COCHRANE IMS
Information Management System

IMS budget request 2009-2012

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- on behalf of the IMS Team
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Executive summary

The Collaboration is asked to increase its contribution to IMS development to cover 6.5 Full Time Equivalent (FTE) staff to the IMS Development team based as the Nordic Cochrane Centre. The Nordic Cochrane Centre will contribute 1.5 FTE staff in addition to this, and will cover the infrastructure costs for hosting the full IMS Development team at the Centre.

The IMS contributes directly to the core business objectives of The Cochrane Collaboration, and gives the Collaboration a unique advantage over other publishers. With adequate investment, it will continue to increase the Collaboration's market value.

If the Collaboration does not identify additional funds for development of the IMS, the Collaboration will not only lose the direct internal benefit of those developments, but will also lose some of its current competitive advantages, and incur a substantial risk of failures in the IMS, in the work of Cochrane entities and in the publication of its output.

As requested by the Steering Group, this proposal provides more detail and rationale for what can be achieved with increased funding. The projects contained in the proposal will provide advances in three main areas:

- Performance, stability and sustainability – by improving the core system and consolidating knowledge retention.
- Information utilisation - by adding and expanding functionality for information storage, handling and sharing.
- User efficiency and satisfaction – by improving flexibility and ease of use.

The projects listed in the proposal are far from an exhaustive list of all possible IMS developments, as some of these projects would naturally lead to further developments, while for other projects, such as the proposed new study register, we cannot estimate the required resources until the requirements are agreed on.

Purpose of the paper

To present budget models for the future operation, maintenance, development and support of The Cochrane Collaboration's Information Management System (IMS), and to present a number of development projects that would be pursued if sufficient funding is available.

Urgency

High.

Background

The IMS provides the electronic infrastructure for preparing and maintaining Cochrane reviews and submitting them for publication in *The Cochrane Library.* The IMS consists of two core elements: Review Manager (RevMan) and Archie.

The IMS team, comprising the IMS Development team and the IMS Support team, is responsible for the development, operation, maintenance and support of the IMS (see Appendix A). The IMS is co-funded by the Collaboration and the Nordic Cochrane Centre, where the IMS Development team is based.

Monica Kjeldstrøm, IMS Director, presented a budget proposal to the Steering Group in April 2008, which requested a substantial increase in the contribution from The Cochrane Collaboration. It has been prepared jointly with Mike Clarke who was the convenor of the Information Management System Group (IMSG) at that time,

IMS facts On 19 March 2009

Archie users account:	4339
Persons:	23,879
Active Authors:	13,351
Individual Reviews:	8757
Workflows:	395
Document versions:	143,787
Comprised of:	
Review versions:	122,384
Module versions:	8365
Website versions:	8171
Other file versions:	4867
RevMan 5 copies installed[1]:	23,824

[1] Counting all individual full installations that have checked for updates

but it had not been pre-approved by the IMSG since it covered the costs of implementing the proposals and systems that had already been agreed by the Group. The proposal suggested an increase in the IMS Development team in Copenhagen to a total of 6.5 FTE funded by The Cochrane Collaboration, supported by an additional 1.5 FTE funded by the Nordic Cochrane Centre. The increased funding is needed for the continued operation, maintenance and support of the IMS, and would provide the platform for future development of existing as well as new products. The proposal also argued that the expansion of the IMS team would reduce the risks to the Collaboration of continuing with a smaller team. Although much of the information in the April 2008 report remains valid, we have not repeated it all here, so Steering Group members might find it useful to remind themselves of the content of that report (http://www.cochrane.org/ccsg/IMSbudgetApril2008toMarch2012.doc).

In concluding her presentation to the Steering Group in April 2008, Monica said that the IMS team would welcome an independent evaluation of the IMS to help the Steering Group assess the whether the IMS provides good value for money before making any firm decisions.

The Steering Group felt that they did not possess sufficient technical knowledge to assess whether the budget request was reasonable, and following their meeting in April 2008, they commissioned a consultant to evaluate the IMS. The consultant agreed that the costs were appropriate for the work envisioned and his report was discussed by the Steering Group at their meeting in October 2008 and by the Information Management System Group (IMSG) in November 2008. Following these meetings, the IMS team was asked to provide a revised budget request, providing more detail and rationale for what can be achieved with increased funding. The IMSG responded to each of the nine recommendations in the consultant's report, and although acceptance of their response by the Steering Group is still pending, the IMS team has pursued its work based on the recommendations from the IMSG.

Detailed minutes from relevant discussions at Steering Group meetings in April and October 2008 and the IMSG in November 2009 are available in Appendix B of this report.

Access

Open access.

Future IMS development

During the last year, since the Steering Group was first presented with the increased IMS budget, the IMS team have several times been asked "why is it necessary to invest more money into expanding the IMS team and supporting further development of the system, when it works well now?". There are several reasons. Firstly, the increased use of Archie demands more from the performance of the system. We need to be pro-active in maintaining and providing a stable and high-performance system that can cope with both current and future needs, to ensure that lack of performance does not have a negative impact on productivity and user experience. Secondly, it is important to invest in improvement of existing functionality. Again, there are both increased efficiency and individual user satisfaction to be gained. Thirdly, we have a solid foundation for developing new services and products that can help to further accomplish the mission and goals of the Collaboration. Finally, we have to ensure that the Collaboration receives good value for money for its investment and we believe that the increased funding is necessary to achieve this.

Pay more to get more

Value for money is a key principle of the Steering Group for all centrally funded items. Quoting from a report by the CEO, value for money is linked to:

a. Economy. Doing less with fewer resources, i.e. making savings.
b. Efficiency. Doing the same as before, but with fewer resources (money, staff, space).
c. Effectiveness. Doing more that before with the same resources as now (or less)

It is widely accepted that the development of the IMS has always been efficient and effective and part of the reason for the large increase in the request for resources is to correct the imbalance between the funding available and the work done and, thereby, reduce the risk of the disintegration of the IMS team. In addition to the above three Es, there

is a fourth item of relevance to value for money which shows that making savings is not always the best way to obtain good value for money:

d. Expansion: Doing substantially more than before with more resources.

Among the recommendations arising out of the Strategic Review of The Cochrane Collaboration, four of the dialogues highlight the need for a stronger focus on product development. This could cover improving existing products and packaging them in different ways, as well as exploring development of new products, possibly in partnership with others.

The IMS projects covered in this report (see below) range from consolidating the foundation of the IMS to venturing into exciting new developments that will make The Cochrane Collaboration a strong strategic partner for others and contribute to making evidence based health care more accessible.

Several of the projects that have been described in detail raise the possibility of generating additional income for the Collaboration, either directly (e.g. by charging 'customers' for certain services and products) or indirectly (e.g. by making national licences more attractive). These projects do not discuss strategies for managing sales and delivery of services, since that is something that will have to be discussed in detail with both the Steering Group and Wiley-Blackwell.

Dealing with additional development work and future - but currently unknown - projects

The projects presented in this report do not cover resources for all development work anticipated in the near to mid-term future. Some of the projects are pilot projects that may result in recommendations for further developments. For other projects, we have insufficient details about the requirements to be able to estimate the required resources (e.g. integration with the proposed new Cochrane Register of Controlled Studies).

There are also a number of existing, relatively large wish list items for the IMS that are not presented as projects, such as support for merging and splitting reviews, or tidying up the many versions of reviews that exist in Archie. However, 1 FTE developer in the IMS Development team is assigned permanently to maintenance, bug fixing and correcting of data errors, and is also expected to deal with individual wish list items that are prioritised as important by the Collaboration.

In the long term, there are projects such as the development of RevMan 6, that are too distant to include in the budgets now (there was nine years between the release of RevMan 4 and 5), but will present itself at some point in response to expected advances in review methodology and other requirements. In planning for that future, the Steering Group should look at where it wants the Collaboration to be in five years' time, and the role of the IMS within that vision.

In the future, when a new project is proposed or when additional information about projects in the pipeline is available, the IMS team will need to estimate the resources required for the implementation. The Collaboration will then need to prioritise the project in relation to other work by the IMS team and the competition for resources from other areas of the work of the Collaboration. This might be done by identifying, obtaining and allocating additional funds, or by shifting resources from an existing project to a new one (with, of course, disruption to the former).

Summary of IMS projects and their associated costs

In November 2008, the IMS team identified a list of projects that future IMS funding could cover and we asked the IMSG to consider this list. They prioritised some of the projects over others, which is reflected in the order by which the projects have been listed below. The IMSG reviewed all the project descriptions in this report in a teleconference on 23 March 2009 and endorsed the full list as an appropriate direction for the Collaboration to go, and stressed the importance of attaching costs to individual projects.

How much does an individual project cost?

Each project description contains a section on resource implications. We have tried to estimate the time required by members of the IMS team to implement the work. A project typically includes specification, development, testing and documentation phases. Each phase may be done by a different IMS team member. However, as it is primarily the developer resources we are concerned about in the context of this report, we have only listed the developer resources in the summary table below. We estimate costs of approximately 50,000 DKK per 1 Full Time Equivalent (FTE) Developer month. Note that this figure excludes infrastructure cost, which the Nordic Cochrane Centre is willing to continue to pay.

We had limited time to investigate each individual project (to minimise the delays to ongoing work on the IMS), so the resource estimates we provide are for guidance only. Furthermore, the estimates are based on the assumption that we will continue to use an agile software development method where we use prototyping to obtain user feedback, and use this feedback to refine further development. This is in contrast to the waterfall method, which requires development of comprehensive specifications and analysis documents for formal sign-off before moving on to the implementation phases. If the latter model was pursued, we estimate the necessary resources should be increased by at least 50%. In the estimates and associated costs we also assume that the developer assigned to a project will be employed in a longer-term position. If we need to employ developers on shorter term contracts or on a project-by-project basis, the estimates for FTE developer months would have to be increased because of the higher costs of short term staff and the need to spend time familiarising them with the IMS. In the tables below, we have calculated and presented the budgets in Danish Kroner (DKK) which is the currency in which we incur costs. However, we have also used Euros and GP pounds. Given the current instability in the currency markets, the more robust currency to consider is the Euro (which the Danish Kroner seeks to shadow: for example, the average monthly exchange rate from January 2007 to March 2009 remained within the range 7.43-7.46 DKK to the Euro). Exchange rates against the GB Pound are much more unstable and unpredictable.

Projects prioritised by the IMSG

Project name	***Deliverable***	***Dev. FTE weeks***	***Approximate costs***	
Project 1 - Improve Archie performance/review and improve technical platform	See sub-projects below.	24	DKK EUR GBP	287,500 37,375 34,500
• Project 1.a - Update server hardware	Improved performance of Archie. Faster and more reliable system.	2	DKK EUR GBP	25,000 3,250 3,000
• Project 1.b - Update database server software	Improved performance. XML indexing of reviews will provide a framework for detailed searching and data extraction. Improved backup functionality	2	DKK EUR GBP	25,000 3,250 3,000
• Project 1.c - Update application server software	Strong platform on which future development of Archie can take place. Possible improvement of performance.	5	DKK EUR GBP	62,500 8,125 7,500
• Project 1.d - Review and update Archie programming framework	Identification of new technology that will improve Archie performance and extend the life span of the code.	15	DKK EUR GBP	175,000 22,750 21,000
Project 2 - Workflow and tracking system	Fully integrated workflow system that allows CRGs to track their progress, and would facilitate standardisation of processes across CRGs.	12	DKK EUR GBP	150,000 19,500 18,000
Project 3 - Technical documentation	Technical guides for Archie and RevMan that will make it easier for new developers to assume responsibility for maintenance and	40	DKK EUR GBP	450,000 58,500 54,000

	development.			
Project 4 - Replacement for the parent database	Replacement of the parent database with an integrated Archie module, which will make it possible to find and extract data for research, statistical and monitoring purposes. Potential for generating income for the Collaboration.	26	DKK EUR GBP	300,000 39,000 36,000
Project 5 - Improve searching functionality	Improved search efficiency and access to information that is currently only accessible to system administrators. Reduced need for special reports.	13	DKK EUR GBP	150,000 19,500 18,000
Project 6 - RevMan 5.1	Improved features that will impact on user experience and Cochrane reviews.	18	DKK EUR GBP	200,000 26,000 24,000

Projects not yet prioritised

Project name	***Deliverable***	***Dev. FTE weeks***	***Approximate costs***	
Project A - Review monitoring system	More efficient and timely dissemination of Cochrane reviews. A service that no other publisher of systematic reviews is providing, thus helping to maintain and increase the Collaboration's market value. The service will help the Collaboration to establish strategic partnerships with parties who are already utilising Cochrane Reviews in other products.	12	DKK EUR GBP	150,000 19,500 18,000
Project B - Online editor	Improved online text editor for the modules that describe the work of the Cochrane entities, which could also be used by authors for editing the main text of reviews.	12	DKK EUR GBP	 150,000 19,500 18,000
Project C - Cross referencing between reviews	Optimal cross-referencing between reviews, which will increase usability of The Cochrane Library, accessibility to Cochrane reviews and the impact factor.	9	DKK EUR GBP	100,000 13,000 12,000
Project D - Evaluation of Archie Interface	Plan for prioritising future development with respect to usability and accessibility.	4	DKK EUR GBP	50,000 6,500 6,000
Total developer resources for projects that have a resource estimate		**170**	DKK EUR GBP	1,987,500 258,375 238,500

Projects that are not yet described in detail, prioritised or assigned an resource estimate

Project name	***Introduction/background***
Integration of Cochrane Register of Controlled Studies (CRS)	The extent to which the proposed new CRS should be integrated with the IMS is currently unclear. We expect that some integration may be called for, in order to access the resources maintained in the IMS, including person records, topics lists, review history, review records (access to, extract from, and insert studies into reviews), workflows and entity records.
Frequency of publication	There is a strong desire in the Collaboration to move to more frequent (or "as ready") publication. It has had already been decided that this should be a high-priority project after the roll out of RevMan 5 was rolled out. However, before speculating about what changes will be required in Archie to support more frequent publication, it is first necessary with a clear plan be developed to define the intentions for more frequent publication. Some issues that need to be addressed are:

	a) impact on the number of issues per year of The Cochrane Library; b) changes to the concept of an issue to, for example, something that only contain new and modified reviews; and c) will "when ready" accessibility be achieved through formal publication or an early view. Deborah Pentesco-Gilbert will propose a plan for moving forward with these issues in Wiley-Blackwell's report to the Steering Group.
Evaluation of Manuscript Central	It has been proposed that Manuscript Central might be suitable for supporting parts of the editorial process of CRGs (e.g. for the peer review process). Initial contact has been established with ScholarOne and subsequently with Wiley-Blackwell to organise an evaluation in the following areas: • General functionality and reporting functionality • Support for Cochrane workflows, in particular the refereeing workflow, and how these can be modified • Possibility for Archie interfacing with Manuscript Central (e.g. delivering reviews and meta data, such as people and roles who should have access, and returning reviews to Archie) • Availability (e.g. downtime) • Training and support • Access for resource or internet poor countries • Costs of use and access to services
Supporting translations	Early, embargoed access to new and updated Cochrane reviews or parts thereof (e.g. abstracts), which will help to provide more timely translations. The IMS team was contacted by the people in Taiwan who are responsible for translating abstracts into Chinese about possibilities for getting access to abstracts as soon as they have been marked for publication. The IberoAmerican Cochrane Centre has also enquired about this possibility in the past, for full reviews.
Supporting podcasts	Before Issue 2 2009 of The Cochrane Library, there are approximately 50 podcasts available for Cochrane reviews. These are managed outside of the IMS, but as the number increases, the IMS could be used to minimise the risk of having a podcast published that does not reflect the latest version of a Cochrane review. The existence of a podcast could be included on the review properties sheet in Archie, which will help to ensure that the podcast editor is notified automatically when the review is updated in a way that should result in the removal or replacement of its existing podcast. The Collaboration may also want to investigate other ways in which Archie can support and manage the production and accessibility of podcasts.

