options. These marginal costs are estimated in the current paper.

The costs involved in preparing a document for printing or as a PDF file are almost entirely those mentioned above for research, authorship, consultation and editing. The additional costs of bringing the material into a smart and readable PDF or printed format are mainly those of graphic and typographical design, indexing and production. If a printed document is to be sold, (as for example TSO do for Traffic Signs Manual Chapters and Local Transport Notes[3,4] and IHT do for their Guidelines), the production and design costs will probably be fully covered by the publisher out of the prospective proceeds of sales. Adding and checking external links (to websites and documents already identified by the authors of the guidance) would take a technician perhaps 3 days and cost around £1600 using the rates given below.

The costs involved in software development are not just those of writing the appropriate computer code. In fact these costs are dwarfed by the need to document the system at various stages, and to test it thoroughly and eliminate the inevitable errors that will be identified. Communication with the actual users or their representatives is another essential element in any successful system, but which can add significant cost, particularly if prototype systems are to be produced. This need for communication can be minimised if the developers are already knowledgeable in the application area concerned, and can thus make sensible assumptions when decisions are needed.

These communication and design aspects will be similar for either of Options 2 and 3. The system development, testing and documentation costs will, however, be very different.

No detailed cost estimate for a computer system is possible until a full specification is available. Otherwise, it is difficult to estimate the complexity or to be sure that the development environment envisaged provides all the facilities that will be needed. However, some idea of an appropriate budget is clearly needed before going to the expense of preparing a formal specification. The remainder of this section attempts to address the cost of the IT-related aspects of this task. No account is taken of the research and authorship costs of the associate technical guidance, that will both influence the development and be available to view within the system.

In *Illustration of Implementation of The Framework* (Robertson & Allsop, 2005)[2] there are a total of 38 sections to be answered in arriving at a suitable pedestrian crossing location and type. Seven of these sections require a question to be answered and 35 require that data be entered and a decision log completed. It is assumed that the data and decision log are fields allowing the entry of any length of free-format

text. Each section probably corresponds to a page in the computer system and has eight system commands available:

- View and amend all input data
- View output based on current state
- View decision log
- Edit decision log
- Save project
- Save current project as…
- Load previously stored project
- Reconsider previous decisions

In addition, there will need to be *Next* and *Back* buttons, a facility to exit, and links to context-sensitive and general guidance, and to help on the use of the software itself.

A system of this complexity could be implemented by a suitably experienced technician using an off-the-shelf form generation or survey completion package, as mentioned above. Checking and user documentation would need to involve an engineer experienced in the design of pedestrian crossings. A budget for the time and cost involved for a system of this complexity is suggested below:

Task	*Technician days*	*Engineer days*	*Manager days*
User consultations (at various stages)	3	4	1.5
Functional specification	2	4	1.5
Outline design	4	1	1.0
Evaluation of form/survey tools	3	1	0.5
Detailed specification	3	1	0.5
Prototype creation & evaluation	3	0	0
Configuration and linking	5	1	0.5
Documentation	6	2	0.5
Testing	5	2	1.0
TOTALS	**34**	**16**	**7**

Option 2: Task breakdown with estimated time required

Suitable commercial rates for UK-based staff undertaking the above tasks are estimated in the table below, to arrive at total development costs (excluding authorship of guidance and VAT.)

	Cost per day (£)	*Days*	*Cost (£)*
Technician	550	34	18700
Engineer	750	16	12000
Manager	1200	7	8400
TOTAL			**39100**

Option 2: Estimated development cost
(excluding authorship of guidance material)

The fully bespoke system, Option 3, would only be worth pursuing if it offered significant additional functionality or ease of use beyond the cheaper Option2. Examples of such enhancements are:

- All data would be stored in formal structures, facilitating further processing and intelligent interpretation. This will require the coding of forms to record and edit the data.
- Calculations and results deduced and derived from other data will be possible.
- Improved report production, fully customisable and producing output in Microsoft Word and PDF formats.
- The ability of the software more intelligently to tailor subsequent forms and questions to the data that has been recorded so far.
- The possibility of incorporating data from remote sources, such as web sites.

In order to provide these enhancements, the system would need to be coded from scratch (but using suitable library functions and controls where applicable), using a programming language such as C# or Visual Basic.Net. It is recommended that a language from the Microsoft Visual Studio.Net suite, or a Java-based language, be used to facilitate connectivity with web sites and to enable the whole system to be web based should this prove necessary either immediately or in the future.

The use of such tools will require the services of a professional programmer, and the use of a more detailed specification. An additional stage is introduced to permit the data structure to be designed in an efficient and maintainable form. The estimated time involvements for a possible Option 3 system of medium complexity are:

Task	*Programmer days*	*Engineer days*	*Manager days*
User consultations (at various stages)	4	7	2.0
Functional specification	5	5	2.0
Outline design	10	1	1.0
Detailed specification	15	5	2.5
Prototype creation & evaluation	5	2	2.0
Systems architecture	5	0	0.5
Coding	25	2	1.5
Documentation	15	3	1.5
Testing	18	4	2.0
TOTALS	**102**	**29**	**15**

Option 3:Task breakdown with estimated time required

Suitable commercial rates for UK-based staff undertaking the above tasks are estimated in the table below, to arrive at total development costs (excluding authorship of guidance and VAT.)

	Cost per day (£)	*Days*	*Cost (£)*
Programmer	750	102	76500
Engineer	750	29	21750
Manager	1200	15	18000
TOTAL			**116,250**

Option 3: Estimated development cost (excluding authorship of guidance material)

An appropriate budget to allow for developing Option 2 would therefore be £40,000, with Option 3 requiring a budget of approximately £120,000 (excluding VAT).

9.11 Maintenance costs

A printed documents and its PDF equivalent is normally regarded as fixed once published and not therefore incurring any maintenance cost until a revised edition is proposed. However, if the PDF document in Option 1 is to have external links (i.e. link to websites and other documents), provision for some maintenance would be advisable, as these links tend to change over time with documents being revised or superseded and websites being reorganised. It is recommended that these links be checked every 3 months, both to identify broken links, and to ensure that the document or page referred to is still current. It is estimated that a technician and a traffic engineer will each need to spend one day per quarter on this maintenance, costing around £5000 per year at the rates quoted above. This cost could probably be eliminated by combining the maintenance with that of the DfT/IHT Traffic Advice Portal[6], or simply by making external links only to the relevant pages of TAP.

For the IT Options 2 & 3, the services outlined in section 9 above are typically provided for commercial software systems installed on local computers for a payment in the range 15% to 25% of the capital cost of acquiring the software licence in the first place. If the system were to sell for (or to have a notional sale price of) £2500, an annual charge of £400 to £800 would probably seem reasonable to users.

There are fixed costs associated with maintaining and supporting a piece of software, even in a company already providing this service for similar systems. It is necessary to ensure that at least two members of staff are trained in the installation and use of the system and are familiar with technical operation, and able use its technical documentation and do simple fault finding. To back this up, a programmer needs to be available, subject to a few days' notice, able to make corrections and minor changes without having the re-learn the system each time. Therefore there is a minimal annual cost for providing a maintenance service, of perhaps £15,000,

regardless of how few users make use of it. For the annual charge to each user, discussed above, there would need to be a minimum of 20 to 30 subscribing to the service. Alternatively, a higher annual charge could be made to support fewer users, but they may not consider that good value or an appropriate use of their limited budgets.

Where the software is leased, rather than purchased outright, the annual payment comprises a combination of the maintenance and support cost and the 'hire purchase' of the software itself, so will probably be around 50% of the notional price that the software might otherwise have been sold for. Some companies only provide services 1-4 in their standard maintenance fee, charging extra for upgrades adding functionality or implementing other major changes, in which case the maintenance charge would tend to be at the lower end of the range indicated.

Service 7 is the most difficult to estimate because it depends upon external factors. There may be no changes to external documents and websites referred to, or there may be major changes with new documents, perhaps in a different format, superseding earlier ones. Ideally, links to external websites should be checked monthly, as they are apt to change without notice. This task could be accomplished by linking to the DfT/IHT Traffic Advice Portal[6], or by sharing it (and the corresponding resources) with the IHT team which maintains that site.

Hosting and maintaining a web server would involve additional costs. These would be very dependent upon the speed and availability required and the number of users amongst whom these costs could be shared. A 'ballpark' figure would be an additional £2000 per authority per year, subject to 20 or more users subscribing to the service.

9.12 Commercial issues

Could a software system be produced as a commercial proposition or would its development need to be subsidised in some way? The answer to this question depends mainly upon three factors:

1. How much would the system cost to develop?
2. How much per copy would be charged?
3. How many copies would be sold in the first 3 years after release?

These questions are, of course, inter-related. Ignoring the costs of making the sales (which can be very small for software), a system selling 1000 copies at £100 each nets the same total sum as one selling 5 copies at £20,000 each. So software of equal complexity and development effort might sell for £100 or £20,000 depending upon the market size and the value it delivered to the purchaser. There is no one right price for software. Local authorities and consultants are accustomed to purchasing design tools for traffic engineering applications that cost in the range £1000 to £5000 for a single computer licence, although traffic modelling packages can be much more expensive.

The issue of market size depends upon whether the system is seen as essential for every local authority responsible for pedestrian crossings or whether it is an optional tool to assist those who require it. It would be difficult for the DfT to insist that its guidance on informal crossings (for example) was only available within a computer software system that needed to be purchased and maintained. It is therefore probable that the guidance would also be available in printed or other forms and available to use without purchasing the software tool. Unlike modelling, junction capacity or scheme assessment, for example, there are no complex calculations that must be performed in a standardised way, so no reason to insist that software be used. It is interesting to note that the Steering Group indicated a preference for the system being used by those new to pedestrian crossing design, rather than by those more experienced. This might indicate that, having become familiar with the guidance, more experienced practitioners would no longer use the tool and would revert to using their previous methods.

Taking account of all these factors, the system might be seen as optional or as a training aid for new practitioners and might be purchased by perhaps as few as 10% of relevant authorities during the first 3 years of its availability.

There are nearly 200 traffic authorities in UK (top-tier or unitary local authorities responsible for order making and formal pedestrian crossings), plus the agents of the Highways Agency, Transport Scotland and Welsh Assembly Government for trunk roads. In a very few two-tier areas county councils delegate some of these powers to district councils. In each authority, it is unlikely that there is more than one person responsible for implementing pedestrian crossings, so most authorities would opt for a single copy of the system. In many areas consultants are carrying out this work under framework or other agreements, but this is unlikely to lead to many extra sales, as the involvement of the consultant would probably remove the need for the authority to also have a copy.

Therefore, unless the DfT was proposing to make the use of the software system either mandatory or to give a very strong recommendation that it be used, it might sell as few as 20 copies during its first 3 years, making it an unattractive prospect for commercial investment in its development.

9.13 Recommendations

Having analysed the benefits and costs of developing a computer system for pedestrian crossing usability and design, it will be seen that neither Option 2 not Option 3 is likely to deliver sufficient benefit to justify its development and maintenance cost as a commercial investment, even after the costs of compiling new guidance and necessary updating of existing guidance have been covered. Under Option 1, the latter costs would in themselves be largely sufficient to enable guidance for informal pedestrian crossings to be developed as a document to be available in printed and PDF form. This could initially be a stand-alone document referring to existing versions of other guidance, notably that for formal crossings. As the latter come up for revision, guidance on informal crossings could be usefully combined with the updated guidance for formal crossings.

Any external links in the PDF should be to pages of the Traffic Advice Portal (subject to the necessary consent and co-operation) to avoid the burden that would otherwise arise in maintaining those links.

Appendix A: References

1. Project USAPED Web Report, Robertson/Thoreau/Allsop, UCL 2005 (available at: www2.cege.ucl.ac.uk/cts/usaped.html)
2. Project USAPED: Illustration of Implementation of The Framework, Robertson/Allsop, UCL 2005 (available at: www2.cege.ucl.ac.uk/cts/usaped/frameworkpagesv4.html)
3. Local Transport Note 1/95: The Assessment of Pedestrian Crossings, DfT 1995 (available at: http://www.dft.gov.uk/pgr/roads/tpm/ltnotes/ssessmentofpedestriancro4033.pdf)
4. Local Transport Note 2/95: The Design of Pedestrian Crossings, DfT 1995 (available at: http://www.dft.gov.uk/pgr/roads/tpm/ltnotes/esignofpedestriancrossin4034.pdf)
5. Puffin Crossings Good Practice Guide, DfT/CSS 2006 (available at: www.dft.gov.uk/pgr/roads/tss/gpg/puffingoodpracticeguide.pdf)
6. Transport Advice Portal (DfT/IHT continuously updated web resource at: www.tap.iht.org)
7. Information on OmniForm Premium, Quask FormArtist, PocketSurvey, SmartDraw and Victoria Forms is available at their respective websites:
   www.nuance.com/omniform
   www.quask.com
   www.pocketsurvey.net
   www.smartdraw.com
   www.victoriaforms.co.uk
8. Information of Microsoft Visual Studio products is available at: http://msdn.microsoft.com/en-gb/vstudio/products/default.aspx
9. Windows User Experience: Official Guidelines for User Interface Developers and Designers, Microsoft Corporation 1999.
10. Traffic Advisory Leaflet 5/05: Pedestrian Facilities at Signal-controlled Junctions, DfT 2005 (available at: www.dft.gov.uk/pgr/roads/tpm/tal/signsandsignals/pedestrianfacilities)

Appendix B: Project brief

Centre for Transport Studies
University College London

Invitation to express interest in a
SCOPING STUDY OF THE FEASIBILITY OF DEVELOPING A SOFTWARE TOOL TO ASSIST DESIGNERS OF PEDESTRIAN CROSSING PLACES

Background

A 30-month EPSRC-funded study of the usability of mid-block pedestrian crossing places carried out by UCL in partnership with local authorities and Living Streets and in consultation with the DfT has provided the research basis for a software tool to assist designers of crossing places. The tool would help them to use site-specific data in choosing from options ranging from simple informal provision to a signalised crossing, and in proceeding to a detailed design, documenting the decisions they make during the design process. To seek a route to exploitation of this research, the DfT has invited UCL to submit a single tender for a scoping study of the feasibility of developing the envisaged software tool. The scoping study will be directed by Professor Benjamin Heydecker and requires expertise in software development for the applications environment of local authority highway and traffic engineering teams and the consulting firms who work for them.

Expertise required

With the benefit of full access to the UCL research findings and to colleagues responsible for the earlier research, and of advice from a small steering group, the expert engaged will be required in consultation with the UCL colleagues to:

- identify the forms in which the software might be developed and recommend the form most likely to achieve widespread use in the light of user requirements;
- identify how the software could best relate to relevant existing and foreseeable software and systems, taking appropriate account of the e-GIF;
- show how the software in the recommended form would lend itself to adaptation and enhancement in the light of changing requirements;
- estimate the workload, timescale and cost of developing the software in the recommended form to yield a marketable product; and
- estimate the annual cost of subsequent maintenance and updating.

Expression of interest

…

For details of the previous UCL research, please see http://www.cts.ucl.ac.uk/usaped.html . Your attention is drawn particularly to Parts 6 and 7 of the Project USAPED web report and the illustration accompanying Part 7. Professor Heydecker and Dr Sandy Robertson, who led the previous research, will be available to discuss the requirements with you during your formulation of your expression of interest.

Appendix C: Briefing document for Steering Group

Scope and purpose of the software tool.
Sandy Robertson

Introduction
This document identifies the scope and purpose of the software tool that was identified as a potential aid to the design process of pedestrian crossings in the USAPED project. The tool is not seen as replacing the content of existing design guidance such as LTN95/1 and LTN95/2 that cover formal crossings, which have statutory requirements for some or all of their design. The tool is seen as being an aid to assist in deciding whether a formal crossing or an informal crossing place is required and in the design process for informal crossings, which have fewer statutory requirements on their design.

There is currently no direct equivalent of LTN 1/95 and 2/95 for informal crossings and appropriate counterpart guidance would need to be formulated for use within the proposed tool. The project team is conscious of the potential difficulties that have in the past been posed by inappropriate interpretation of rules such as pv^2 and that there is now a view that guidance rather than a simple rule based approach can give better overall results. The team is also aware that a simple formulaic approach to decisions could lead to a situation where inexperienced staff are basing their decisions solely on the output of the program rather than considering the design themselves.