Individual project descriptions

It has been a time consuming but interesting process to write the project descriptions. We have tried to strike a balance between describing the projects in enough detail for members of the Steering Group and others to make informed decisions, without spending too much time going into detail which would have been wasted if the project is not funded. On average, each project description has required approximately 2 days of work covering preliminary investigations, discussions with relevant parties, writing up and editing.

About reading the project descriptions

We have followed the same structure for each project description, but they have been written by several members of the IMS Team, leading to some variation in style and detail. The descriptions can be read independently of each other.

Project 1 - Improve Archie performance, review and improve the technical platform

This project consists of four sub-projects: 1.a Update server hardware, 1.b Update database server software, 1.c Update application server software, and 1.d Review and update Archie programming framework.

1.a Update server hardware

1.a.1 Background

The typical life span for server hardware is between three and five years. Archie has been running on two servers since 2004 and these are becoming outdated. The system sometimes becomes slow or unresponsive - especially around the peak load periods before submission deadlines. Even if we move to a 'publish when ready' model for individual Cochrane reviews, we expect that these surges of activity will continue when the four full issues per year are being compiled. In the current configuration, one server hosts the Archie application itself, while the other hosts the database.

1.a.2 Proposal and discussion

The Archie servers need to be replaced with state of the art hardware. This will improve the general response time, and will reduce the risk of out-of-memory errors bringing Archie to a halt during critical periods. It is difficult to predict the performance gain because this depends on the choice of hardware, but a speed improvement factor of 1.5 to 2.5 is realistic (2 would mean a doubling in the speed).

This project will begin with a period of monitoring of the current hardware configuration. This will locate the bottlenecks (e.g. processing power or memory) and will support a well-informed choice of the hardware that will deliver the best value for money. This will include the key decision as to whether Archie should run on one or two separate servers. The final steps would be to prepare and install the new server(s).

1.a.3 Summary of recommendations

The outdated Archie servers should be replaced by state of the art hardware, to substantially improve performance. This hardware should be chosen following an assessment of needs, which will allow the decision to be made on the basis of the best value for money.

1.a.4 Resource implications

We expect that the new hardware will cost around 10,000 Euro in total. Approximately 2 FTE weeks for the system administrator and 2 FTE weeks for the developer time will be needed to investigate and implement the upgrade.

1.a.5 Impact statement

All users of Archie will benefit from improved performance. A faster and more reliable system will increase productivity and satisfaction with Archie. Reduced down time around the submission deadline will indirectly help to improve the end product by ensuring that each build of The Cochrane Library includes the maximum amount of new and updated material. Furthermore, the upgrade will substantially reduce the risk of a major hardware failure.

Failing to update the hardware will gradually reduce Archie's performance as the number of users and the amount of data increases. This may lead to serious stability problems. If one of the servers should fail altogether, it may take weeks to replace, during which time Archie will have to run on one of the spare servers (e.g. the test server) with limited capacity and performance.

1.b Update database server software

1.b.1 Background

All data in Archie (including the reviews) are stored in a Microsoft SQL Server database. We currently use a year 2000 version of this software in Archie. There have been two major updates since then, in 2005 and 2008. Microsoft ended mainstream support for the 2000 version in April 2008, meaning that no more bug fixes or security updates will be released.

1.b.2 Proposal and discussion

The database used by Archie should be upgraded to Microsoft SQL Server 2008. This version has mainstream support available until at least 2014, includes new features and is better equipped to exploit modern hardware to improve performance. One particular improvement, which will allow us to put in place the replacement for the parent

database (see Project 4), is XML indexing. This dramatically decreases the time it takes to search inside structured documents, such as Cochrane reviews. Another feature is improved backup functionality. This might permit the automation of this time-consuming procedure, which is currently done manually by the system administrator.

1.b.3 Summary of recommendations

Archie's database should be brought up to date by replacing Microsoft SQL Server 2000 with the 2008 version.

1.b.4 Resource implications

The cost of the software license is ? (pending quote). Approximately 2 FTE weeks of the system administrator and 2 FTE weeks of developer time are needed to investigate and implement the update.

1.b.5 Impact statement

All users of Archie will benefit from the improved performance. Improved backup functionality will reduce the cost of running Archie. Keeping the database up to date is a safeguard against future problems that could arise with incompatible software or hardware.

Failure to update the database will mean that the project to replace the parent database (Project 4) cannot be carried out in the presently conceived form, and will require more resources. Updating software is part of the lifecycle of any system, it needs to be done periodically and delays increase the risk that the system will stop working.

1.c Update application server software

1.c.1 Background

The Archie application runs on top of another piece of software known as an application server. The specific application server used for Archie is JBoss. This is widely recognised as the best open source application server and by being open source it is free of charge. We use version 4.2.2 for Archie, from October 2007. Version 5 was released in December 2008 after several years of development and testing.

1.c.2 Proposal and discussion

The JBoss application server, on which Archie is running, should be upgraded to the new version (5.0.0 or later). We would do this within a test environment initially, to resolve any incompatibility problems associated with running Archie on the new version. After this testing and an assessment that the new version is running smoothly, we will update the application server for Archie itself.

This project does not include any modifications to Archie except what is required to make it run on the new application server. Investigating and taking advantage of the many new feature and technologies in JBoss 5 will be part of Project 1.d and other future projects. We strongly recommend therefore that this project should be done before 1.d and, in fact, it might not be possible to embark on 1.d without the completion of 1.c

1.c.3 Summary of recommendations

The application server should be updated to the latest version, in order to create a strong platform for future development of Archie.

1.c.4 Resource implications

The application server software is free. The setting up of the test environment for the new version will take about 1 FTE week, and between 1 and 4 FTE weeks of developer time will be needed to modify Archie to run on the new version.

1.c.5 Impact statement

This upgrade is an investment for the future. There will probably not be any measurable effects immediately for end users but performance may be improved. We cannot confirm this until the upgrade has been tested.

It is always easiest to update software incrementally, taking advantage of each major new version when it is ready. If we do not take this incremental step now, upgrading may be much more difficult in the future and future support or bug fixes for JBoss will only be available for the new version.

1.d Review and update Archie programming framework

1.d.1 Background

The framework on which Archie is based was state of the art five years ago, but several relevant technologies have been developed since then. The main problem with the old technology is that it is 'heavyweight' and is under-performing when many objects are involved (e.g. for the production of reports). Another consideration is that developers believe the technology is difficult to use, which may impact on our ability to attract staff to work on the IMS, but might also be indicative of inefficiencies in continuing to use this framework.

1.d.2 Proposal and discussion

It is likely that performance could be improved by switching to a new, lightweight technology, which may also be easier for the developers to use. The first part of this project would be to investigate the new technologies that are available, and select one for a pilot project. The new technology may be provided by an updated application server (Project 1.c), or may have to be found elsewhere.

The pilot project would either apply the new technology to an existing part of Archie or use it in the development of a new module. After this initial assessment, the IMS team would decide that the results are satisfactory, or that a different technology should be assessed. We might also decide that external consultation is required at this stage.

The second part of this project is to plan the application of the new technology to Archie as a whole. The choice of technology and the programming resources available will determine which of the different implementation models to follow. For example, we could do it all at once (which may be a huge job); or set aside a certain amount of time each month to update the existing code over a period of several months.

1.d.3 Summary of recommendations

- A pilot project should be undertaken to identify new technologies to improve the performance of Archie
- Devise a plan for applying the new technology to Archie as a whole
- Implement this plan– perhaps as part of another project

1.d.4 Resource implications

The pilot project would take up to 13 FTE weeks of developer time. This will need to be followed by a few more weeks to prepare the report. The resources needed thereafter, to implement the preferred new technology cannot be estimated at this time, since the pilot project will determine these needs. We do not expect that the new technology will lead to additional hardware or software costs.

1.d.5 Impact statement

The primary aim of this project is to improve performance in the future. This is part of the general maintenance of any system, where the evaluation and, if relevant, renewal of the technology is to be expected. It is difficult to list the benefits of this project in advance, since the project itself is needed to identify the needs and potential benefits. However, we do know that the programming code for Archie needs to be sustainable into the future and that the longer we wait to undertake this project, the larger the task will be. In a competitive market for skilled programmers and systems developers, working with new, interesting technologies is an advantage, and as technology becomes old, this also reduces the size of the skill base from which staff who understand the code can be recruited.

Project 2 – Workflow and tracking system

2.1 Background

The main purposes of the workflow system in Archie are to (1) help CRGs keep track of each review through the editorial process; and (2) inform people involved in the preparation and editorial processing of reviews when they need to take action. When most of a CRG's reviews have been incorporated into the workflow system, staff at the editorial base would also be able to use the system to (3) plan and prioritize work more effectively across multiple reviews; and (4) identify and analyze trends in the CRG's processes (e.g., by identifying common 'bottlenecks' in the review process). Finally, when most CRGs are using the workflow system to track most reviews, it will be possible for the system to (5) generate reports for Collaboration-wide monitoring purposes.

The availability of an integrated workflow and tracking system was part of the original rationale and vision for the 'new' IMS approved for The Cochrane Collaboration in 2003. The workflow and tracking system is being piloted in three stages. Stage 1, which started in September 2008, was the initial pilot with only 8 groups (involving RGCs only). Stage 2 began in March 2009 and will include approximately 24 groups (involving editorial staff and editors). Stage 3 has been scheduled to start in September 2009, and will be open to all interested groups (involving editorial staff, editors, peer referees and authors).

2.2 Proposal and discussion

This project is included in this document because of the need to allocate resources for the remaining work needed to deliver the system, as it was envisaged in 2003, rather than because resources are needed for a new project.

The resources allocated to the workflow and tracking system will be used for:

- Responding to bugs identified by Stage 2 users
- Implementation of the remaining workflow templates (Feedback, Amendment/Update and possibly Request Help)
- Refinement of current functionality and, provided adequate resources, responding to prioritised requests for minor new functionality
- Development of reports for Collaboration-wide monitoring purposes
- Preparation of end-user documentation
- Preparing for the roll out to all CRGs (in keeping with Steering Group's decision that the workflow and tracking system should be mandatory)

2.3 Summary of recommendations

Resources should be allocated to allow completion of the workflow and tracking system, the third and final phase of the 'new' IMS (following the establishment of the contacts database and the implementation of RevMan 5).

2.4 Resource implications

Approximately 2 FTE weeks are needed for analysis and design, followed by 10 FTE weeks development, 4 FTE weeks of testing and technical documentation and 4 FTE weeks to prepare the end-user documentation.

2.5 Impact statement

An integrated workflow and tracking system will assist CRGs with managing their editorial process and will lead to efficiencies in the face of increasing workload and static of decreasing resources. In addition, with a sufficient amount of data stored in the system, reports can be made available for Collaboration-wide monitoring and reporting purposes.

The workflow and tracking system has the potential to improve the quality of Cochrane reviews, both by helping to standardise the editorial processes and also by helping the editorial bases to manage their limited resources effectively.

Project 3 - Technical documentation

3.1 Background

The priorities for the IMS Team over the last few years have been the implementation of the new IMS, rather than the preparation of documentation. The available resources were used to ensure the successful implementation of the contacts database, the rollout of RevMan 5 and the piloting of the workflow and tracking system by 2008. Documentation was restricted to the preparation of the most important, but still very basic, technical documentation about the IMS. There is a clear and urgent need to set aside resources to prepare more complete documentation. The external IT consultant who evaluated the IMS and the IMSG recommended that this be given high priority.

3.2 Proposal and discussion

We need to extend the current technical documentation and to implement a new organisational structure for this. A substantial degree of essential knowledge about the IMS (both Archie and RevMan) is not recorded, but is known to core IMS Development team members only. This puts the Collaboration at risk of serious disruption in the operation, development and maintenance of the IMS if one or more of the team's core members were to leave. The lack of documentation also means that when new members join the team, they spend longer than necessary becoming familiar with the IMS database structure, technology and architecture, while established members have to spend time teaching their new colleagues about the system. Furthermore, the established members will themselves benefit from the additional documentation when they work in areas of the IMS that are not familiar to them.

The technical documentation needs to consist of structured Technical Guides for Archie and RevMan.

The Technical Guide for Archie should include:

- *Programming environment*. Access to source code. Description of development tools. Target group: developers.
- *Server setup*. Introduction to the different servers and how to access them. Target groups: developers and system administrators.
- *Database structure*. Comprehensive description of the database model. Target groups: developers, system administrators and developers of user documentation.
- *Programming framework*. Description of the system structure, including description of the three system tiers (model, view and controller) and their interactions. Description of central classes and principles for using them. Description of technologies and third-party components. Target group: developers.
- *Application Programming Interface (API)*. Information on interfaces used to exchange data between Archie and other systems (including www.cochrane.org, RevMan, Wiley-Blackwell). Target groups: internal and external developers, system administrators.

The Technical Guide for RevMan should include:

- *Programming environment*. Access to source code. Description of programming tools. Target group: developers.
- *Programming framework*. Description of the system structure, central classes and principles for using them. Description of technologies and third-party components. Target group: developers.
- *Review document specifications*. Description of the XML structure of Cochrane reviews. Target groups: developers, publishers and other potential recipients of review data.