One major aspect of the development of the software tool is the specification of what the tool will do and what the needs of the end users will be. We are asking you to comment upon the scope, purpose and broad user requirements of the proposed tool and to help identify what features/functions should be included in the tool.
In asking for your input, it is very easy (particularly in group situations) for the answer to every proposed feature to be "yes, please". However, the group is asked to consider carefully the cost benefit of each requested item, as an over complex system might prove to be difficult to use and thus not be used. Each feature added must pay for itself in terms of the benefits it brings compared with an otherwise similar tool that is simpler because the feature is omitted.

The vision of the tool based on the USAPED workshops with potential end users:-
During the USAPED project, two workshops were run with potential end users of the tool drawn from Local Authorities, consultants and user groups. The workshops were run in order to obtain information about the potential needs of users of the tool. The workshops were run in 2004. The vision of the tool that emerged from those workshops was a design aid aimed at providing users with a one-stop-shop for information relating to the design of pedestrian facilities and informal crossings in particular. It was also envisaged that the tool would provide the facility to do calculations for the user where required. The tool would also provide a decision logging facility.

The USAPED report recognised that the range of information relating to the place where a crossing is being considered that is available or which it is affordable to collect will differ greatly from case to case. The desirability of some affordable information may

become evident only partway through the design process. Whilst the USAPED research was oriented towards the scope for a computerised design tool, the question whether computer-based or paper-based implementation of the design process to which the findings pointed would in practice be preferred was left open.

We would like know your views and comments on the desirability of different features in the proposed tool particularly in terms of what users would find to be most helpful in practice.

Issue:- Who is the tool for?
Participants at the seminars run as part of the USAPED project were conscious that small traffic management measures like pedestrian crossing places can arouse great interest among local people, user groups and elected members. In such cases, as part of the consultation process, designers can be expected to explain options and their pros and cons, and sometimes to involve lay people in the design process.

There was a clear feeling that this should be considered in developing the software, with some participants thinking simply in terms of the software helping the designer to interact with the interested parties. Others, we believe, were thinking more radically in terms of the software itself being available, probably with some limited form of access, to interested parties themselves.

Logging of the decisions as made would be potentially important for legal departments, who might find direct access to the relevant part of the software helpful in the event of needing to justify a particular design or implementation decision.

Discussions at the early stages of the current phase of the work have indicated that perhaps an application to cover both the needs of the design team and those of the interested other parties might be too ambitious.

Question 1: Who would benefit from the tool as proposed?
Please indicate on the attached questionnaire the extent to which the tool could benefit the types of end users listed there.

Issue:- What data should the tool incorporate and present?
Some specific examples of the types of data are given in an extract from the USAPED report included at the end of this document.. Broadly the data can be divided into the following categories:

- Data about general characteristics (e.g. vehicle braking distances, age structure of the UK population).
- Data about site specific characteristics (e.g. width of road, vehicle flow).
- Data about local or wider area characteristics (e.g. proportion of disabled people in the surrounding area).

Question 2: What information should be provided by the tool?
Please indicate on the attached questionnaire which information should be accessible through the tool. See the extract from the USAPED report at the end of this document for examples of each category of information. Please also indicate if we have missed anything.

Issue: What is the anticipated lifetime of the tool?
Should the tool be designed in such a way that it would become a standard for, say a 20 year period, or the duration of current policy? Such a consideration will affect the design of the tool in terms of ease of updating and of the platform (operating system) upon which/with which it will work. For example how will the tool link into/match existing and changing policy? It is anticipated that the system would need be able to be updated in the light of policy changes over time.

Question 3: What is the anticipated lifetime of the tool?
Please indicate on the attached questionnaire.

Issue:- What functions should the tool perform?
One of the issues that we are considering is what the tool should do and what pre-existing information it will allow users to access
The detailed design of the user interface and the functions that the tool performs will be based on a user requirements capture/assessment. Experience has shown that a software based tool will only be successful (as opposed to being in wide circulation but unused) if it meets effectively the needs of the end users and provides a visible/tangible benefit to them. This is likely to be a substantial part of the development process and the outcome of the user needs assessment may well determine the nature of the finished product. The extent to which training in the use of a system is required is also an issue, particularly where there is high turnover of staff.

It was envisaged that the tool should be able to store the set of choices and inputs making up an incomplete design in such a way that the designer can resume progressing it where they left off without having to repeat previous steps. This may arise when the designer follows option A (chosen at stage Z) up to a certain subsequent point and then decides that they had better also try option B from stage Z instead, whilst still leaving open whether the final design will use A or B. It was anticipated that the system would also have a facility for users to add notes and/or annotations to clarify their decisions.

Question 4: What functional features would it be useful to incorporate into the tool?
Please indicate on the attached questionnaire what functions the tool should be able to perform. See the extract from the USAPED report at the end of this document for examples of each category of information that might be relevant. Please also indicate if we have missed anything or if you have specific thoughts on features that would be helpful.

Issue: The tool in the context of other IT systems.
It was anticipated that the tool should link to existing data sources where possible, for example existing highway maps, utilities information etc. Some of the issues are covered in the companion questionnaire. Information comes in many forms, whether it be data such as traffic flows or a document detailing guidance.

To what extent do current or planned government IT initiatives affect how the system may integrate with other IT systems in the short/medium/long term? for example are there any planned protocols for data exchange between government systems.

Question 5: what information sources would be of most use for the tool to have direct links to.

Extract from USAPED report.
The section provides an overview of the way that the tool was envisaged together with some details about the type of information that might be needed.

7.3 Scope of input to the framework

It is recognised that the range of information that is available or which it is affordable to collect will differ greatly from case to case, and that the desirability of some affordable information may become evident only partway through the design process. The list of items provided here can all be drawn upon while using the framework, but its use does not require the user to provide any more than the most basic dimensional data.

The items are described here in terms of conventional compass directions in which the road runs East-West and pedestrians cross between North and South. The input software will provide for user-specified directions to be substituted automatically.

Indented items are perhaps less likely to be available.

7.3.1 Location

Title of site
Specification of four directions as counterparts for conventional compass points

7.3.2 Traffic

Daily vehicle flows E & W
- Typical peak hour flows
- Typical daytime offpeak flows
- Relevant aspects of traffic composition

Vehicle approach speeds from E & W in uncongested conditions

Daily crossing pedestrian flow
- Daily flows from N and from S
- Daily flows NE-SE, NE-SW, NW-SE and NW-SW and vice versa
- Typical peak hour flows
- Typical daytime offpeak flows

- Daily pedestrian flows along N & S footways
- Typical peak hour flows along footways

Pedestrian walking speed

Pedestrian routes of which crossing place will form part
- Desire lines and indications of corresponding flows
- Indications of suppressed or diverted journeys on foot

7.3.3 Geometry

Width of highway excluding banks
Minimum width required for carriageway N side
Minimum width required for carriageway S side
Width of N footway
Width of S footway
Minimum width of N verges excluding bank
Minimum width of S verges excluding bank
Depth of current refuge

Whether bus lane E
Whether bus lane W
Whether cycle lane E
Whether cycle lane W

Distance to nearest junction E and with major road or side road
Distance to nearest junction W and with major road or side road

Whether bus stop on N side and if so where
Whether bus stop on S side and if so where

Visibility of traffic to pedestrians at kerbline N side looking E
N side looking W
S side looking E
S side looking W

Sight distance of crossing place for drivers from E
Sight distance of crossing place for drivers from W
Sight distance of full width of both footways for drivers from E
Sight distance of full width of both footways for drivers from W

Existing kerbing and slope of footway to kerb N side
Existing kerbing and slope of footway to kerb S side

Existing condition of drainage

7.3.4 Utilities

Presence and location of inspection covers or posts in relevant length of highway:
Electricity
Gas
Telecoms
Sewerage
Water
Other

7.3.5 Street furniture and landscaping

Presence and location in relevant length of footways and verges or in refuge:
Posts or cabinets for signage or traffic control
Lampposts
Guardrails
Seats
Decorative features
Trees and shrubs

7.3.6 Lighting

Existing standard of lighting

7.3.7 Land use

Usage N side
Significant destinations on foot N side
Usage S side
Significant destinations on foot S side

7.3.8 Parking and loading

Location on N side
Location on S side

7.3.9 Prospective pedestrian users

Whether there is an unusually high proportion of users:
with physical mobility needs
- with visual impairment
- with hearing impairment
- with cognitive needs
- using accompanying devices
- who are encumbered

who are children
who are older people
- whose native language is not English
- who are not local people
- who are not regular users

7.3.10 Interests and representations

Particular points relevant to the provision or design of the crossing place that are believed to be important to local interest groups

Appendix D: IT Briefing note for Steering Group

Briefing note and questionnaire produced for the first Steering Group meeting on 27 October 2008.