The IMS Development team employed a Test and Documentation (TD) Officer (1 FTE) in October 2008. The TD Officer's main responsibilities are to organise testing, prepare technical documentation of new developments, and contribute to end-user documentation. The TD Officer also co-ordinates the technical documentation of existing parts of the system, and contributes were possible to the writing of this documentation.

The efficient preparation of accurate technical documentation will rely heavily on contributions by the IMS developers. This is particularly true for the parts of the system that were designed, programmed and tested without the participations of the new TD officer. For instance, the developer responsible for programming RevMan is best placed to best describe that system.

In principle, best practice in system development is that time spent on programming should be matched equally with time spent documenting the code. As noted above, the resources available meant this was not possible in the development of the new IMS without causing substantial delays (measured in years) to the implementation of improvements needed to support the rapid growth of the Collaboration and demand for Cochrane reviews. Looking to the future, redressing this imbalance between software development and documentation could mean years of documentation work ahead. However, there is agreement both inside and outside the IMS Development team that the focus of work should be spent on essential areas. Nonetheless, the task at hand is substantial and it would be advisable to limit the number of developer FTE months allocated to the project.

3.3 Summary of recommendations

- The essential technical documentation that would minimise the high risk of severe disruption of IMS development and maintenance should be prepared as described above.
- The TD Officer should continue to work with the developers to ensure their work is documented to keep the Technical Guides up to date. The IMS Team should take this into consideration when estimating and allocating resources for future projects. It is recommended that the developers' time on new projects should be divided in the ratio 4:1 between coding and contributing to documentation.
- 1 FTE developer is needed on an ongoing basis to maintain the IMS and address bug fixes. With the current level of developer resources available to the IMS Team, this leaves 1 FTE developer to work on both new developments and technical documentation (of both past and future development). This raises the possibility of a situation where there would be insufficient resources for new developments, and, so, additional resources need to be identified. The alternatives are to reduce the proportion of time spent on preparing technical documentation and to spread this over a longer period of time to allow core developments to continue or to switch more resources to documentation and slow down core developments.

3.4 Resource implications

Initially, approximately half of the TD Officer's time is spent on co-ordinating and contributing to completion of the Technical Guides described above. In addition, a total 40 FTE weeks of a developer is needed for work on the Technical Guides.

The IMS Team will keep the Steering Group informed of progress on documentation, in the bi-annual reports.

3.5 Impact statement

By recording the extensive knowledge of the core members of the IMS Development team, the Technical Guides will considerably reduce the risk of serious disruption in the operation, development and maintenance of the IMS and consequently of the CRGs and The Cochrane Collaboration if one or more of the team's core members left.

The time spent by established IMS team members to introduce new staff members to the system will be reduced, and new members will be able to work effectively sooner. It will also be easier to contract external developers to work on add-on modules to the IMS, or for someone to work on systems that should interface with the IMS.

Established team members will save time when working on areas of the system that they infrequently maintain by utilising the Technical Guides as reference tools. This will increase flexibility within the team.

Project 4 - Replacement for Parent Database

4.1 Background

The Cochrane Database of Systematic Reviews (CDSR) provides The Cochrane Collaboration with great advantages over regular journals in that all of its published output is stored in a highly structured, consistent, granular format. This makes it possible to perform automatic searches that extract similar data across all reviews or subsets of reviews. There is considerable scope to exploit this unique feature of Cochrane reviews for the benefit of CRGs, The Cochrane Collaboration, current users of our output and potential users.

The Parent Database (PD) was used to assemble CDSR in order to deliver it to the publisher, before the implementation of Archie removed the need for this compilation. The need to compile the PD had the spin off benefit of allowing data extraction for scientific, statistical and monitoring purposes across the whole of CDSR. The publishing efficiencies arising from the introduction of Archie and the removal of the need for the PD for that purpose arise from the ability to store reviews as discrete, whole documents rather than as a collection of individual fields that cut across Cochrane reviews. The downside of this is that it is now more difficult to extract data from all reviews. As an example, it is now time consuming to find and extract all the statistically significant meta-analyses from CDSR since each review document has to be accessed, compared to previously when the relevant fields (comparisons, outcomes, and study results) could be accessed across all reviews.

The move to the new Archie document model and the introduction of the XML format in Cochrane reviews meant that the old PD could no longer be used and a replacement for the PD was developed[1] and launched with Issue 2, 2006 of The Cochrane Library. This 'new' PD was developed like the old PD as a system running in parallel to Archie. For each new Issue, all the reviews from Archie for that issue were imported by running a program that split the documents into individual fields. This new PD contains each issue of CDSR from Issue 2, 2006 to Issue 1, 2008, and has been the data source for numerous data requests[2].

From issue 2, 2008, reviews in RevMan 5 format started to appear in the CDSR. These reviews (which include Diagnostic and Overviews of reviews) have a quite different structure to RevMan 4 reviews, meaning that they could not be loaded into the PD. Therefore, from Issue 2, 2008, it has not been possible to create a PD and the IMS team do not have the resources for the more laborious task of extracting data from the individual reviews to meet most requests for data for scientific, statistical and monitoring purposes. Therefore, such requests need to be dealt with either using data that can be extracted directly from Archie, or by using the data from issue 1, 2008, which is now substantially out of date and does not reflect the considerable enhancements introduced with RevMan 5.

In hindsight, if we had invested more resources in 2005 when considering how the new PD could be integrated with Archie, it may have been possible to "future proof" this so that it would have lasted longer than two years. However, at that time we decided that it was better to develop a system quickly using the technology we knew, rather than divert resources from the other Archie development work. In addition, the version of the database software we used (and are still using) for Archie did not provide the technology required for integration. The update that introduced this technology was released in 2005, but we did not have sufficient resources to consider the benefits of updating at that time.

4.2 Proposal and discussion

A replacement for the PD should be developed, as an integrated module of Archie rather than a separate database. This should consist of a "back-end" where each published version of a Cochrane review is stored in searchable form (as part of the Archie database), and a "front-end" interface for performing searches across the reviews and extracting data.

The advantage of integrating the new module with Archie, rather than developing another parallel system is that this module will benefit from the existing framework for the storage of data and access to it. It will also reduce the resources that have previously been required for the maintenance of a standalone PD and for designing and running queries on behalf of the people needing data from Cochrane reviews. This change will require guidance on which Archie users should have the rights to perform their own queries, which we can implement when setting up the system.

The technology (XML indexing) required for the development will be available with an update to the database server software as described above, and this project is therefore dependent on the completion of project 1.b (updating the database software).

[1] Development took approximately 2 FTE months.

[2] Access to data is restricted to projects approved by the Steering Group Executive. The IMS Team performs the extraction.

XML indexing technology can index any type of XML document, independent of its detailed structure. This means that the introduction of the new module will remove the need for a redesign of the PD each time changes to the review structure are introduced, for example in any replacement to RevMan 5. All published review versions stored in Archie (back to 1995) would be indexed, so the new PD would include the data in previous versions of the PD, providing a resource that would be unmatched for investigations of healthcare research.

From the user perspective, some of major features in an integrated module would be:

- The ability to search on specific review versions (e.g. search only in the reviews published in Issue 4, 2008, search in all issues of 2007 for reviews from the Stroke group, or track the impact of updating on reviews with more than five included studies since the first issue of CDSR)
- To allow specification of detailed search criteria relating to the content of the searched document versions (e.g. where one or more outcomes report SMD, or where the Declaration of interest section contains the word 'none').
- To allow extraction (exporting) of specific data from the hits (e.g. the number of included studies, the I-squared value of each meta-analysis, or the Authors' conclusions section)

This project is related to Project 5 (Improve searching functionality) and will benefit from some of the improvements resulting from that project, including:

- The ability to group and sort results (e.g. sort by date edited, or group by number of included studies)
- The ability to report results as counts rather than individual hits (e.g. how many reviews have one included study, how many have two, etc.)
- The ability to combine different Boolean operators (and, or) in a single search

This module will also enable efficiencies in the implementation of other projects including:

- Project A – Review monitoring system (e.g. notify users about changes in specific sections of reviews, such as individual meta-analyses or the Implications for practice)
- Project D - Cross referencing between reviews (e.g. to improve the impact factor and the ease with which users can move between Cochrane reviews)
- Data exchange between Archie and the Cochrane Register of Studies (e.g. extraction and insertion of studies and sharing of information on studies between the new Register and Cochrane reviews)

4.3 Summary of recommendations

Replace the PD with an integrated Archie module.

4.4 Resource implications

This project is dependent on the completion of project 1.b (updating the database software). We do not expect any additional hardware or software costs. Development time can roughly be divided into three stages: Investigation and design (6 FTE weeks), implementation of working prototype (14 FTE weeks), implementation of first working version (6 FTE weeks). We estimate that testing and technical documentation will require 6 FTE weeks and end-user documentation will require 2 FTE weeks.

4.5 Impact statement

The Cochrane Collaboration as a whole will benefit because it will be easier to find and extract data for research, statistics and monitoring purposes. There is a possibility of generating income for the Collaboration by setting up criteria for charging people for access to the data.

If the PD is not replaced with a new system this will remove the ability to perform detailed searches and data extraction across Cochrane reviews, which has existed since the first release of CDSR. Researches will have to extract data manually from The Cochrane Library (for example by cutting and pasting from the relevant section of each review), and it will not be possible for the IMS team to provide data for monitoring and statistical purposes, including those required by the Steering Group or the Editor in Chief.

Project 5 - Improve searching functionality

5.1 Background

Since Archie's launch in 2004, there have been considerable increases in the quantity and complexity of data stored in the system, but the search component has remained structurally unchanged. There have been several minor updates to introduce additional search options, but these have all been within the limits of the original framework.

There are a number of known shortcomings to the current search function. One simple example is that it is not possible to directly search for people who live in a developing country – this would have to be done by specifying each country.

Requests for changes to the features available for Archie are recorded on the Archie wish list[3], and assessed by the EMAG. This project proposal is based on a combination of the recorded requests, and developer analysis of the unexplored potential of the search functionality of Archie.

5.2 Proposal and discussion

5.2.1 Focus area 1: Working with search queries

The primary focus in this area is the Advanced Search function. As the data complexity continues to grow, the need for flexibility in the search framework increases. Investing developer resources in a focused overhaul of the search component will pre-empt having to use even more resources over time in response to individual requests.

Use both AND and OR in same search

Many complex search queries rely on using different Boolean operators within a single query. However, this is not currently possible in Archie. Instead, users have to run multiple searches, and use the selection set to combine the results. This makes the system difficult to use, increases the risk of errors and prevents the saving of such searches for easy reuse.

Remove restraints on query construction

The current interface for Advanced Search in Archie is highly structured with users constructing searches by selecting from predefined lists of terms, constrictors and values. This rigid structure is helpful when users construct queries that fit neatly within the structure, but the converse is that it limits the number of possible queries that can be expressed. Imposing this limitation allowed us to save resources during the initial development of the system but it would now be possible to develop a system that incorporates the best of both worlds by adding a search option where users enter their queries in a free-form text based search language. Users would not have to remember all the available attributes, constrictors and operators, as these would all be listed for easy insertion as part of the interface.

The following example illustrates how a complex search that is not possible in the current framework could be expressed in the proposed search language:
"Reviews where Author has Country where (Income is Low Income or Lower-Middle Income)"

Search in current selection set

The ability to search in the current selection set, allows a user to refine quickly their previous search (for example, if the result set is larger than expected).

Search on relation to selection set resources

The current search options are nearly all limited to attributes on the type of resource being searched for. For example, one can find the *reviews* first published in a specific issue, but one cannot *contact persons* for the reviews first

[3] The Archie wish list can be seen at http://archie.cochrane.org/fogbugz/archiewishlist.jsp

published in a specific issue. If it was possible to find and select the reviews first, and then run a second search on the selected reviews for the contact persons, many more advanced queries would be possible.

Add additional search terms

Several feature requests relate to making it possible to search on additional attributes. For example, being able to find documents based on the version description, or linked topics. Additional person searches that have been requested include:

- Role with Specification in Entity
- Authors on published reviews only
- Date a role was assigned
- Country income level rating
- The *Sex* and *Country of Origin* fields
- Reference centre based on *Country of Origin*
- Bulk Mailings setting
- Authors by Review Type

5.2.2 Focus area 2: Presenting and working with results

Improvements within this area would benefit users of all search types.

Provide search results as both counts, groups and individual hits

If search results could be grouped or counted based on different criteria, this would allow a user to group the search results by, for example, reviews that were at the title, protocol and full review stages.

Sort results

Users should be able to specify how their search results are sorted for display. At the moment, the results are divided into pages that are only retrieved one at a time (in order to conserve bandwidth, by avoiding to have to fetch thousands of results), and so it would be best if order for sorting was specified as part of the search query.

Ranking of results

Archie should, where applicable, enable ranking of results based on the number of search criteria met. Ranking is especially relevant in free text searches, such as searches within document text. If we implement sorting (see above), ranking would be one of the sort options.

5.2.3 Dependencies on other projects

This project relates to projects 1.b (updating the database server software) and 4 (replacement for the parent database). Most of the improvements proposed here could be implemented if those two projects do not go ahead, but there is significant synergy to be gained by implementing all three.

5.3 Summary of recommendations

Develop Archie's search functionality to ensure it meets the needs of current users and is better placed to respond to future needs.

5.4 Resource implications

The total research and development time for this project is estimated to be about 13 FTE weeks. We estimate that 4 FTE weeks are needed for testing and 8 FTE weeks for user documentation (see note below).

Note: The FTE required for documentation needs to be higher than that required for development time because a highly versatile search interface can be daunting to use, and user documentation is especially important. In addition to developing comprehensive coverage of the search functions in the standard user documentation (the help file and various user guides), more help information could be added directly in interface. This would include advice to users of the not-so-obvious consequences of relying on a particular search attribute.

5.5 Impact statement

The value of stored information is directly related to the ability to retrieve it. A cornerstone for any information management system is therefore its ability to deliver the required information with the right presentation. Improving search efficiency contributes to maximising the benefit gained from the overall resources invested in the IMS.

If this project is implemented:

- Archie users in general will save time building queries, and working with the results.
- Users will have direct access to information that is currently 'wasted'.
- Entities, especially CRGs, will have faster, more reliable, means of retrieving the information they need when reporting on their activities to the Collaboration, their funder and their host institution.
- The capabilities of Archie's search system will be more obvious to users.
- The developers will save future resources, by not having to 'force' requested functionality into a restrictive framework.

Project 6 - RevMan 5.1

6.1 Background

Review Manager (RevMan) is the tool used for preparing and maintaining Cochrane reviews. RevMan 5.0 was released in March 2008 as the first major update in nine years. Since then, we have released a number of improvements to the software and RevMan 5.0.18 is the latest version at the time of writing this report (March 2009). The program is now considered to be in a stable condition, and new bugs are uncommon. More than 5000 people are actively using RevMan 5[4], and all published protocols and reviews were in RevMan 5 format by Issue 1 2009 of The Cochrane Library. Most draft reviews are now also in the new format.

The Nordic Cochrane Centre maintains the 'wish list' of requests for changes to RevMan. There are 99 items on the list, 82 of which have been requested since the release of RevMan 5.0 (as of March 20 2009). The RevMan Advisory Group (RAG) has considered 57 of the wish list items, and 11 items have been given the priority *Important*, while 27 items have the priority *Desirable*. Our other priority levels are *Critical* (0), *Low Priority* (10), and *Don't Implement* (9). Forty-two items remain to be considered at future meetings of RAG. This project description does not list each feature recommended by RAG, but the individual priority can be seen on the online list (http://www.cc-ims.net/RevMan/revman-wish-list).

Note on process: The RAG meeting scheduled for January 2009 to discuss priorities for RevMan 5.1 was cancelled following the resignation of Mike Clarke as convenor. This means that the IMS Team are not able to present a fully specified proposal for RevMan 5.1 at this time, since guidance from RAG is vital to this. Instead, this proposal has been developed to allow the Steering Group to consider the general need for further development of RevMan in planning the budgets for the coming years.

6.2 Proposal and discussion

RevMan 5.1 would be an optional update to RevMan 5.0, which means that there can be no major changes to the review structure or anything else that would make reviews edited in 5.1 incompatible with 5.0. Any major changes will have to wait for RevMan 6 (not yet planned), which would be mandatory for all Cochrane reviews.

A full list of new features for RevMan 5.1 cannot be finalised until the RAG has considered the remaining items on the wish list, but the aim would be to include all the items prioritised as *Important* or *Desirable*. The lists of new features would probably include improvements in the following areas (not all of these have yet been prioritised by the RAG):

[4] The number is derived from our log of requests for updates during the month of February 2009. When an individual user's installation of RevMan connects to Archie, this is recorded separately. Duplicates are eliminated, so each user is only counted once for the reported period.

Area	*Details / rationale*	*Scope of benefit*
Multiple author affiliations	Allow more than one affiliation per author. Requested by the Publishing Policy Group.	Few authors.
Integration of functionality of GRADEPro	To make it easier to generate, and especially update, Summary of Findings tables.	All authors. Rate of adoption of SoF tables.
Sort in 'Open' file dialogs	For example to sort on the date modified when looking for the file to open. Standard in other modern software.	All users.
More validation checks	9 cases - e.g. for length of abstract, broken links, empty references, number of figures, etc. Will improve quality and ease editorial process.	Editorial bases. Quality of end product.
Importing	3 cases - e.g. importing of plain text and Vancouver formatted references. To give users more options for generating files that can be imported.	Some authors.
Improved editing of comparisons and outcomes	3 cases - e.g. to change settings for all outcomes within a comparison at the same time.	All users.
Improvements to track changes and text marker	5 cases - e.g. allow text marker to be applied to text that contains links. Would be very useful to all those who rely on these functions, e.g. for copy editing.	All users involved in editing.
User defined headings shown in outline pane	Would make it easier to navigate in reviews with many user defined headings.	Some users.
A function to open any section for editing on a separate tab	For example, to edit an included study table in a separate tab/window. This would make it easier to switch between working on the table and the related text sections.	Some users.
Easier reference editing	3 cases - e.g. by making it possible to browse through all references in a single tab so you don't have to open a new tab for each reference.	All users.

Table 1.

There are also a number of cases categorised as bugs (which could also be seen as feature requests) that have not yet been addressed in the updates to RevMan 5.0 because they were not critical and required a considerable amount of time to program. Some of these cases that would be suitable for RevMan 5.1 are:

- Optional heading cannot be inserted after a recommended heading at the same level
- Word Count counts words deleted using Track Changes
- Yellow marker removes track changes information (and vice versa)

The programming and release of RevMan 5.1 would also include the need to update the user documentation to cover all new features and fill gaps that have been identified in the existing documentation.

6.2.1 Updating the Java programming framework

RevMan 5.0 is based on version 5 of the Java programming framework, but version 6 has been available for more than two years. Some of the advantages of version 6 are improved start-up time (RevMan would open faster) and a generally improved look-and-feel of the user interface (e.g. on Windows Vista). Updating from Java 5 to Java 6 requires very little programming, but after the switch it is important to test all parts of RevMan for incompatibility issues. Since RevMan 5.1 will be thoroughly tested, this would be a good opportunity to update the Java framework and benefit from the improved features.

6.3 Summary of recommendations

To plan for the development of a major (but non mandatory) update to RevMan (RevMan 5.1) that includes the features recommended by the RAG and would improve the use of the software.

6.4 Resource implications

The required development time is proportional to the number of items that are approved for inclusion. Without knowing the details it is not possible to provide a robust prediction of the resources needed. However, we suggest that a minimum of 18 FTE weeks will be needed for programming, 6 FTE weeks for testing and technical documentation and 4 FTE weeks for user documentation. This level of resource commitment would achieve significant improvements for a large number of users, without spending resources on requests with minor or no impact.

6.5 Impact statement

Authors, RGCs, Editors and users of the end product would benefit from the new, improved features as described in Table 1.

Project A - Review monitoring system

A.1 Background

Around the world, policy makers, healthcare professionals and publishers use Cochrane Reviews as the foundation for practice, clinical guidelines and various derivative products. At the Cochrane Colloquium in Freiburg, we heard from several speakers how Cochrane Reviews provide an important high-quality source of information within their organisations. A representative of Kaiser Permanente spoke of extensive use of Cochrane Reviews in their Clinical Guidelines, Medical Technology Assessments and Evidence Summaries. The World Health Organisation (WHO) is using Cochrane Reviews in their guidelines and in implementing the Essential Drugs list, and called for the Collaboration to provide more accessible, easy-to-use and timely information. We also produce derivative products as output of the Collaboration – for instance Evidence Summaries, Overview of reviews and podcasts; and many other derivatives exist in, for example, “Cochrane corners” in journals

Currently, those who have used Cochrane reviews as a basis for clinical guidelines and similar publications intended for national or international audiences rely on manually detecting whether a review has been changed and looking through the review to detect the changes if they are concerned about the stability of their recommendations to changes to the reviews. Such users might benefit from a ‘push’ model, in which they request notification of changes, and these are sent to them as soon as they occur. For example, Wiley-Blackwell may be able to offer a service that lets users subscribe to alerts for when a review has been updated (triggered by the marking of reviews as ‘Update’ or ‘New citation’, for instance), but it will not be possible through the Wiley-Blackwell system to detect automatically what the changes in a review are and to inform the user of these specific changes.

A.2 Proposal and discussion

All Cochrane reviews have the same, highly structured format, which makes it possible to query or monitor changes to any text or data element within individual reviews and across collections of reviews. We propose that the Collaboration should exploit this finely detailed structure of Cochrane reviews to make it easier for policy makers, guideline developers and others to get easy access to information about changes in updated reviews, without having to check the entire content of the review manually. Through a restricted interface in Archie, users (or a designated manager) should be able mark specific reviews for this monitoring, including an indication of which particular

elements of a review should be monitored. The combinations of possibilities for monitoring are numerous and varied, and would need to be determined in collaboration with stakeholders both internal and external to the Collaboration, but examples of services that could be offered include:

- Alerts when a protocol is turned into a full review
- Alerts when outcomes of a particular review changes (with or without details)
- Alerts if a review is withdrawn
- Alerts and details of Authors' conclusions when an amended review results in a new citation version with Conclusions changed.
- Alerts when a review is updated (incorporating results of a new search) and information about the number of studies, patients and events added to the meta-analyses
- Alerts and details of changes to an Abstract
- Alerts and details of changes to a Plain Language Summary
- Alerts about changes to reviews that are summarised in an Overview of Reviews
- Alerts about changes to reviews for which a podcast exists
- Alerts about the availability of new reviews or changes to existing reviews that are of interest to a particular topic, e.g. Evidence Aid.

For selected stakeholders, it could also be made possible to be alerted and get access to relevant information in advance of publication of a relevant Cochrane review, that is, as soon as a review is released for publication by the CRG. This might be especially attractive for the Collaboration itself, for instance for:

- Updating of podcasts for reviews that have conclusion changed
- Updating of new Evidence Aid summaries and creation of new summaries to coincide with publication of new relevant reviews
- Updating of Overview of Reviews
- Translations of reviews or subset of reviews (also relevant for external stakeholders)
- Updating the cross referral to the updated review in other Cochrane reviews

For external stakeholders, such as national and international guideline producers, early access would also be attractive. Allowing access to embargoed review data would let guideline producers start working on updating their guidelines as soon as new evidence become available and would allow them to respond appropriately to comment when the new data becomes public. The service could be complemented with the delivery of live links to specific elements of the published review, e.g. a meta-analysis graph. Guideline producers could insert these links into their guidelines with a minimum of effort, but it would greatly enhance the transparency of their work, allowing users of the guideline to see exactly what data were considered in the guideline (for example, in support of a specific recommendation). The Collaboration would also gain considerable knowledge about the reviews, and parts of reviews, being used in guidelines, which would be useful knowledge for prioritisation.

There are a variety of ways in which a review monitoring service could be made available. One possibility might be to make it a complimentary part of the package that countries get access to through their national licence to The Cochrane Library, thus making it more attractive with a national subscription.

The proposed new service will help the Cochrane Collaboration to present itself as an attractive strategic partner for non-commercial entities such as Global Health organisations and national guideline producers. In addition, it might also help raise income for the Collaboration. For example, the availability of a complimentary service to national subscribers might persuade countries to decide in favour of a national licence; and commercial partners such as publishers who base their products on Cochrane reviews or managed care organisations, like Kaiser Permanente, might purchase the service as it has the potential to greatly enhance the services they deliver to their customers and lead to efficiencies within their own systems.

There are no specific cases in our wish list system on this project. The proposal presented here is based on discussions with and ideas brought forward by various members of the Collaboration, including Mike Clarke, former IMSG convenor, and the IMS team.

A.2.1 Dependencies on other projects

This project is dependent on the implementation of a replacement for the Parent Database (Project 4).

A.3 Summary of recommendations

Resources should be allocated to work on a pilot project that will deliver a core system for monitoring changes to Cochrane Reviews and a business plan for further development and marketing of the proposed service. We recommend that we pilot the system with WHO, which would be a strong strategic partner and signal the Collaboration's intention to contribute to Global Health. The results of this project should help to determine how the Collaboration could best provide the service more broadly, including planning the best way of managing commercial and non-commercial 'subscriptions' to changes to reviews through the system.

A.4 Resource implications

Resource implications for the pilot project are approximately 4 FTE weeks analysis and design, 8 FTE weeks development, 4 FTE weeks for testing and technical documentation. Some resources will also be required for discussions with the Publishing Policy Group, Wiley-Blackwell and others in the Collaboration about various business models.

A.5 Impact statement

The Collaboration's goal is to improve access to evidence about health care. With the service described above, the Collaboration can help to ensure that the evidence it produces is disseminated more effectively and timely. It would provide a service that no other publisher of systematic reviews is capable of, thus helping to maintain and increase the Collaboration's market value. The service would also help the Collaboration to establish formal partnerships with parties who are already re-using Cochrane Reviews in various other products.

Project B – Online text editor

B.1 Background

Ninety-four Cochrane entities prepare and maintain their module text through an online editor in Archie. This module text is submitted to Wiley-Blackwell and is published in The Cochrane Library under About Cochrane/Cochrane Groups. In contrast, the text of a Cochrane review is edited in RevMan 5, software that needs to be installed locally onto a PC. It is not possible to edit the text of a review online through Archie.

B.1.1 Module text

An entity's module document is published in The Cochrane Library. Although the text of the module document can be edited online, the current text editor has limited editing capabilities, and does not allow an entity's module document to be published as professionally as it could be. There are also many reports of problems when substantial edits are made to the text of a Cochrane Review Group's (CRG's) module document, usually around the quarterly module submission deadline when most of the editing of the module text takes place. For example, users have experienced the system freezing, had problems with line spacing and headings or had errors when saving the text, resulting in the loss of work. Editors of the module text, usually Review Group Co-ordinators (RGCs), have to find ways of working around these problems, which in many cases can be frustrating and time consuming. The Editorial Management Advisory Group (EMAG) and others have asked for greater flexibility in the preparation and formatting of the module text, e.g., to be able to include tables. These requests have been documented and in many cases approved already, but the current online text editor cannot accommodate them.

B.1.2 Review text

RevMan 5 is the key authoring tool for the preparation and maintenance of Cochrane reviews. It includes the statistical package used for the conduct and display of analyses in the reviews and considerable functionality beyond the ability to edit text. In order to use RevMan 5, it is necessary for authors and editorial teams to install the software locally onto their PCs.

However, there are many examples worldwide of institutions that will not allow authors to install RevMan on their work PCs because of local restrictions on the installation of third party software. It is usually possible to obtain the

necessary permission but, even then, the installation has to be carried out by the institution's IT staff. An online text editor for the review text would give authors access to the text of their reviews and allow authors greater flexibility to work on their reviews when away from their offices without having to open or install RevMan 5 onto the computer they are using.

B.2 Proposal and discussion

We propose the replacement of the current online text editor for the module document, to resolve the problems with it and to allow entities greater flexibility in the preparation and presentation of their module documents. The current guidelines for preparing the module document (for CRGs and all other Cochrane entities) were prepared before Archie was introduced and, in some areas, reflect the restrictions of the software available at that time.
When considering a new online text editor for the module text, it makes sense to include the requirements for an online text editor for Cochrane reviews.

B.3 Summary of recommendations

The IMS team should identify a more advanced online text editor that will cover the needs of editors of the text of the module document as well as of authors (to allow them to edit the text of their reviews online, if this is approved by the Collaboration). In choosing a new online text editor, the following should be borne in mind:

- The editor for the module text should improve the ability to use data already stored in Archie (e.g. a list of new reviews) so as not to duplicate work. It should be able to prepare tables and incorporate other standard editing features such as heading styles, yellow marker and track changes.
- The editor for the review text needs to have all the editing functions that are currently available in RevMan 5, including links, nested lists and symbols.
- The IMS team should liaise with the RevMan Advisory Group, EMAG and the Editor in Chief to identify all the requirements for improvements to the quality of module documents and the text of reviews so that these can be addressed by the new online editor.