List of possible software types for initial meeting of Steering Group

1. Introduction to IT development options

The proposed system could be implemented in a number of different ways. The views of the Steering Group are therefore sought on both its functionality and the ways in which the user interacts with it for both input and output. The group is asked to consider what elements of the proposed advice and guidance should be integrated into the software, or whether any of it should be published separately in printed, PDF or web page form.

The complexity of the system could be anything from a series of linked web pages through to a major bespoke package taking many months to develop. In asking for your input on the functionality, it is very easy (particularly in group situations) for the answer to every proposed feature to be "yes, please". However, the group is asked to consider carefully the cost benefit of each requested item, as an over complex system might cost too much to develop and thus never see the light of day. Each feature added must pay for itself in terms of the benefits it brings by being computerised over present manual methods.

2. Project Brief

Buchanan Computing are involved in this project to address the following tasks, in consultation with UCL colleagues and with the benefit of previous UCL research in this area:

- identify the forms in which the software might be developed and recommend the form most likely to achieve widespread use in the light of user requirements;
- identify how the software could best relate to relevant existing and foreseeable software and systems, taking appropriate account of e-GIF;
- show how the software in the recommended form would lend itself to adaptation and enhancement in the light of changing requirements;
- estimate the workload, timescale and cost of developing the software in the recommended form to yield a marketable product; and
- estimate the annual cost of subsequent maintenance and updating.

3. Development Options

It is suggested that the proposed system will fall into one of these five broad categories.

a. Static document with hyperlinks
This would contain detailed advice on pedestrian crossing type and design options, together with references to other sources. It would be presented as web pages or a downloadable PDF, with contents, index and internal and external hyperlinks.

b. Flowchart system
Locally stored or web pages implementing a chain or flowchart, where a different sequence of pages is presented depending upon user selections.

It would include Next/Back buttons on each page to review previous stages or move forward.

c. Flowchart with storage of options
As (b) but with user options recorded and retained for subsequent completion or editing, and for summarisation.

d. Full process recording and reporting
As (c) but with space for text responses of unlimited length to explain or justify each stage of the decision-making process, leading to the production of a text report (Word or PDF) on completion or at any stage of the process.

e. Custom-built fully interactive design assistant
This option is a bespoke package very closely tailored to the needs of pedestrian crossing designers. In addition to all the above facilities, it would allow the facts to be entered in any order. It would include data import and various types of calculation. In addition to a full report of the options and text entered, it would provide a list of possible pedestrian crossing types ranked by their suitability.

4. Other options

For each of the above a decision is needed as to what extent guidance on pedestrian crossing choice and design is integrated into the software, or whether it is provided on separate documents or web pages (with appropriate links provided). The latter would be significantly easier and less costly to maintain and keep up-to-date.

5. GIS/mapping links

Knowledge of the physical layout of the roads and footways at the proposed crossing site is essential to the decision process. A map could be imported as a static image, or there could be formal links to GIS or CAD to enable the map image to be zoomed an panned and to have layers of information and map labels added, removed or changed.

A formal GIS window could be added to any of the above scenarios, but would need interfacing to a suitable source of map data at each authority.

6. Data import sources

The following have been suggested as sources for automated data import

- Highway authorities' condition and asset inventory records
- Statutory undertakers' systems
- Highway authorities' own traffic flow and pedestrian movement survey records
- Other authority-based data

Please comment on the relevance and suitability of the above and add any further sources needed.

Questionnaire

Name ……..
Current professional role ……..
……
……

Steering Group participants are asked to identify and rank the aspects of the proposed software that deliver the most value. This process will be aided by identifying the parts of the current manual process that are most time-consuming and most problematic, and the extent to which software can ameliorate this.

Please rank the following options for helping with pedestrian crossing location and design in order of preference (1 most preferred – 7 least preferred):

Option	Please rank 1-7
Printed guidance and advice document	
Printed document also available as downloadable PDF (with internal links)	
(a) Static web pages with appropriate links offered to other pages.	
(b) Flowchart system (different pages presented depending upon options selected)	
(c) Flowchart system (with storage of data, so that work can be resumed or inspected at a later date)	

Option	Please rank 1-7
(d) Full process recording (with free text entry and report production)	
(e) Custom-built fully interactive design assistant	

Other guidance requested

Issue	Comments
Should detailed guidance and reference material be provided in the software or in a separate document?	
What are the sources for regular data import into the system (if any) and what formats of data are involved?	
Does the system need to link to or import from GIS or CAD? If so what systems should it cater for?	
Please list any sources that the system should be able to import data automatically from.	
General guidance and comment on the project and the other IT-related tasks listed in section 2 above.	

Many thanks for your help.

Appendix E: Examples of software categories

Examples of software categories produced for the first Steering Group meeting on 27 October 2008.

Screen shots for Pedestrian Crossing software project Steering Group
(SKM 18.9.08)

Option a. Static document with hyperlinks

If the main area of footway is the same colour as the recommended tactile surface, a band of lighter/darker coloured bricks/blocks can be used, as an edging, to provide contrast.

2.7 Facilities for Disabled Pedestrians

2.7.1 The needs of disabled pedestrians should be considered when designing the layout of crossings. If these are well provided then a better crossing will probably result for all users.

2.7.2 Dropped kerbs provide easy access for wheelchair users and people with walking difficulties. Care should be exercised, therefore, when laying the kerbs which form the crossing boundary. To ensure the safety of blind and partially sighted people at these sites it is important to provide tactile paving to the recommended layouts in Disability Unit Circular DUI/91 [SOID 2/1994](10).

2.7.3 The ramped section, leading to the crossing and the immediate approaches, should be indicated by contrasting coloured tactile surfaces. Recommendations for the design and use of tactile pavement are also detailed in Circular No. DU 1/91 [SOID 2/1994](10).

2.7.4 At signal-controlled crossings audible signals or bleepers in the form of a pulsed tone and/or tactile signals are normally used during the green figure or “invitation to cross” period. The signals are intended for the benefit of blind or partially sighted pedestrians although they can also be helpful to others.