B.4 Resource implications

The project will depend on the successful identification of an editor component that can be customised to fulfil the requirements. If the editor is open source there will be no direct software costs involved. If not, the costs for a licence fee will need be added. The staff resources set out here cover development of the module text and the review text editors, but additional resources may be required if some features need special development (e.g., track changes).

- Analysis (including identification of a suitable editor tool): 2 FTE weeks
- Development (customisation of editor component, conversion to and from XML): 6-10 FTE weeks
- Testing: 2 FTE weeks
- Documentation: 2-3 FTE weeks

B.5 Impact statement

A more advanced online text editor will:

- allow entities to improve the quality of their module documents, giving them a more professional look when published, and helping users to obtain relevant material more easily;
- allow entities to concentrate on the content of the module document rather than spending time trying to cope with the problems with the current editor;
- provide authors with greater flexibility in the preparation and maintenance of their Cochrane reviews. This might lead to more timely submissions of draft reviews for editorial approval and faster correction of minor errors in reviews for publication.

Project C – Cross-referencing between reviews

C.1 Background

Reviews that are related by topic should cite each other. This makes it easier to move between reviews within The Cochrane Library but will also help to improve the impact factor of Cochrane reviews where the cited reviews are within the relevant publication period window. At the moment, however, Archie does not contain special features to help authors cite other Cochrane reviews and it is difficult to find which reviews cite other reviews in The Cochrane Library.

For Overviews of reviews, accurate referencing between parent and child reviews is of special importance.

C.2 Proposal and discussion

Archie should provide the following facilities:

- A search option for reviews that cite a particular review
- A search option to show the reviews being cited within a review and to find Cochrane reviews that do not cite other reviews
- A wizard that suggests reviews to cite for a particular review and helps insert the correct citations
- A system for notifying authors when other reviews cite their review

We propose an analysis phase before implementing these features, which may identify other facilities that should also be included.

Searching for references across all reviews is a computationally heavy operation, and so many aspects of this project rely on the introduction of the XML indexing functionality in Project 4 (Replacement for parent database).

C.3 Summary of recommendations

Resources should be allocated to provide cross-referencing facilities for Cochrane reviews in Archie.

C.4 Resource implications

Resource implications are approximately 2 FTE weeks on analysis and design, 7 FTE weeks for development, 3 FTE weeks for testing and 1 FTE week for user documentation.

C. 5 Impact statement

Ensuring optimal cross-referencing between Cochrane reviews will increase the usability of The Cochrane Library, improve access to Cochrane reviews, and have a beneficial effect on the impact factor.

Project D - Evaluation of Archie interface

D.1 Background

Developments in several areas mean that the time is right to re-evaluate the principles and technologies behind the interface used for Archie. These developments include:

- an increased focus on web accessibility
- an expanding user base with expectations shaped by exposure to other web applications (“But it’s much easier on Facebook, Gmail and eBay”)
- the emergence and maturation of relevant technologies.

D.1.1 Accessibility

> *"Web accessibility means that people with disabilities can use the Web. More specifically, Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web. Web accessibility also benefits others, including older people with changing abilities due to aging."*[5]

The original plans for Archie included programming an interface that combined usability with accessibility. However, the over-riding need to deliver a working system in a timely fashion within the resources available meant that we focused on developing a rich interface with high levels of interactivity and responsiveness, but without consistent attention to accessibility.
As a consequence, Archie does not live up to many basic accessibility guideline requirements, and although some of the problems can be identified easily, an accurate and complete overview of the resources needed to reach compliance requires a more thorough analysis (beginning with the resources to do such an analysis).

D.1.2 Usability

> *"Usability is a term used to denote the ease with which people can employ a particular tool or other human-made object in order to achieve a particular goal. […] In human-computer interaction and computer science, usability usually refers to the elegance and clarity with which the interaction with a computer program or a web site is designed."*[6]

Although Archie is web-based, it was originally designed mimic a desktop application in many ways. For example, it relies heavily on the use of context menus (i.e. those accessed with a right-click). But since Archie's launch, the use of dynamic interfaces for websites has increased tremendously (as part of the 'Web 2.0' phenomenon), and most of these websites have interfaces that are very different from Archie.

Usability testing could explore the extent to which Archie's interface paradigms meet user expectations and thereby allows intuitive use.

D.1.3 Technology advances

Archie can be characterized as a Rich Internet Application (RIA). Many new technologies have been developed to enhance RIA development specifically. A few of the examples are AJAX, Adobe AIR, Microsoft Silverlight, and JavaFX.

We also need to keep emerging platform trends under review. For many years, the target audience of Archie has been entity staff, and it has been safe to assume that most users were accessing Archie from an office PC with a reasonable display size. Now that the user base is expanding to include authors, editors and maybe even peer referees (who could, for example, be responding to a workflow task), the types of systems they may be working from is broadening. This does not mean that there is a pressing need to develop 'Archie for iPhone', or other mobile clients right now. But the point where the Collaboration can gain overall efficiency by providing its systems on a wider variety of platforms may not be too far off.

In combination, an evaluation of the appropriateness of Archie's interface technology should look at how it compares to the available alternatives in terms of developer resource requirements and broad platform support.

D.2 Proposal and discussion

To maintain resource efficiency, an evaluation should be performed so it produces results that can be turned into realistic recommendations. Considerable time can be saved by at the outset establishing the general priorities of the Collaboration within the area. The evaluation should therefore begin with a limited consultation with the CCSG and/or its relevant advisory groups.

The evaluation would then consist of at least three 'branches', with resources allocated based on the established priorities:

[5] http://www.w3.org/WAI/intro/accessibility.php
[6] http://en.wikipedia.org/wiki/Usability

- Usability testing and analysis
- Accessibility compliance analysis
- Identification and evaluation of current RIA interface technologies.

D.3 Summary of recommendations

1. Determine Collaboration priorities
2. Analyse how well the current interface meets the requirements associated with these priorities
3. Develop a proposal for addressing identified shortcomings

D.4 Resource implications

Until the priority mapping has been done, we are unable to fully predict the resources requirements. However, it is likely that there would be a minimum of 4 FTE weeks for a developer and 4 FTE weeks for a Communication and Support Officer. We also propose that at least 2 weeks be set aside for work to be done by people outside of the IMS core team, for example by the Cochrane Web team. The Steering Group and various Advisory groups would also need to devote some time to defining the Collaboration's priorities and usability testing will be required by volunteers.

D.5 Impact statement

Evaluating the current interface for Archie against best practice in usability, accessibility and appropriateness of technology will enable the Collaboration to make informed choices when prioritising future development.

Scenario timelines

The Steering Group has requested a timeline reflecting different funding scenarios. We have included three scenarios concerning software development. Model A assumes three FTE developers, Model B assumes two FTE developers and Model C assumes one FTE developer. Using simple building blocks we present below a crude presentation of the project plan, which provides some idea about the estimated end date for all the projects with resource estimates. However, it is important to remember the many sources of uncertainty when interpreting the figures. These uncertainties include

- The impact of the qualifications and experience of the developers on our ability to assign them to projects.
- The exact start and end dates of projects, making the planning or avoidance of overlaps unpredictable.
- Whether or not all developer resources can be assigned to a single project from start to finish (as they have been in the figure).
- The need to spread some projects over longer periods of time to cope with the time lags inherent in obtaining feedback, scheduling meetings and obtaining goods.
- Factors external to the IMS team.
- The impact of the different scenarios on the job satisfaction of the developers (and, hence, their decisions on whether to stay with the IMS team). For example, in the scenario below (Model A), all three developers are assigned to work on technical documentation for several months in a row. Assigning qualified and creative developers to work exclusively on documentation for such a period of time may encourage them to look elsewhere for a job. Specifically on technical documentation work, we feel it would be most efficient and least demoralising to require developers to spend no more than one week per month on documenting the existing system.
- Changes in the priority of projects without a current resource estimate which would require them to be inserted into the project schedule, moving other projects further into the future.

The Steering Group will wish to draw their own conclusions from the figure. We feel that, in a fast changing environment of internet authoring and publishing, Model C would postpone some projects for too long, for example Project A. In such a scenario, the Collaboration will not only fail to gain additional advantages over other publishers but will lose some of the advantages that it currently enjoys because of the IMS.
In the figure, we have used "Away" to indicate the approximately 2 FTE months per year that a developer would not be working on the IMS (through, for example, vacation, illness) and we have used "Train" to cover the period needed for induction and training of new staff members.

Model A

Deliverable			Dev 1		Dev 2		Dev 3	
	2009	Apr	1.a	2				
1.a		May	1.b	2				
1.b		Jun	1.c	2	n/a		n/a	
		Jul	Away	Away				
		Aug	1.c	2				
		Sep	1.c	2	1.d	Train	3	Train
1.c		Oct	1.d	2	1.d	Train	3	Train
2		Nov	1.d	1.d	1.d	Train	3	Train
		Dec	Away	Away	1.d	Train	3	Train
1.d	2010	Jan	3	3	3	3	3	3
		Feb	3	3	3	3	3	3
		Mar	3	3	4	4	4	4
3		Apr	5	5	4	4	4	4
		May	5	5	4	4	4	4
4		Jun	Away	Away	Away	Away	Away	Away
		Jul	5	5	6	6	6	6
5		Aug	A	A	A	B	6	6
		Sep	A	A	A	B	6	6
6, A		Oct	B	B	B	B	C	C
B		Nov	D	D			C	C
C, D		Dec	Away	Away	Away	Away	Away	Away

Model B

Deliverable	Dev		Dev 1		Dev 2	
	2009	Apr	1.a	2		
1.a		May	1.b	2		
1.b		Jun	1.c	2	n/a	
		Jul	Away	Away		
		Aug	1.c	2		
		Sep	1.c	2	1.d	Train
1.c		Oct	1.d	2	1.d	Train
2		Nov	1.d	1.d	1.d	Train
		Dec	Away	Away	1.d	Train
1.d	2010	Jan	3	3	3	3
		Feb	3	3	3	3
		Mar	3	3	3	3
		Apr	3	3	3	3
		May	3	3	4	4
3		Jun	Away	Away	Away	Away
		Jul	4	4	4	4
		Aug	4	4	4	4
		Sep	4	4	5	5
4		Oct	6	6	5	5
		Nov	6	6	5	5
5		Dec	Away	Away	Away	Away
	2011	Jan	6	6	6	6
6		Feb	B	A	A	A
		Mar	B	A	A	A
A		Apr	B	B	C	C
		May	B	B	C	C
B, C		Jun	Away	Away	Away	Away
		Jul	D	D		
D		Aug				

Model C

Deliverable			Dev 1	
	2009	Apr	1.a	2
1.a		May	1.b	2
1.b		Jun	1.c	2
		Jul	Away	Away
		Aug	1.c	2
		Sep	1.c	2
1.c		Oct	1.d	2
2		Nov	1.d	1.d
		Dec	Away	Away
	2010	Jan	1.d	1.d
		Feb	1.d	1.d
1.d		Mar	3	3
		Apr	3	3
		May	3	3
		Jun	Away	Away
		Jul	3	3
		Aug	3	3
		Sep	3	3
		Oct	3	3
		Nov	3	3
		Dec	Away	Away
	2011	Jan	3	3
3		Feb	4	4
		Mar	4	4
		Apr	4	4
		May	4	4
		Jun	Away	Away
		Jul	4	4
		Aug	4	4
4		Sep	5	5
		Oct	5	5
		Nov	5	5
5		Dec	Away	Away
	2012	Jan	6	6
		Feb	6	6
		Mar	6	6
		Apr	6	6
6		May	A	A
		Jun	Away	Away
		Jul	A	A
		Aug	A	A
A		Sep	B	B
		Oct	B	B
		Nov	B	B
B		Dec	Away	Away
	2013	Jan	C	C
		Feb	C	C
C		Mar	D	D
D		Apr		

Projects	**FTE months**
1. Improve Archie performance/	5 3/4
1.a Update server hardware	1/2
1.b Update database server	1/2
1.c Update application server	1 1/4
1.d Review & update Archie prog.	3 1/2
2 Workflow and tracking system	3
3 Technical documentation	9
4 Replacement for the parent db	6
5 Improve searching functionality	3
6 RevMan 5.1	4
A Review monitoring system	3
B Online editor	3
C Cross referencing between reviews	2
D Evaluation of Archie Interface	1

Budgets

In April 2008, we presented an IMS budget that required the number of FTEs at the IMS Development team in Copenhagen to increase from 5.9 FTE to 7.9 FTE. In March 2009, The Cochrane Collaboration and the Nordic Cochrane Centre are jointly funding 4.5 FTE with the other 1.4 FTE being funded from savings we made from previous years.

In this report, we present four different budgets for the future IMS Development team. The budgets run from April 2009 to March 2012 but we realise that the budget period from April to August 2009 is already funded. Therefore, we do not expect any change in funding before September 2009.

As it is not cost effective to employ developers for short periods of time, all four budgets are based on the expectation that we will be able to employ them full time. We have proposed budgets to March 2012, but if the Collaboration chooses to shorten the funding period for additional FTE employees, we urge that this be no shorted than two years (e.g. running from September 2009 to August 2011). In our experience, positions that are advertised for shorter periods than two years result in fewer qualified applicants and if someone suitable can be appointed this can create too large an overhead in time spent getting familiar with the systems compared to the time then available to deliver effective development work. There is also an increased risk that a developer will leave the position ahead of time in favour of a longer term position (especially in the last months of a short term contract when the developer is likely to be applying for their next job). Fuller details on the budgets are included in Appendix C.

Model A covers the existing 5.9 FTE team members plus 2 new FTE Developers from September 2009. This increases the total resources for new development to three FTE developers.

Existing IMS Development team + 2 FTE developers from Sep 2009 - Model A

	2009-10	2010-11	2011-12
Total Expense DKK	4,607,000	5,090,360	5,201,970
Total income DKK	4,032,000	3,778,412	3,657,563
Expense minus income DKK	-575,000	-1,311,948	-1,544,407
Expense minus income EUR	-74,750	-170,553	-200,773
Expense minus income GBP	-69,000	-157.433	-185,328

Model B covers the existing 5.9 FTE team members plus 1 new FTE Developer from September 2009. This increases the total developer resources for new development to two FTE developers.