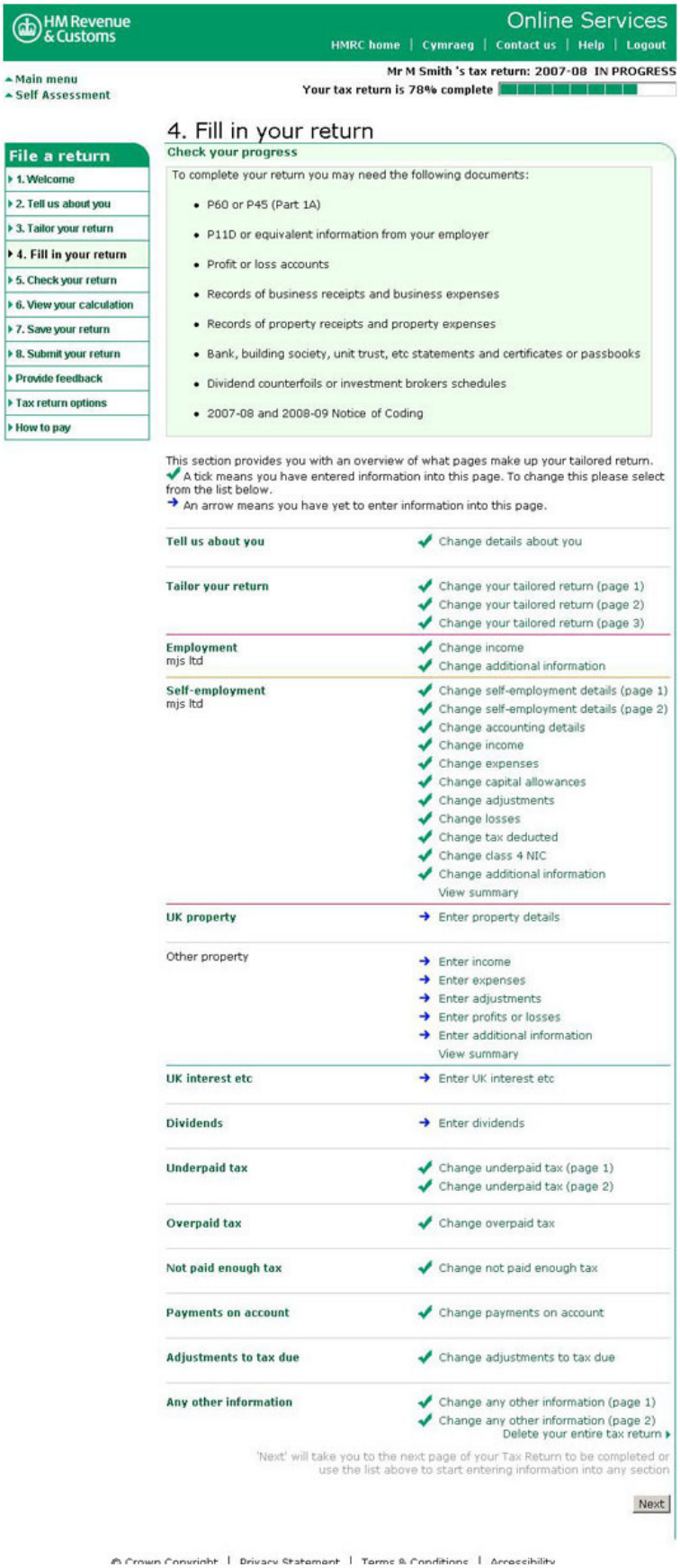
2.7.5 In residential areas objections to audible signals may be encountered. It is important that the audible unit is adjusted to suit the local conditions. There can be particular annoyance at night. A time switch may be incorporated to enable the sound to be reduced in level, or, if appropriate, switched off.

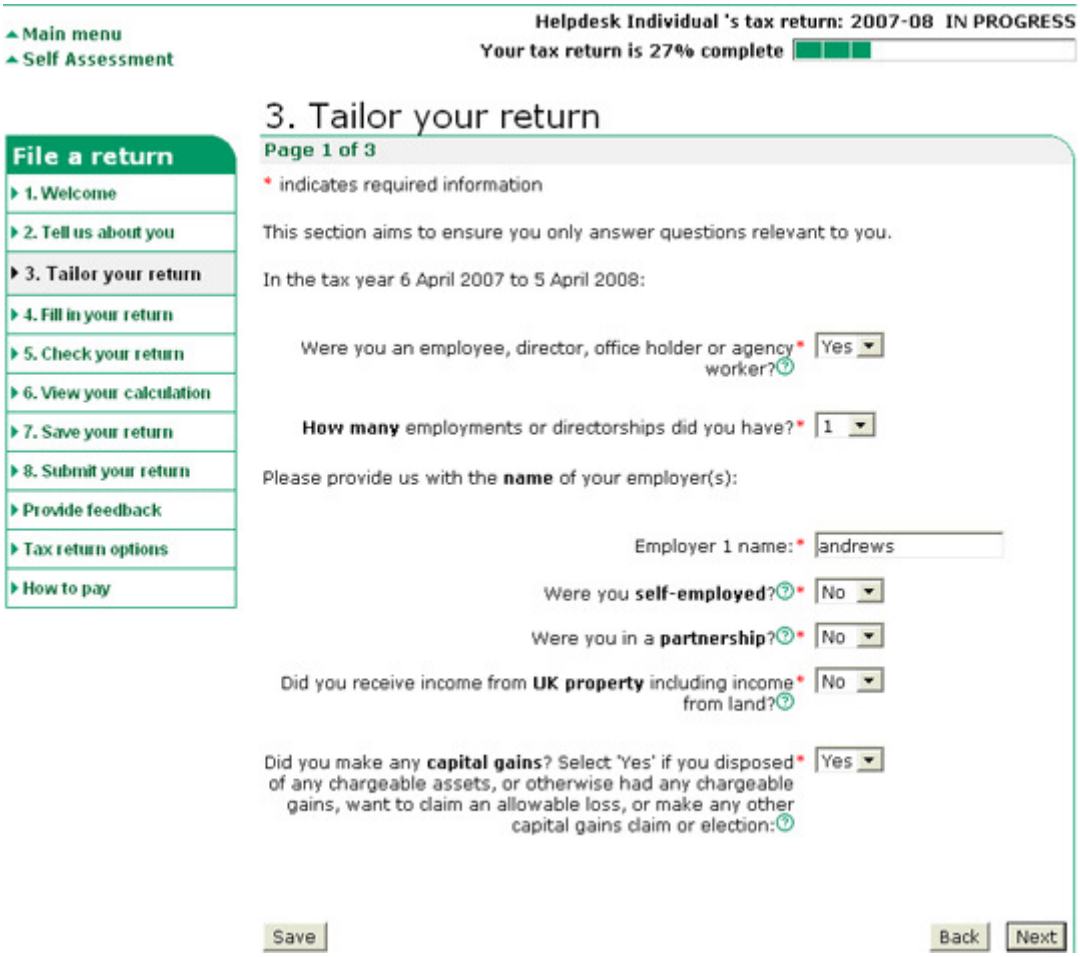
2.7.6 At adjacent sites, such as at a staggered crossing, there is a risk that the signal at one crossing may be heard and mistaken for another and so the standard audible signal must not be used. An alternative which is suitable for use at staggered crossings is the facility known as ‘bleep and sweep’. The tone produced by the unit has been specially designed to be distinctive and the audible range has been restricted. By monitoring the ambient level of traffic noise the unit adjusts the level of the audible tone to that which is loud enough to be heard only near the crossing in use.

2.7.7 If audible signals cannot be used then tactile signals should always be provided. These are small cones mounted beneath the push button box which rotate when the steady green figure is shown. Reference should be made to local mobility officers/representative groups. If there are local people with vision and hearing difficulties, tactile signals are strongly recommended. Also if audible signals are to be switched off at night, then tactile signals should be considered.

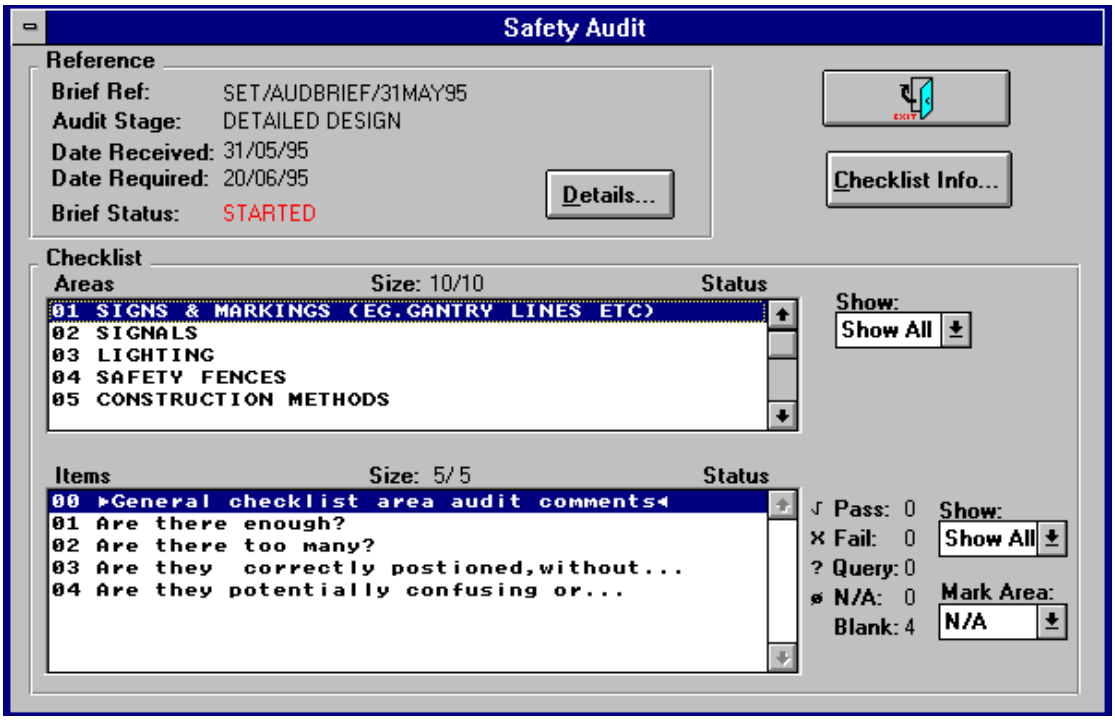
2.7.8 All the above devices, whether audible or tactile, must conform to TR 0141(5) including the requirements for lamp monitoring. Traffic Advisory Leaflet 4/91(11) gives further information.

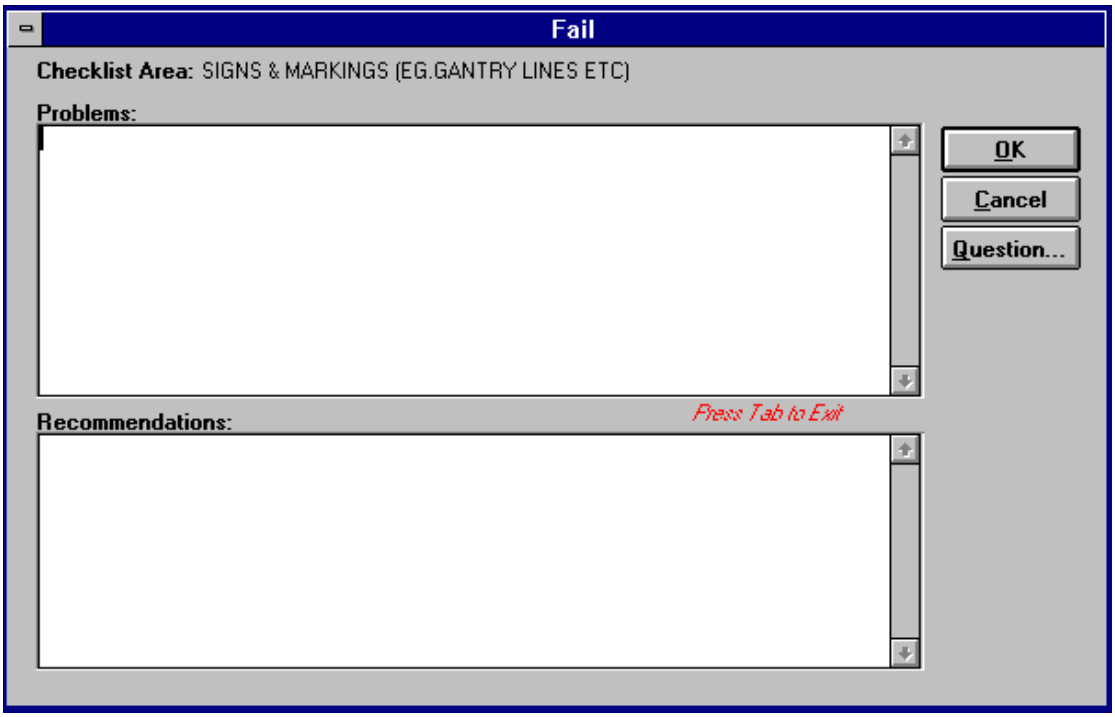
Option b/c. Flowchart system



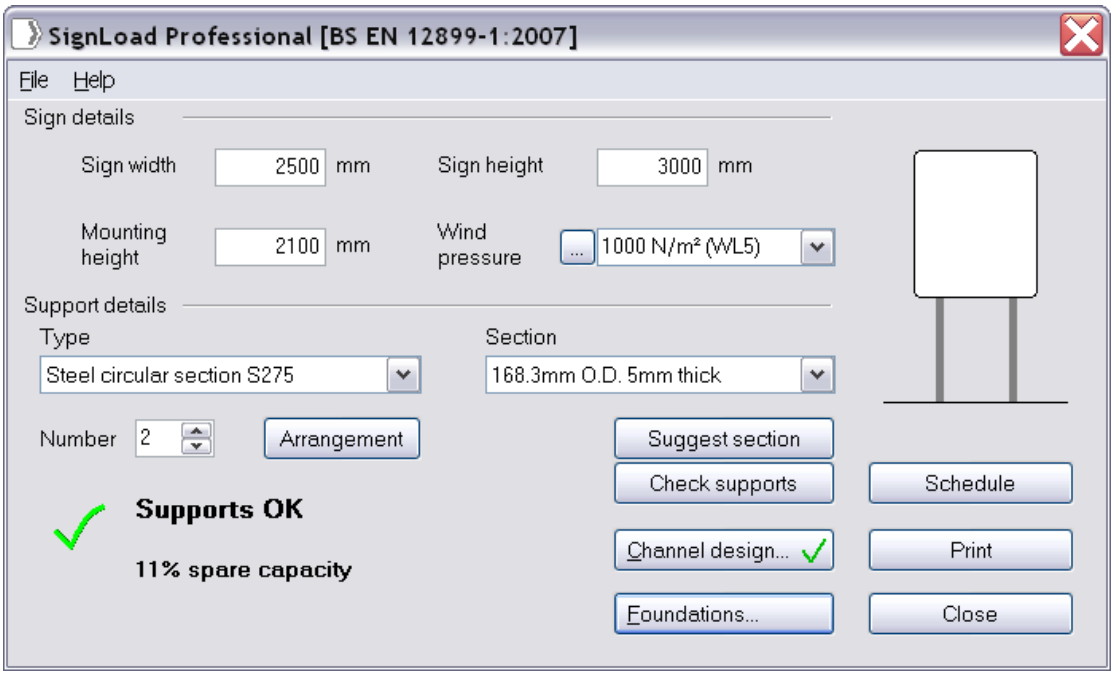

Main menu
Self Assessment
Helpdesk Individual 's tax return: 2007-08 IN PROGRESS
Your tax return is 27% complete
3. Tailor your return
File a return
1. Welcome
2. Tell us about you
3. Tailor your return
4. Fill in your return
5. Check your return
6. View your calculation
7. Save your return
8. Submit your return
Provide feedback
Tax return options
How to pay
Page 1 of 3
* indicates required information
This section aims to ensure you only answer questions relevant to you.
In the tax year 6 April 2007 to 5 April 2008:
Were you an employee, director, office holder or agency worker?
Yes
How many employments or directorships did you have?
1
Please provide us with the name of your employer(s):
Employer 1 name:
andrews
Were you self-employed?
No
Were you in a partnership?
No
Did you receive income from UK property including income from land?
No
Did you make any capital gains? Select 'Yes' if you disposed of any chargeable assets, or otherwise had any chargeable gains, want to claim an allowable loss, or make any other capital gains claim or election:
Yes
Save
Back
Next

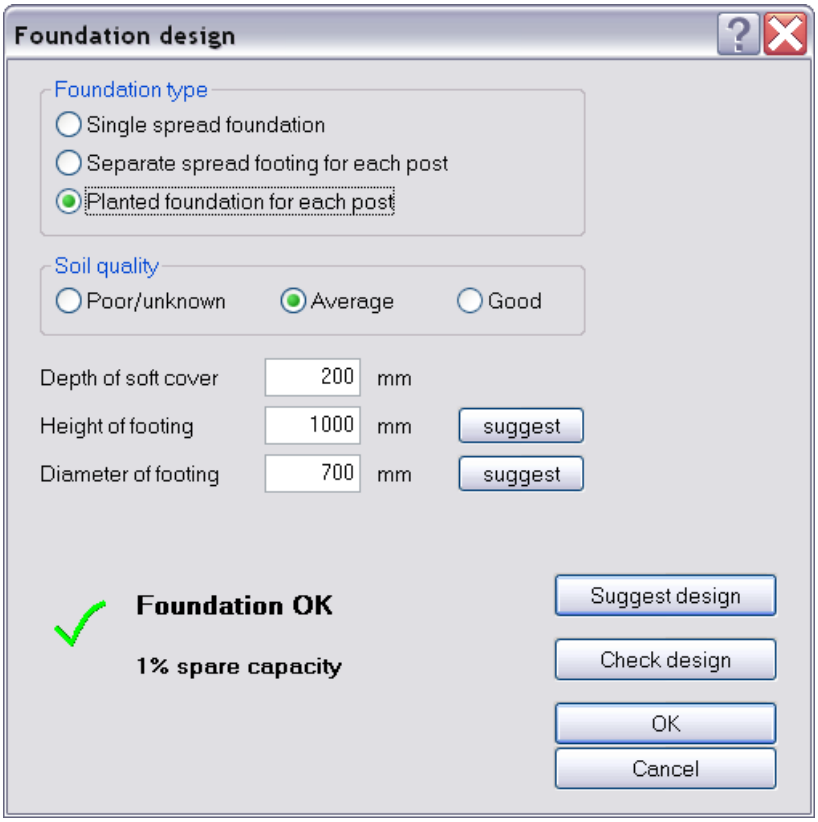
Option d. Full process recording and reporting





Option e. Fully interactive design assistant





Appendix F:
Summary of Steering Group Responses

Summary of responses from the first Steering Group meeting on
27 October 2008
produced by Dr Sandy Robertson.