Existing IMS Development team + 1 FTE developer from Sep 2009 - Model B

	2009-10	2010-11	2011-12
Total Expense in DKK	4,319,500	4,601,860	4,699,565
Total income	4,032,000	3,778,412	3,657,563
Expense minus income DKK	-287,500	-823,448	-1,042,002
Expense minus income EUR	-37,375	-107,048	-135,460
Expense minus income GBP	-34,500	-98,813	-125,040

Model C covers the existing 5.9 FTE team members. This continues with the provision of 1 FTE developer for new development.

Existing IMS Development team - Model C

	2009-10	2010-11	2011-12
Total Expense	4,032,000	4,113,360	4,197,160
Total income	4,032,000	3,778,412	3,657,563

Expense minus income DKK	0,00	-334,948	-539,597
Expense minus income EUR	0,00	-43,543	-70,147
Expense minus income GBP	0,00	-40,193	-64,751

Model D covers 4.5 FTE team members. We currently have an additional 1.4 FTE funded through past savings until October 2010. After November 2010, this Model would limit the work of the IMS team to operation, hosting and maintenance of the IMS.

Reduced IMS Development team - Model D			
	2009-10	2010-11	2011-12
Total Expense	4,032,000	3,792,962	3,661,111
Total income	4,032,000	3,778,412	3,657,563
Expense minus income DKK	0	-14,550	-3548
Expense minus income EUR	0	-1,891	-461
Expense minus income GBP	0	-1,746	-425

As noted above, our costs are incurred in Danish Kroner (DKK) but we have converted these costs into euros (EUR) and GB pounds (GBP). We expect that the conversion to euros is likely to be stable through the period, but the costs in GP pounds are extremely uncertain. We have used the following exchange rates: 1 EUR = 7.45 DKK and 1 GBP = 8.02 DKK.

The removal of the development element from the IMS team (Model D) would represent a high risk to the Collaboration. It would undoubtedly lead to experienced IMS team members moving to other work. We feel that the impact would be similar to asking the Editors of the Cochrane Handbooks to no longer investigate and incorporate new methodologies which might be beneficial for systematic reviews but rather focus their energies on formatting the handbook content and correcting spelling mistakes, or to asking a Cochrane Review Group to take on no new reviews or methods but simply to add the data from new studies to their existing reviews.

Summary of recommendations

The Steering Group should review the project descriptions included in this report and consider the possibilities the IMS offers for improvement of the Collaboration's existing products and the development of new products and partnerships. If the Collaboration is able to provide adequate and timely investment, this will continue to provide the support needed for the efficient production of high-quality Cochrane Reviews and will make the Collaboration an attractive strategic partner to both commercial and non-commercial entities.

The Steering Group should determine where it wants the Collaboration to be in five years' time, and the role of the IMS within that vision.

Resource implications

Model A proposes an additional investment of approximately DKK 3,400,000 over the three years from September 2009 to March 2012. This is equivalent to EUR 450,000 or, at the exchange rates when this report was written, GBP 410,000.

Impact statement

The funding of the IMS contributes directly towards the core business and objectives of The Cochrane Collaboration. No other publisher of systematic reviews has a system that has been developed as fit for purpose as the IMS. This gives the Collaboration an advantage over other publishers and, with adequate investment, will help to maintain and increase the Collaboration's market value. However, we are already substantially behind with developments that would have been possible if the budget requested in April 2008 had been approved and implemented.

If the Collaboration does not identify additional funds for future development of the IMS and make these funds available in the near future, the Collaboration will lose the potential advantages that the future development of the IMS offers, will lose some of its current advantages over others, and is at substantial risk of failures in the IMS, in the work of Cochrane entities and in the publication of its output.

Decision required of the Steering Group

The Steering Group should make a decision urgently about the level of funding it will commit to future development of the IMS. It should provide clear guidance on the prioritisation of the projects it approves, and explicitly record its decisions and reasons for rejecting any projects that it does not approve.

Contributions and acknowledgement

Monica Kjeldstrøm, Rasmus Moustgaard and Jacob Riis are the main authors of this report. However, in the usual collaborative and motivating spirit, all IMS Team members (see Appendix A) have contributed to either writing parts of the report or commenting on individual project descriptions.

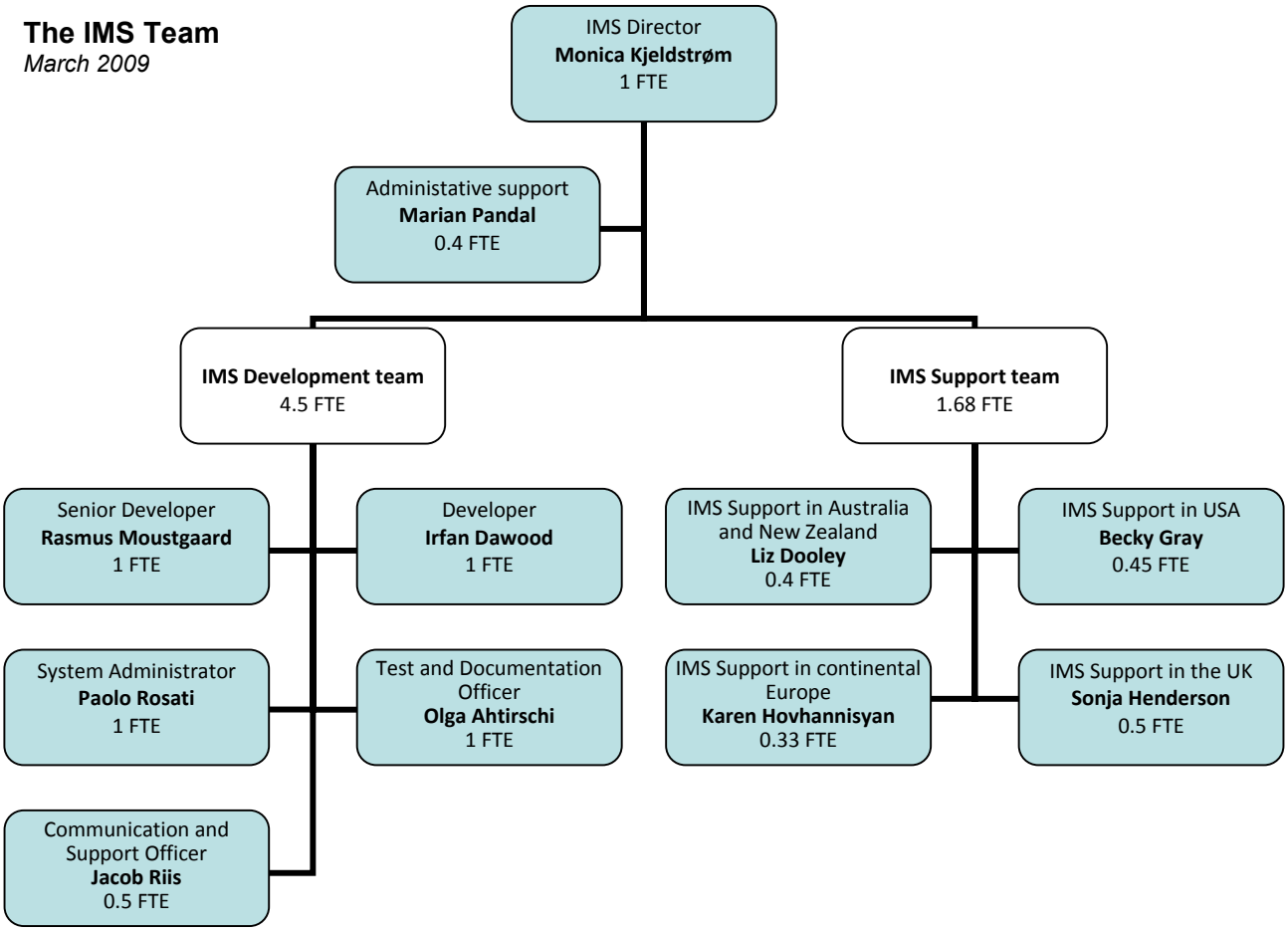
We are grateful to the members of the IMSG for their helpful input on specific project descriptions and process issues. We are particularly grateful to David Tovey, the new IMSG Convenor, for his detailed feedback on several of the project descriptions. We are also grateful for the input of the co-chairs of the Steering Group, Lorne Becker and Adrian Grant, on the outline of the report and for helping us to conceptualise the information needed by the Steering Group to make informed decisions about the allocation of funding to future IMS development. We also thank Peter Gøtzsche, Director of the Nordic Cochrane Centre for his strong support to the IMS team in discussing issues and ideas relevant to this report and future IMS development, and for his continuing commitment to dedicate funding and resources from the Nordic Cochrane Centre to support an IMS which we believe is vital to the future of The Cochrane Collaboration.

We are grateful to Mike Clarke, former IMSG Convenor, for providing great inspiration to the IMS Team by sharing his strong visions for possibilities the IMS offers, and by providing invaluable support during his five years as IMSG Convenor. We are very pleased that Mike continues to take a strong interest in several of the future possible projects described in this report and for the continuing opportunities to share and develop ideas with him.

Appendix A - The Cochrane IMS Team

The IMS team consists of two working parties: IMS Development and IMS Support. The five IMS Development team members (a total of 4.5 FTE) are all based at the Nordic Cochrane Centre in Copenhagen. The four IMS Support team members (a total of 1.68 FTE) are based in Australia, Denmark, England and the USA.

The IMS Director, Monica Kjeldstrøm (1 FTE) oversees the work of both teams. Marian Pandal (0.4 FTE) provides administrative support. Both are based at the Nordic Cochrane Centre. The full IMS team amounts to 7.58 FTE.



Tasks and duties performed by the IMS Development team

- Developing, operating (including hosting) and maintaining Archie.
- Developing and maintaining RevMan.
- Producing software specifications for new features.
- Monitoring feature requests and bugs.
- Liaising and planning development work with *The Cochrane Library* publishers.
- Acting as advisors on central IT issues for Groups within The Cochrane Collaboration.
- Providing data and reports extracted from reviews and other data held in Archie.
- Managing rollout of changes to the IMS throughout the Collaboration.
- Operating and maintaining the IMS website.
- Developing and maintaining web services that feed updated information automatically to www.cochrane.org and other websites (e.g. review titles, synopses and abstracts, contact details for entities and membership of Cochrane groups).

- Preparing material for and presenting work at meetings of the RAG, EMAG and IMSG.
- Preparing and maintaining technical documentation (including technical guides for Archie and RevMan).
- Preparing and maintaining user documentation.
- Providing feedback to end users of recent system changes.
- Encouraging end users to provide feedback on system changes.
- Maintaining a flexible yet professional and friendly approach when assessing and responding to requests from end users.
- Providing technical support to users of the IMS and the IMS Support team.
- Providing user support to staff at Centres, Fields, Networks and Methods Groups.
- Organising and contributing to training workshops for Cochrane entities and trainers of review authors at regional Cochrane meetings and Cochrane Colloquia.

Tasks and duties performed by the IMS Support team

- Training new Review Group Co-ordinators in the use of Archie and RevMan as part of their induction training. This involves a two-day site visit.
- Training of the editorial base staff of all Collaborative Review Groups (CRGs) in the use of Archie and RevMan as required by new developments or on request.
- Training staff at CRG satellites in the use of Archie and RevMan as requested and funded by 'parent' CRGs.
- Advising CRG and satellite staff on the optimal use of the IMS in relation to their Group's particular requirements.
- Providing ongoing support (by telephone and email) to staff at CRG editorial bases and satellites.
- Keeping CRG editorial base and satellite staff up to date on the latest plans for, and improvements to, the IMS by preparing and regularly circulating information (via email and the IMS website) via regular IMS Bulletins.
- Planning and presenting training workshops on Archie and RevMan at regional Cochrane meetings and Cochrane Colloquia.
- Developing and maintaining training programmes and materials; collaborating with other entities involved in training, to minimize duplication of effort.
- Assisting in the development of clear and useful documentation for users of the IMS, including those whose primary language is not English.
- Testing new software features before they go on general release.
- Maintaining logs of training workshops attended by CRG staff, Fields, Networks and Centres.
- Participating in an advisory capacity on the Editorial Management Advisory Group and the CRG Procedures Collection Working Group.

Tasks and duties performed by the IMS Director

- Managing IMS staff (including coaching and individual supervision, annual appraisals, recruiting new staff, and conflict resolution).
- Managing and supervising the work of the two IMS teams.
- Project managing IT projects.
- Communicating and managing requests and changes through many communication channels, with people from both inside and outside The Cochrane Collaboration.
- Having close and regular co-operation with several Cochrane groups, in particular the Cochrane Information Management System Group and its advisory groups, the Editors of the Cochrane Handbook for Systematic Reviews of Interventions, the Publishing Policy Group, the Steering Group, the Collaboration's publishing partner, Wiley-Blackwell, and the Cochrane Web Team at the German Cochrane Centre.
- Managing the budget for the IMS Development team (including securing and managing the contribution from The Cochrane Collaboration).
- Securing and managing the budget for the IMS Support team, provided by The Cochrane Collaboration; renewing the team members' contracts.
- Negotiating contracts (licences and services) with third parties.
- Managing the Licence Agreement between Rigshospitalet and The Cochrane Collaboration.

- Managing sales of Review Manager and other parts of the IMS to third parties.
- Developing standards for supporting users of the IMS in consultation with the two IMS teams.
- Coordinating the development and dissemination of training courses and material.
- Investigating and implementing strategies to minimise the environmental impact of the IMS.

Appendix B – Extracts of CCSG and IMSG minutes

The minutes in this appendix are extracted from relevant Steering Group and IMSG meetings.

Extract of approved minutes of CCSG meeting, 11-13 April 2008

For full minutes, visit: http://www.cochrane.org/ccsg/MinutesofCCSGmeetingVellore.htm

7.3 IMS budget April 2008 to March 2012: Following the Steering Group meeting in October 2007, at which Monica had highlighted the need for an expansion of the IMS team resources, she introduced the proposed new IMS budget from April 2008 to March 2012. Monica acknowledged the invaluable contribution of many volunteers across the Collaboration, and the substantial financial contributions of both the Nordic Cochrane Centre and The Cochrane Collaboration that had already gone into the development of the new IMS – a process that had started in 2002 following the results of the Collaboration-wide software needs assessment survey. The proposed new budget included an increase from the current 5.3 FTE to 8 FTE for the IMS Development team and an increase from 1.4 FTE to 1.8 FTE for the IMS Support team. The expanded IMS Development team would be responsible for operation, core development (including completion of the workflow system in 2008) and maintenance. The increase should be seen in light of the increasing user base and IMS' crucial role in supporting the preparation and publishing of Cochrane reviews. Monica stressed the importance of having a critical mass to ensure that the system is based on a solid foundation that operates reliably, and the IMS team is resourced to respond to important requests for changes and to provide technical troubleshooting to the growing number of RevMan 5 users in particular. Peter Gøtzsche had advised that the Nordic Cochrane Centre (NCC) would continue to contribute the salary for 2.5 FTE for the IMS Development team until the end of March 2009; after this (from April 2009), due to a cut in its core budget, the NCC would continue to contribute 1.5 FTE to the development as well as cover the infrastructure cost for the full IMS Development team. In concluding her presentation and acknowledging the size of the proposed new budget, Monica said that the IMS team would welcome an independent timely evaluation of the IMS to help the Steering Group to assess the value of the IMS before making any firm decisions.