Scope and purpose of the software tool: Summary of results.

Sandy Robertson

Introduction
This document summarises the responses to questions on the USAPED tool from members of the Steering Group and their colleagues and will provide a discussion point for the next meeting of the project team.

Present at the Steering Group on Monday 27 October were:-

The USAPED team
Richard Allsop (REA)
Benjamin Heydecker (BGH)
Simon Morgan (SM)
Sandy Robertson (SAR)

DfT Client:
Suku Phull SP

Invited Practitioners:
Keith Hopper (KH) , a Project Director with Mouchel based in the London Blackfriars office (for last two years), but now working primarily for TfL on the Olympic Route Network. Previously with Herts CC and then Mouchel specialising in Traffic Calming and Town Centre Enhancement projects (over period of 16 years from 1990).

KH had discussed the questionnaire with colleagues and his responses to the questionnaire were based on his discussions with them. It is understood that there was unanimous agreement about the responses from KH.

Ray Yelland (RY), Team Leader Road Safety Engineering with TfL
RY passed on the questionnaire to Julie Dye (JD), a walking and accessibility manger for TfL who responded separately from him. At the Steering Group meeting Ray expressed a view that he thought that there might be a different perspective from the walking and accessibility team and had sought DJ to provide their perspective.

All participants at the Steering Group had been provided with a copy of the questionnaires in advance of the session. It was anticipated that the during the session the ideas relating to the questionnaires would be discussed with the participants to

ensure that they had a clear understanding of the issues and questions that the team were seeking answers about.
The participants indicated during the meeting that they had a positive attitude toward the provision of facilities for pedestrians, but were also aware of the need to maintain a workable road system for all road users.

One issue that was raised at the meeting was that of the availability and use of experienced staff versus junior staff in the design process. It was clear that, particularly for challenging locations, experienced staff were required to be able to take into account the full range of users' needs, whereas junior, less experienced staff might not be able to look at the full picture. From SP's perspective it was important for the design team to be thinking about the issues associated with a design rather than slavishly following a set of fixed criteria (e.g. if pv^2 does not meet the value, then no crossing). There was a sense that in some areas over rigid adherence the fixed criteria led to poor outcomes in the design process. This was one of the reasons that more flexible guidance had been introduced to encourage broader and more detailed thinking about the implementation of schemes.

It was noted, however, that many engineers tend to like clear, measurable criteria to inform their decisions whereas in practice the installation of pedestrian facilities was sometimes less clear cut. This was especially so when there was suppressed demand for crossing.

Responses to the questionnaires
The responses to the questionnaires are shown in this section together with some commentary on the responses

Issue:- Who is the tool for?
Participants at the Steering Group discussion indicated that there were often differences in the organisational structure in different parts of the country. This made it more difficult to answer this question. For example the use by local authorities of consultants versus in-house teams changed the perspective of who might be interested in such a tool. The structures in London were also identified as being different.

Question 1: Who would benefit from the tool as proposed?
Please indicate on the attached questionnaire the extent to which the tool could benefit the types of end users listed there.

Who would benefit from the tool as proposed? Please rate 1-5 1= very relevant, 5=not relevant	KH	JD	RY
Design team (experienced)	2 / 3	2	3
Design team (new to the task)	1	1	1
Elected members and other interested parties	1	3	5
Administrative departments (including legal)	2	3	1
Other (please state) Local Authority Planners	1		

Who would benefit from the tool as proposed? Please rate 1-5 1= very relevant, 5=not relevant	KH	JD	RY
Other (please state) Client team (i.e. those funding or asking fc facilities		1	
Other (please state) Developers	1		

There was universal agreement that the tool would be useful to inexperienced members of the design team but less so for Experienced designers. There was some variation, but all neutral or positive as to the view about the usefulness for administrative departments. There was considerable variation in the perceived usefulness of the tool for elected members

There were additional groups who were identified (each by one of the respondents) as being potential beneficiaries. These were:

- Local Authority Planners
- Client team (i.e. those funding or asking for facilities
- Developers

Comments from the respondents:
KH: The major current problems are lack of experience of the designers and information being wide spread or difficult to obtain. The reasons for providing crossings will vary considerably and in most cases they will be provided on an area basis rather than a single isolated crossing. The design process is then rather different eg creation of 20 mph zones, home zones, enhanced areas, using "pedestrian priority" ratings.

Issue:- What data should the tool incorporate and present?
Some specific examples of the types of data were given to respondents in the questionnaire

Question 2: What information should be provided by the tool?
Please indicate on the attached questionnaire which information should be accessible through the tool. See the extract from the USAPED report at the end of this document for examples of each category of information. Please also indicate if we have missed anything.

What information should be accessible through tool?
Respondents were directed to the extract from the USAPED report at the end of the questionnaire

Please rate 1-5 1= very relevant 5=not relevant	KH	JD	RY
Location of proposed site	1	1	1
Traffic characteristics at proposed site	1	2	1
Geometry at proposed site	1	2	1
Road features at proposed site	1	1	1
Utilities at proposed site	4	2	1
Road features and landscaping at	1	2	1

What information should be accessible through tool?
Respondents were directed to the extract from the USAPED report at the end of the questionnaire

Please rate 1-5 1= very relevant 5=not relevant proposed site	KH	JD	RY
Lighting at proposed site	1	3	1
Parking at proposed site	1	3	1
Land use at proposed site	1	3	1
Types of likely users (e.g. special needs) at proposed site	1	1	1
Attitudes and behaviour of users. (e.g. aggressivity)	5	1	
Interests and representations	5	2	
Other (please state) Bus stops – location of stop could change due to crossing position	1		
Other (please state) cycling issues – interaction on footway, would they use ped crossing?	1		
Other (please state) drainage issues – suitable for peds?	1		
Other (please state) accident history			1
Other (please state) pedestrian demand, (desire lines)			1

KH also indicated that the designer would need to take into account all of the factors identified in the question but noted "The answers to the above are not intended to show a need for full mapping within the tool, only to show that the issues are important. It is likely that the tool would only note the importance."

KH noted at the second steering group meeting that while he had indicated that some items were less relevant, this was in the context of practicability rather than importance. He also indicated that all the items that had been identified were important. Other members of the steering group also indicated that their answers were based upon what they felt would be practicable within the next decade,

Issue: What is the anticipated lifetime of the tool?
Respondents were asked "Should the tool be designed in such a way that it would become a standard for, say a 20 year period, or the duration of current policy? Such a consideration will affect the design of the tool in terms of ease of updating and of the platform (operating system) upon which/with which it will work. For example how will the tool link into/match existing and changing policy? ".

Question 3: What is the anticipated lifetime of the tool?

There was an interesting variety of responses to this question:

- JD: I think a 10 year period would be better as a starting point as a 20 year period would be too long and there are likely to be changes to policy over that time affecting the tool and requiring updates
- RY: Any tool of this nature would have to undergo constant updating and would be subject to changes in specification.
- KH: Say 3 years. Traffic signs are being revised by DfT and will have big effect. It would be a shame if the tool was superseded as soon as it was released, as signing is such an important issue. Later on, assess the success of a low key document and tool to decide on future route, timing and need for a more complex design tool. Publish as a one off and then assess above and decide on the way forward.

In all cases the need for any advisory tool to be able to respond to changes in guidance/policy/knowledge seemed to be at the heart of the answers. Given the timescale of existing guidance documents (e.g. LTN 1/95) the respondents seemed to be anticipating more frequent changes in the coming years though this may reflect their knowledge of some major changes in the near future.

Issue:- What functions should the tool perform?
One of the issues that being considered is what the tool should do and what pre-existing information it will allow users to access.

Question 4: What functional features would it be useful to incorporate into the tool?
Respondents were given a fairly detailed description of what they were being asked:- "Please indicate on the attached questionnaire what functions the tool should be able to perform. See the extract from the USAPED report at the end of this document for examples of each category of information that might be relevant. Please also indicate if we have missed anything or if you have specific thoughts on features that would be helpful."

What would be useful functions to incorporate into the tool?

1= very relevant, 5=not relevant	KH	JD	RY
Access to current guidance/regulations	1	1	1
Access to case studies	1	2	1
Decision aid (gives recommendations about crossing type based on input)	1	2	2
Log of decisions leading to the selection of an outcome	2	3	1
Access to information about area (e.g. maps of area)	4	1	2
Undertaking of routine calculations. (refer to tables if necessary)	5	5	2

What would be useful functions to incorporate into the tool?

1= very relevant, 5=not relevant If so , which calculations would be useful	KH	JD	RY **
Access point for data about proposed location	2	3	
Access to general/national data that may be relevant for the proposed location	1	3	

** Calculations suggested were: Accident savings, compared to expected rates, cost benefit and FYRR.

Interestingly two of the respondents indicated that calculations were less relevant. This was surprising given the view from IT specialists that it was calculations that often made a package efficient and effective. Having said that, the respondent who did indicate that calculations would be helpful had also discussed this with colleagues. The nature of the calculation was also quite complex and would require some non-trivial data to support such a calculation.

Issue: The tool in the context of other IT systems.
It was anticipated that the tool should link to existing data sources where possible, for example existing highway maps, utilities information etc. Some of the issues are covered in the companion questionnaire. Information comes in many forms, whether it be data such as traffic flows or a document detailing guidance.

To what extent do current or planned government IT initiatives affect how the system may integrate with other IT systems in the short/medium/long term? for example are there any planned protocols for data exchange between government systems.

Question 5: what information sources would be of most use for the tool to have direct links to.

The participants' answers are shown below.

KH:
DfT website especially LTN series.
Statutory docs
Home Zone Design Guidelines
Traffic Calming Techniques doc – by IHT and CSS but not yet available as PDF but perhaps could be.

JD:
I presume this is different to any of the data or details as listed above, so other information which might be relevant would be comparisons from elsewhere, related research, news articles, etc (as everything else of interest in included as above in Q4)

RY:
LTN 1/95 and 2/95
Traffic Signs Manual
TSRGD
TAL4/05

It is clear that those from the engineering roles, valued a single point of access to the statutory and guidance documentation. The other participant had indicated that information giving a wider perspective would be useful.

The picture that is emerging is that the participants would value a 'one stop shop' for the information they need. This also reflects the feelings expressed in the seminar/workshop given toward the end of the first USAPED project. There appears to be a need for the tool to help manage the external information needed by the design team.

Question 6
Should the tool cover the choice between formal crossings and informal crossing place as well as the design of the latter or should it be concerned only with the design of informal crossing places?

This question was added following the discussions at the Steering Group meeting. It was based on the premise that for a complex tool there would be relatively little additional work to make the tool cover more than one type of crossing.

KH
Information about all types of crossing is important as well as comment on the reasons for choosing the different types. Information and guidance on the differences, the benefits and disbenefits of each to assist in making a choice. Comment on the "mixability" of different types. Real detail though only on the informal crossings, including all the different speed types.

JD
No comment made

RY
The tool should cover the provision and design of both informal and formal crossing places.

From the responses it was clear that the participants felt that the inclusion of both formal and informal crossings would be useful in the tool though with a particular focus on the informal crossing (those without a statutory basis). This reflected the discussion at the Steering Group meeting. In that discussion it was noted that guidance for informal crossings was generally conspicuous by its absence so development of the tool would run in parallel to the development of the guidance. SP in particular was looking to get guidance for informal crossing places to be developed. To some extent the views expressed in the earlier USAPED workshop/seminars were also reflected in the discussion.

Questionnaire on the IT issues relating to the software tool.

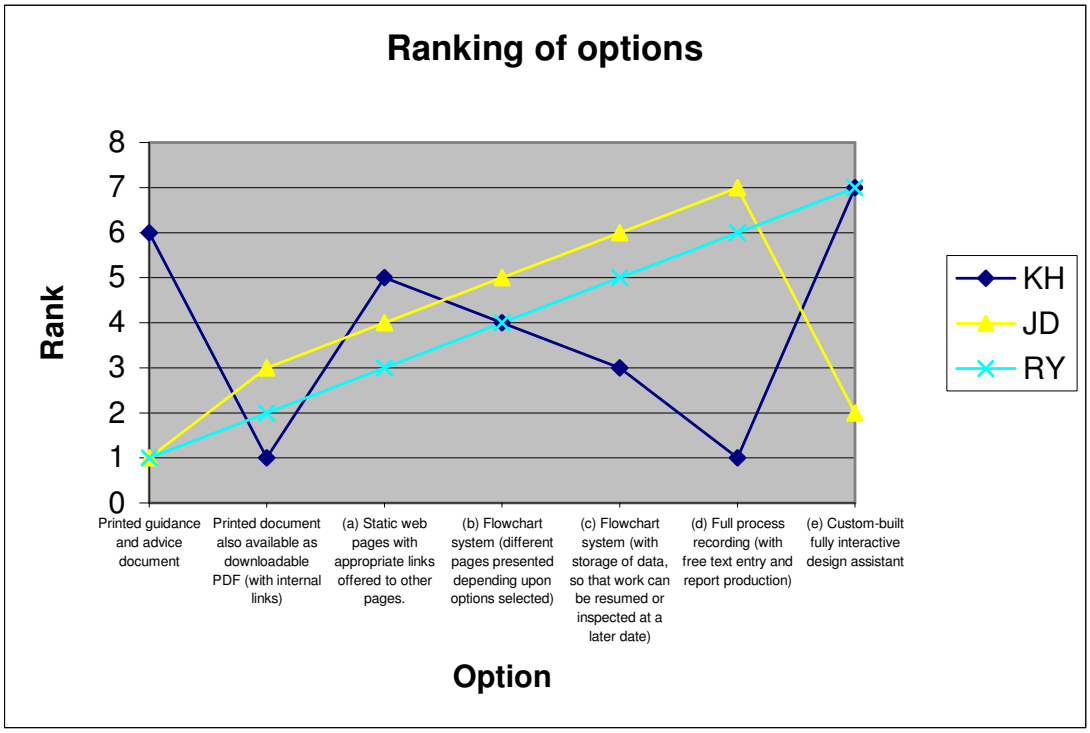
The questionnaire from SM related to the form that the tool might take. A range of options were described from a purely paper based approach to a custom design assistant. Respondents were asked to rank the options.

Responses to the second questionnaire on the IT aspects of the tool.

Please rank the following options for helping with pedestrian crossing location and design in order of preference (1 most preferred – 7 least preferred):

Option Please rank 1-7	KH	JD	RY
Printed guidance and advice document	6	1	1
Printed document also available as downloadable PDF (with internal links)	1	3	2
(a) Static web pages with appropriate links offered to other pages.	5	4	3
(b) Flowchart system (different pages presented depending upon options selected)	4	5	4
(c) Flowchart system (with storage of data, so that work can be resumed or inspected at a later date)	3	6	5
(d) Full process recording (with free text entry and report production)	1	7	6
(e) Custom-built fully interactive design assistant	7	2	7

Overall preferences seem to lean toward paper based option or one of the more complex solutions. The overall preferred solution appears to be “Printed document also available as downloadable PDF (with internal links)”. The low end IT solutions were consistently not favoured, but the top end IT solutions and paper only solutions elicited very polarised responses. This can be seen on the plot shown below.



Plot showing ranking of different options.

Additional comments were requested from the participants on the content and links for the software tool.

Issue	KH	JD	RY
Should detailed guidance and reference material be provided in the software or in a separate document?	Both	In the software	In a separate document so that it can be referred to at leisure
What are the sources for regular data import into the system (if any) and what formats of data are involved?	Data not required, but links to design guidance etc		DfT
Does the system need to link to or import from GIS or CAD? If so what other systems should it cater for?	No		No