In discussion after Monica left the room, some members of the Steering Group felt that they did not possess sufficient technical knowledge to assess whether the budget request was reasonable. The IMS development team should be strongly congratulated and thanked for RevMan 5, and told that the Steering Group was keen to support them; however, it had some uncertainties about the level of funding being requested. After lengthy consideration of the proposal, maintenance of funding at the current level was agreed to for one additional year, until the end of March 2010, with an increase of The Cochrane Collaboration's contribution from April 2009 to March 2010 to cover the cut in the budget of the Nordic Cochrane Centre, raising the Collaboration's contribution from 112,585 to 176,019 GBP (including allowance for currency fluctuations). It was also agreed to increase the budget for the IMS Support team from 1.4 to 1.8 FTE, raising the Collaboration's contribution from 57,500 to 65,000 GBP. The total amount of additional funding approved was 70,934 GBP. It was agreed that Lorne and Nick would engage an independent consultant with experience in the editorial and publishing software field to examine our current approach to software development, bearing in mind developments in comparable products since the original IMS funding decision had been made in 2003, to ensure that we were taking a technologically appropriate and cost-effective approach, within the context of where the rest of the publishing industry was in regard to software systems. The consultant should be expected to make recommendations on the type of system we might use for editorial management software (comparable with the IMS, which includes contact management, content/document management, workflow and tracking and RevMan) and on the level of resources we should be committing, presenting different options for the future.

- End of extract -

Extract of approved minutes of CCSG meeting 2 and 6 October 2008

For full minutes, visit: http://www.cochrane.org/ccsg/1MinutesofCCSGmeetingFreiburg.htm

Information Management System: IT consultant's brief and report

8.1 Monica Kjeldstrøm (as Director of the IMS) and Sonja Henderson (as a member of the IMS Support Team) declared their interest in this item. Mike Clarke, Convenor of the Information Management System Group (IMSG) and Convenor of the RevMan Advisory Group (RAG), attended the meeting for the first part of the discussion of this item, which Adrian chaired. Lorne explained the background to the commissioning of an independent IT consultant to assess the IMS and make recommendations. At its meeting in April 2008 in Vellore, the Steering Group had agreed that it needed such advice following a request for an unexpectedly large increase in funding of the IMS which did not contain a breakdown of the expenditure needed for discrete projects or parts of the IMS, such that it was unclear what would be achieved with the current and requested levels of funding. Recognising the valuable ongoing contribution made by the Nordic Cochrane Centre (NCC), the Steering Group had agreed to provide the additional funding needed from 1 April 2009 to keep the IMS development team at its current strength, following an unavoidable reduction in the support received by the IMS team from the NCC. However, irrespective of the question of value for money, the Steering Group did not feel in a position to increase IMS funding to the full amount that had been requested at its Vellore meeting, as the Collaboration did not have sufficient projected resources over the next five years.

8.2 Lorne highlighted the very strongly positive statements about the status of the IMS and its accomplishments in the consultant's report, which referred to it as something many publishers would see as "a kind of holy grail of production workflows". Lorne also noted that the report highlighted the risk to the Collaboration arising from the fact that the IMS depends on a few key individuals, the recommendation that this risk should be addressed by documenting key portions of the system, particularly the application programming interfaces (APIs) which specify how the program interacts with other software, and the consultant's opinion that expanding the IMS team would not give adequate protection against the loss of key individuals. The consultant's opinion was noted that the Collaboration should not continue its current approach of producing all of its software in a bespoke manner because of the expense involved. The consultant had also recommended that new IMS software development should, where possible, make use of software already produced by others that could be integrated within the existing system, but also build upon the considerable work done already by the IMS team and the Cochrane Review Groups (CRGs) that had already contributed to the workflow pilot project.

8.3 Mike asked if the comments that Monica and he had sent to Nick about the consultant's report, on September 22 and 23 respectively, had been shared with other members of the Steering Group, in order to avoid any unnecessary repetition of the points during this discussion. They had not been circulated and Lorne and Nick were the only two people present, aside from Monica and Mike, who had seen them. Monica explained that she would not be making detailed comments but that she would like to make a statement before withdrawing from the meeting and leaving the discussion to the members of the Steering Group and Mike. At the Steering Group meeting in October 2007, Monica said, she had already highlighted the need for more resources for preparing system documentation and for core development (including the new workflow system). The proposal that she had brought to the Vellore meeting had covered these needs, including a request for more resources to make the IMS sustainable for the future. The proposal also included an invitation for an independent evaluation of the IMS to help the Steering Group assess the value of the IMS to The Cochrane Collaboration. Monica said she was pleased, therefore, to see the positive evaluation the IMS had received from the IT consultant, and that he had confirmed that the estimated budget was consistent with the system operation, core development and maintenance set out in her report for the Vellore meeting. She said she had taken exception to some comments that had been made about "the current crisis of the IMS", "poor software management" and "better value for money of the IMS". Nick reiterated the points he had made in his presentation about the requirement placed by the Charity Commission on Trustees to be prudent with the Charity's resources, and the importance of seeking value for money in all Steering Group financial decisions, and reminded the meeting that this was not a specific comment about the IMS. He clarified that other comments he had made had not been directed at the work of, or management of, the IMS team but at the Collaboration's high-level management of software needs assessment, specification, procurement, and the management of this process across the range of software systems used by the Collaboration, thinking specifically of the way that the CENTRAL software requirement had been handled to date. Her comments completed, Monica left the meeting at this point.

8.4 Mike addressed the IT consultant's report, which contained three options:

Option 1: To "scrap" the current IMS and wholly replace it with off-the-shelf software.

Option 2: To continue as is, with the team at the Rigshospitalet developing the functionality of the IMS within the Collaboration, expanded with further full-time employees, in accordance with the budget requested at the Vellore meeting.

Option 3: To reorientate the system towards a core of well-defined functionality, with other components assembled around the IMS core. These additional components would not necessarily be developed by the IMS team but would possibly be sourced from outside the Collaboration, with an assumption that this would cost less than Option 2.

The consultant's report had confirmed the value of the work done to date. It had essentially ruled out Option 1, and had confirmed the appropriateness of the budget in the Vellore request for continuing with the Collaboration's current approach to IMS development. Mike expressed concern about the quality of the report in regard to the apparent disconnection between the opinions and evidence in the main body of the report and the recommendations, and the failure of the report to meet the brief agreed with the consultant. He noted the lack of a clear distinction between the opinion of the consultant, the opinion of people the consultant had spoken to, and the facts. Mike indicated that the Vellore budget request was to implement what the IMSG and the Steering Group had previously agreed, in terms of current and future development. He reminded the meeting that the budget presented in Vellore had been for an increase in funding from 1 April 2008, and that the shortfall was having a negative impact on the IMS. Mike said that in his opinion the inclusion of software developed by others (listed as Option 3 in the consultant's report) would not necessarily provide savings or a better system, and that this option would not necessarily be a lower risk. He expressed the opinion that, because healthcare programmers have different motivations for working on projects from programmers working in a commercial environment, the Collaboration was at less risk than commercial projects that key members of the IMS team would leave, and that the consultant did not appear to have taken this into account. He suggested that, as the IMS team was enlarged, people who joined it would share the commitment of the current members of the team to the Collaboration and its goals and would "stick with it". He said that the IMS was one of the most successful parts of the Collaboration, confirmed by the IT consultant's report. Mike expressed further concerns about the completeness of the consultant's report, in particular the lack of detailed costings for the options outlined for further development. He thought that the costs for Option 1 might have been under-estimated, and noted that no costs had been provided for Option 3, making it impossible to know at this stage whether it would truly be cheaper or more cost-effective than Option 2 (the status quo). He recognised that more work was needed to cost out the implications of Option 3 and, if that option was adopted, to re-prioritise the work of the IMS team and others. Mike strongly supported the view that what had been done in the IMS up to now was at the forefront in this field, and considered that continuing with the status quo (Option 2) was the only viable way to proceed. He pointed out that his job did not depend directly on the IMS, so he did not feel conflicted in expressing these opinions, above and beyond his work along with others in the IMSG and RAG over the last several years to bring the IMS to its current state.

8.5 Adrian returned to the concern about the risks posed by a few individuals holding all the information, allied with the lack of documentation, and asked why bringing in outside sources for certain components would not provide some protection against this. Mike responded that outside components would need to be integrated, and that having knowledge of this integration within a small team might also be risky. Lorne pointed out that a lot of progress had been made in the area of software integration and interoperability in the last few years, so that this option, while not attractive when the current IMS structure had been planned, was now feasible in the opinion of the consultant.

8.6 Attention was drawn to Recommendation 9 in the consultant's report which called for an improved process for gathering and prioritising IMS requirements according to the Collaboration's strategic goals.

8.7 It was noted that scaling back on IMS activities while continuing the current bespoke approach to development would be another option for cutting costs. Mike was asked if there was any room for compromise between the increase in funding requested and the Collaboration's ability to pay, and whether a middle course could not be plotted along the lines that had been proposed. Mike replied that in his opinion the only way

forward was that proposed in Vellore, if the Collaboration wished to continue to develop the IMS in the way that had been agreed previously. He said that if Option 3 were to be agreed on, he would resign as IMSG Convenor, after five years in this role, because he was unwilling to devote his time to a process that would dismantle the current IMS, would delay the implementation of the previously agreed plans, and would not necessarily be more cost-effective than Option 2. He also disagreed with the premise that the Collaboration could not afford Option 2. In his opinion, Option 3 would not provide savings and would not provide a more robust programming system; however, he recognised that it was for the Steering Group to make decisions about the use of resources and the strategic direction of the Collaboration and its infrastructure. Adrian thanked Mike very much for his input, and Mike left the meeting at this point.

8.8 Several shortcomings of the IT consultant's report were identified. It was highlighted that the report had not included any information or costs of the off-the-shelf services and components that could be used; without these, some members thought that the Steering Group could not make an informed decision. Costs had been provided for Options 1 and 2 but not for Option 3, so it was not yet possible for the Steering Group to make a comparison, and come to a decision as to which option would provide the best value for money. It was agreed that the consultant should be asked to provide the missing costings as he had not yet fulfilled his brief in this respect, although it was suggested that the additional information was unlikely to change the core recommendations of the report. The large absolute amount of increased funding requested for the IMS (and proportionally of the Collaboration's income) was noted, as was the possibility that these costs would continue to rise over time if the current approach was maintained. Attention was drawn to the Steering Group's responsibility to consider whether it could justify spending this amount of money in the light of the Collaboration's other needs for funding. The consultant's report, although light on Option 3 detail, had simply stated the obvious, that there are only three options: to keep going as is, to abandon all the IMS and entity work, or to use what has been developed by the IMS team and combine with external software to develop a sustainable long-term option. Concerns were raised about the lack of detailed budget justification in the IMS funding request presented in Vellore, the lack of any indication of prioritisation of the activities for which additional funding had been requested, and how CRG (and other entity) requests for prioritisation were actualised. It would have been reassuring if the IMS team had come back and said they appreciated that the budget request represented a big increase in a major expense for the Collaboration, and had provided details on costs and expected benefits for each key element of the project. Several Steering Group members pointed out that their experience of software development in healthcare research was different from Mike's, and that programmers were as likely to leave for other jobs as in any other sector.
Action: Nick

8.9 Lorne noted that the plan for moving forward with the consultant's report included a request for the IMSG's reaction, that a meeting of this group was scheduled for 13 November, and that their recommendations would be considered at the subsequent Executive meeting. It was also noted that the incoming Editor-in-Chief would have a key responsibility for the editorial processes and software systems used within the Collaboration. Concern was expressed that commercial software could be highly counter-productive, and there was some support for negotiating towards keeping the IMS doing all the development. It was suggested that the IMS team be given a maximum budget and asked to work within that, together with a specification of what could and could not be done with that funding, and how much additional funding would be required for specific pieces of additional work. It was agreed to ask the IMS team to consider this suggestion. In the meantime, the Steering Group decision in Vellore would be upheld, to provide the additional funding needed to maintain total IMS funding at its current level. It was pointed out that the contractual process had been modified since the current IMS contract had been signed; when the contract with the NCC was renewed it would include more explicit details on deliverables and on the management framework for the project. The Steering Group was reminded that it is the Rigshospitalet rather than the Collaboration that owns the copyright to the IMS software.

8.10 The Steering Group agreed on the following messages to be conveyed to the IMS team and the IMSG:

8.10.1 The additional funding requested over four years (April 2008 to March 2012) is beyond what can be provided, given the Collaboration's current financial circumstances. However, the Steering Group will continue to reassess the ability to provide additional funding to the IMS as the Collaboration's financial situation is monitored at each Steering Group meeting, and will continue to consider detailed further, well-justified proposals from the IMS Director as a high priority for additional funding should it become available.

8.10.2 The Steering Group will ask the IMS team to provide an itemized budget showing, at differing levels of funding between that originally requested and that currently committed by the Steering Group, details of, and the rationale for, what can be achieved at each different level.
Action: Adrian, Lorne

8.10.3 The Steering Group is concerned about the risks noted in the consultant's report arising from a lack of documentation of the system, and agreed with the IMS team that documentation, particularly of APIs (Application Program Interfaces), is a high priority.

8.10.4 The Steering Group invites the opinion of the IMSG on how IMS development activities should be prioritized, given the Collaboration's current funding realities, and on the options presented by the consultant for future IMS development. Recommendations from the IMSG meeting on 13 November will be discussed by the Steering Group's Executive at its subsequent meeting.

8.10.5 A short-term ad hoc sub-group of the Steering Group (Adrian, Julian, Lorne, Nick and Ruth) will be charged with working to move things forward, optimizing communications between the Steering Group, the IMS and the IMSG.
Action: Adrian, Lorne

8.10.6 The consultant will be asked to provide additional information on the anticipated costs of the various options in the report, especially Option 3.
Action: Nick

End of extract.

Extract of provisional minutes of IMSG meeting 13 November 2008

For full minutes, visit: http://www.cc-ims.net/IMSG/Minutes/IMSG-2008-November.pdf

7.2 IT consultant's report: Adrian provided some background to the commissioning of an IT consultant, whom the Steering Group had decided to engage at its meeting in Vellore in April 2008. Value for money of all centrally funded items was being treated as a high priority. The future investment in an Editor-in-Chief had markedly changed the financial situation. Adrian would raise with the Steering Group Executive whether this would be the final version of the report, and whether the 'Confidential' label could be removed, so that others could have access to it.
Action: Adrian

7.3 IMS team's response to IT consultant's report: The version of the consultant's report that included Monica and Rasmus' comments was reviewed. Adrian said that the Collaboration was not in a position to meet the level of funds for IMS development that had been requested over and above what had already been committed (from April 2009, this would be 1.5 FTE and infrastructure costs from the NCC, and 3 FTE and operational costs from the Collaboration). Adrian said that this had been very fully discussed by the Steering Group on two separate occasions, at its meetings in Vellore and Freiburg; on both occasions it had decided that the requested increase would not be sustainable in the longer term. However, the last quarter's income from *The Cochrane Library* had been higher than expected and also there had been delays in spending on some items; this provided some short-term 'head room'. There were therefore possibilities for Monica and her team to come back with a revised budget request, providing more detail and what would be provided for particular options, at what price, and over what period of time.

Adrian pointed out that as the Collaboration's contribution to the funding of the IMS increases, so it becomes appropriate for the Collaboration to look closely at how the money is being used. Furthermore, there would be competing demands on any money available: for example, there were likely to be significant as yet unknown resource implications arising from the strategic review of the Collaboration, the training initiative, the future of CENTRAL, and the updating of reviews. Adrian said he anticipated a revised proposal would be considered at the 2009 mid-year meeting in Copenhagen but that it would be possible to do this sooner, if requested.

Dave explained that the consultant's report had not addressed the fact that potential advantages of customisation of

off-the-shelf software were not self-evident: this could be more rather than less expensive, and reduce time-efficiency rather than increase it. When customisation is necessary on top of a system, updating of versions of software is out of one's control, so responses have to be 'on the fly'; his experience with the 'Colloquium Event Manager' software had shown this. Barney said there are often gaps in bought software for which no-one takes responsibility when support is needed. Also, functionality can never be as good as bespoke software. Adrian said that one reason why off-the-shelf software had been recommended by the consultant was to protect against the risks of only a few people developing the IMS as bespoke software; this concern was one reason why the IMS team had requested additional funds. Adrian acknowledged that the IMS team and also the web team do incorporate off-the-shelf software already, but suggested that this could perhaps be done to a greater extent, in order to reduce these risks.

Monica said that the IMS is a core function of the Collaboration; if there were to be no money to develop it further, development would stop. As a consequence the vision would be abandoned and the Collaboration would risk not having a stable platform for future exploitation of its source material . The IT consultant's recommendation that the IMS development team be reduced to three people would lead to the IMS not functioning in a sustainable way. John drew a parallel with the IT disasters suffered by the NHS. He said that the IMS team knows the best way of developing the system; they could perhaps communicate better what they are doing, but the safest option is to try to get additional funds to continue with existing development plans rather than to go outside. Barney completely supported John's comments; the IMS is central to everything the Collaboration is about, historically and for the future. Methods Group abstraction of data could not work if the Collaboration ceased to be responsive via its IMS team. Volunteer authors would become frustrated and demotivated.

Sally said that CRGs were alarmed that the time and money that had already been invested in the training of editors, editorial teams and authors might be wasted; she thought there was an over-arching need for a statement as to where the Steering Group thinks the Collaboration is going in general terms with respect to the further development of the IMS systems. Ruth said that if outsourcing would cause more trouble than good, something else had to give. The Collaboration cannot continue to behave as if there is an unlimited resource available, as it has in the past. Barney noted that the report characterizes the IMS as 'state of the art' and ahead of the field. The IMS is a unique feature of the Collaboration; no-one else is doing this.

Dave said that if we take the middle ground and continue with what the IMS team has started, and we don't have enough money, we have to choose whether to take risks or to slow down development. He said he had no basis for deciding whether or not the IMS was asking for a reasonable amount of money: there were insufficient figures from the consultant, and the Steering Group's figures were unclear. Rob said that the de luxe option was a fully integrated IMS. He found it frustrating that there had been a vision five years ago, then a request for funding, and in Vellore a substantially increased request for funding. He could not judge whether the IMS was sustainable; we should make choices, and focus on RevMan, using separate software for, for example, the contact database or the workflow system. Rasmus said that the risk increased as development reduced, because it would not be possible to keep a team of developers interested if maintenance was the only thing occurring; a compromise was needed.

The IMSG went through the recommendations in the consultant's report. Barney drew attention to the fact that several people had said that the consultant had not fully understood our core business, and did not understand the progressive nature of the Collaboration. He said that the IMS was already using third-party software, and building onto it, although perhaps not at the level that was being recommended. He was concerned about the risks of loss of functionality and things falling between the gaps if the consultant's approach were to be adopted. Lorne said that in incorporating the use of third-party software, the Collaboration would need to consider the risks that had been highlighted. However, he felt that a process was needed to examine the use of third-party software more systematically, especially when large new development tasks were being considered. Barney argued that those who best understand what the IMS is there to do, and whose needs it serves, are the IMS team. This team doesn't want to make work for itself; given that it is at the cutting edge, as evidenced by the report itself; he would trust the IMS team to look to ways to expand their use of third-party software. There was some agreement with this position; however, Ruth said that the report was suggesting the opposite.

Kate said it was self-evident that other publishers don't do what we do, which is to say "Yes" to authors from Day 1 and support them throughout the process of preparing their reviews, and publishing and re-publishing them. John drew attention to the uncertainty of choosing one solution over another without having the evidence to make that choice. Rasmus said we should continue to purchase off-the-shelf software when feasible; for example, for

interrogating the Parent Database; for the future it would be counter-productive to let go of the system we already have. Sally suggested we consolidate what we have now, but look more broadly at off-the-shelf software for future developments.

Recommendation 1: Adrian summarized that there were huge pluses for adopting Option 2, if the IMS team agreed in future to ensure systematically that it continued to consider third-party components. Monica confirmed that they would continue to do so. The IMSG disagreed that Archie should be rolled back to core functionality.

Recommendation 2: The IMSG agreed with this recommendation, of retaining the current IMS team as the core of future development activity, with the current IMS team doing the work.

Recommendation 3: The Steering Group had agreed with the IMS team that it was a very high priority to document the system, i.e. to produce a programmer's guide to the use of the IMS. Dave asked how large a task it would be to document APIs. Rasmus responded that the system had very few APIs, and that documenting them would only address a small part of the need; he suggested that the aim of documentation should be to produce a programmer's guide that would make it easier for a new development team member to understand the system and work with it.

Recommendation 4: To procure additional software services: The widest held view amongst members of the IMSG was that this recommendation should not be adopted.

Recommendation 5: Agreed.

Recommendation 6: Not relevant, as an Editor-in-Chief had already been employed, and would commence in early to mid-January 2009.

Recommendation 7: Not relevant, as there are no plans to change RevMan at this point in time.

Recommendation 8: Leave the contractual agreement to Nick Royle who is already working on it. The issue of an open source licence was not a concern.

Recommendation 9: Prioritising according to the Strategic Plan: Monica's suggestion was approved, that the Steering Group should look at where it wants the Collaboration to be in five years' time, and the role of the IMS within that.

Lorne explained why he had not originally circulated the consultant's e-mail comments to the IMSG and others.

7.4 Discussion of IT consultant's report, and Steering Group's response: See item 5.3 above.

- End of extract -

Appendix C – Detailed budgets

Model A

Existing IMS Development team + 2 FTE developers from Sep 2009

	2009-10	2010-11	2011-12
Expenses			
IMS Development team salaries: 7.9 FTE (assumes 3% annual increase)	3.237.000,00	3.720.360,00	3.831.970,80
Infrastructure costs	1.000.000,00	1.000.000,00	1.000.000,00
Hardware, software and support and maintenance agreements	150.000,00	150.000,00	150.000,00
Travel (flights, conference fees, accommodation, etc) (15,000 kr/FTE annually)	120.000,00	120.000,00	120.000,00
Training (5,000 kr/FTE annually)	40.000,00	40.000,00	40.000,00
Uncategorised cost	60.000,00	60.000,00	60.000,00
Total Expense	**4.607.000,00**	**5.090.360,00**	**5.201.970,80**
Pledges/income			
Approved NCC contribution to salaries from Nordic Cochrane Centre: 1,5 FTE	795.000,00	818.850,00	843.415,50
Approved NCC contribution to infrastructure costs	1.000.000,00	1.000.000,00	1.000.000,00
Approved CC contribution (assumes a 3% annual increase on salary contribution)	1.726.756,00	1.769.806,00	1.814.147,50
Expected savings in bank *	510.244,00	189.756,00	
Total income	**4.032.000,00**	**3.778.412,00**	**3.657.563,00**
Expense minus income	**-575.000,00**	**-1.311.948,00**	**-1.544.407,80**

*) Based on a saving in previous years on hosting and software licences, and savings because of periods of an unfilled developer post, a saving on the IMS account of approximately 700,000 kr is expected by April 2009. This saving is earmarked for salaries which were not accounted for in the previous budget (April 2007-March 2009) approved by the CCSG in November 2005.

Model B

Existing IMS Development team + 1 FTE developer from Sep 2009

	2009-10	2010-11	2011-12
Expenses			
IMS Development team salaries: 6.9 FTE (assumes 3% annual increase)	2.974.500,00	3.256.860,00	3.354.565,80
Infrastructure costs	1.000.000,00	1.000.000,00	1.000.000,00
Hardware, software and support and maintenance agreements	150.000,00	150.000,00	150.000,00
Travel (flights, conference fees, accommodation, etc) (15,000 kr/FTE annually)	105.000,00	105.000,00	105.000,00
Training (5,000 kr/FTE annually)	35.000,00	35.000,00	35.000,00
Uncategorised cost	55.000,00	55.000,00	55.000,00
Total Expense in DKK	**4.319.500,00**	**4.601.860,00**	**4.699.565,80**
Pledges/income			
Approved NCC contribution to salaries from Nordic Cochrane Centre: 1,5 FTE	795.000,00	818.850,00	843.415,50
Approved NCC contribution to infrastructure costs	1.000.000,00	1.000.000,00	1.000.000,00

Approved CC contribution (assumes a 3% annual increase on salary contribution)	1.726.756,00	1.769.806,00	1.814.147,50
Expected savings in bank *	510.244,00	189.756,00	
Total income	**4.032.000,00**	**3.778.412,00**	**3.657.563,00**
Expense minus income	**-287.500,00**	**-823.448,00**	**-1.042.002,80**

*) Based on a saving in previous years on hosting and software licences, and savings because of periods of an unfilled developer post, a saving on the IMS account of approximately 700,000 kr is expected by April 2009. This saving is earmarked for salaries which were not accounted for in the previous budget (April 2007-March 2009) approved by the CCSG in November 2005.

Model C

Existing IMS Development team

	2009-10	2010-11	2011-12
Expenses			
IMS Development team salaries: 5.9 FTE (assumes 3% annual increase)	2.712.000,00	2.793.360,00	2.877.160,80
Infrastructure costs	1.000.000,00	1.000.000,00	1.000.000,00
Hardware, software and support and maintenance agreements	150.000,00	150.000,00	150.000,00
Travel (flights, conference fees, accommodation, etc) (15,000 kr/FTE annually)	90.000,00	90.000,00	90.000,00
Training (5,000 kr/FTE annually)	30.000,00	30.000,00	30.000,00
Uncategorised cost	50.000,00	50.000,00	50.000,00
Total Expense	**4.032.000,00**	**4.113.360,00**	**4.197.160,80**
Pledges/income			
Approved NCC contribution to salaries from Nordic Cochrane Centre: 1,5 FTE	795.000,00	818.850,00	843.415,50
Approved NCC contribution to infrastructure costs	1.000.000,00	1.000.000,00	1.000.000,00
Approved CC contribution (assumes a 3% annual increase on salary contribution)	1.726.756,00	1.769.806,00	1.814.147,50
Expected savings in bank *	510.244,00	189.756,00	
Total income	**4.032.000,00**	**3.778.412,00**	**3.657.563,00**
Expense minus income	**0,00**	**-334.948,00**	**-539.597,80**

*) Based on a saving in previous years on hosting and software licences, and savings because of periods of an unfilled developer post, a saving on the IMS account of approximately 700,000 kr is expected by April 2009. This saving is earmarked for salaries which were not accounted for in the previous budget (April 2007-March 2009) approved by the CCSG in November 2005.

Model D

Reduced IMS Development team

	2009-10	2010-11	2011-12
Expenses			
IMS Development team salaries: 4.5 FTE + 0.4 FTE until April 2010 and 1 FTE until November 2010 (assumes 3% annual increase)	2.712.000,00	2.491.312,50	2.371.111,50
Infrastructure costs	1.000.000,00	1.000.000,00	1.000.000,00
Hardware, software and support and maintenance agreements	150.000,00	150.000,00	150.000,00
Travel (flights, conference fees, accommodation, etc) (15,000 kr/FTE annually)	90.000,00	76.250,00	67.500,00
Training (5,000 kr/FTE annually)	30.000,00	25.400,00	22.500,00

Uncategorised cost	50.000,00	50.000,00	50.000,00
Total Expense	**4.032.000,00**	**3.792.962,50**	**3.661.111,50**
Pledges/income			
Approved NCC contribution to salaries from Nordic Cochrane Centre: 1,5 FTE	795.000,00	818.850,00	843.415,50
Approved NCC contribution to infrastructure costs	1.000.000,00	1.000.000,00	1.000.000,00
Approved CC contribution (assumes a 3% annual increase on salary contribution)	1.726.756,00	1.769.806,00	1.814.147,50
Expected savings in bank *	510.244,00	189.756,00	
Total income	**4.032.000,00**	**3.778.412,00**	**3.657.563,00**
Expense minus income	**0,00**	**-14.550,50**	**-3.548,50**

*) Based on a saving in previous years on hosting and software licences, and savings because of periods of an unfilled developer post, a saving on the IMS account of approximately 700,000 kr is expected by April 2009. This saving is earmarked for salaries which were not accounted for in the previous budget (April 2007-March 2009) approved by the CCSG in November 2005.