Commonwealth Department of Health and Family Services

and

IBM Consulting Group

Clinical & Administrative General Practice Computer Systems Consultancy

GPCS CONSULTANCY

REPORT

Prepared By

IBM Consulting Group Health Practice

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Executive Summary

In late January 1997, the Commonwealth Department of Health and Family Services (DH&FS) General Practice Branch (GPB) engaged the IBM Consulting Group to conduct a project to deliver an appropriate functional requirements specification and supporting technical framework for Clinical and Administrative General Practice Computer Systems (GPCS) that will ultimately lead to widespread adoption and use by practitioners, and to investigate and report a broad range of issues surrounding the development, utility, adoption and effective use of the GPCS.

The essential premise on which the overall consultancy was based was that providing the medical software industry of Australia with quality specifications would act as a major catalyst for the industry to improve the quality, availability and utility of General Practice software and ultimately lead to improvements in the overall quality of care delivered by General Practice.

The broad objectives and scope of this consultancy are documented in the *Project Charter*, which defines the key project management elements for this consultancy. This consultancy adopted a *five* phased approach to develop the major deliverables. Following endorsement of the Charter (Phase One deliverable) by the DH&FS in March 1997, Phase Two background research and stakeholder consultation commenced. The GPCS Consultancy Report follows the Functional Requirements Specification (Phase Three deliverable) and Technical Framework and Architecture Reports (Phase Four deliverable) delivered in July 1997, and GPCS Scope Definition and Stakeholder Consultation Report (Phase Two deliverable) delivered in June 1997.

The purpose of this Report is to consolidate the literature research and stakeholder consultation findings and clearly articulate the benefits and importance of automation of General Practice, and the barriers and issues impacting the successful implementation and widespread adoption of the GPCS by practitioners within an acceptable (short) timeframe.

From our research, it is clear that there are compelling reasons for deployment of an information technology infrastructure in General Practice. The benefits that may accrue to the relevant stakeholders from automation of General Practice are significant and include:

- A higher level of consistency & quality of patient care.
- Confidence for the consumer that their practitioner has the necessary support and information to effectively co-ordinate the delivery of their care and to effect the best outcome.
- Greater access to information on how the practice is performing both clinically and financially.
- Diminution of risk to patient and practitioner through the provision of alert and reminder systems.
- Confidence for the practitioner that patient treatment is being delivered optimally.
- Avoidance of, or reduction in the effort involved, in the production of forms.
- Reduction in the time and effort required to produce legible, properly formatted prescriptions.
- Much enhanced connection and flow in information from the General Practice to and from diagnostic test providers, hospitals, specialists, other General Practitioners and patients.
- Expansion of and an increase in the co-ordinating role of the General Practitioner.
- Enhanced rural practitioner communication / retention.

- Reduced cost of claims management and benefits payment.
- Improved capability for clinical outcome based assessment, funding and disease management approaches to be implemented.
- Improved rational use of drugs, immunisation rates and cancer screening rates.

In the conduct of this engagement, the following major findings have emerged:

- The GPCS will be a significant and challenging system to develop, but is demonstrably not beyond the capability of software developers of similar products overseas.

- There are major benefits to be obtained for all stakeholders in the progressive automation of General Practice.

- Successful automation of General Practice will require high quality, integrated software covering a broad range of functionality.

- The GPCS must intrinsically address a number of critical technical requirements including speed, reliability, ease of use and robustness, data entry, data integrity, data security and protection, software and information currency, data portability and practitioner mobility, in addition to providing an application suite with a very broad range of functions to a significant depth.

- A properly architected Electronic Health Record possessing the attributes described in the Functional Requirements Specification Report, was found to be central to the effective use of a GPCS and the delivery of improved quality of patient care supported by sophisticated decision support linked to both the EHR and appropriate medicine knowledge-bases.

- The GPCS as specified in the Functional Requirements Specification Report is technically feasible assuming the appropriate information sources are available to support its operation.

- The present levels of computerisation of General Practice continues to be significantly less than most of the advanced western democracies and there is evidence in the literature that raising this level will result in significant improvements in the health of the community.

- From development of the GPCS Functional Requirements Specification, it is apparent that an adequate breadth and quality of General Practice software (as perceived by practitioners) does not presently exist in this country and this is significantly impacting rates of adoption and use.

- The most significant barriers to computerisation are not technology related issues.

- Evidence that Government policy decisions and funding can profoundly alter practitioner adoption and use of computers.

- There are a range of infrastructure, standards, policy and legislative issues that need to be addressed before the full value and benefits of the GPCS can be realised by all major stakeholders.

- The cause of low adoption of computers by practitioners is multi-factorial and includes at least:
  - Poor functional fit of existing software with practitioner requirements
  - Poor quality of user interfaces with many systems and the low perceived level and quality of vendor system support and training provided
  - The unstructured and complex nature of General Practice
  - Concern by practitioners with the one-time and on-going costs of computerisation
  - Lack of specific funding as part of a larger adoption strategy
  - Lack of an adequate co-ordinated effort by Government and professional bodies to encourage adoption through education, training and payment
  - A perceived real imbalance in the benefits and costs between major stakeholders
  - A range of human factors such as fear, uncertainty and doubt
  - Practitioner technophobia
  - Change toxicity on the part of practitioners – 'too much change too fast'
  - Lack of demonstrable quality support services and variable medical software industry performance
  - The perverse incentive issue – the structural linkage between short consultation time and profitability for practitioners which computers may impact negatively.

- It is clear from the U.K. experience with computerisation of General Practice, that an appropriate policy framework and incentives will significantly impact the quantum and rate of adoption of computers by practitioners.

- The lack of Information Technology (IT) infrastructure in General Practice will very soon limit important policy options.

- There will be an inevitable delay between initial delivery of GPCS compliant systems and widespread adoption which will need to be managed.

- Developing a GPCS and obtaining widespread adoption are separate issues for which separate but highly co-ordinated strategies are needed.

It is clear that successful delivery of the GPCS, as specified, in a reasonable and acceptable timeframe to the key Stakeholders will be a complex undertaking requiring a high level of co-ordination and management of a large range of critical and diverse tasks

In summary, based on the evidence we have accumulated from our consultation and research, there exists a compelling case for automation of General Practice using systems developed in conformity with the Specifications provided in this consultancy.

Preface to this Report

This Report consolidates the information gathered from the stakeholder consultation and literature research conducted during all phases of this consultancy, and presents an overview of the functional requirements specification and technical framework and architecture detailed in previous reports.

This Report should be read in conjunction with the following consultancy reports:

1. ***Technical Framework and Architecture Report*** **- which describes the high level technical architecture and standards for the GPCS.**

2. ***GPCS Scope Definition and Stakeholder Consultation Report*** **- which provides the overall scope of the GPCS, analysis of issues from stakeholder consultation and context for the Functional Specification Report.**

3. ***Functional Requirements Specification Report*** **- which presents the detailed functional specification in addition to the analysis of workshop findings, standards framework, general requirements and interoperation principles for the GPCS.**

This Report has the following sections:

Sections 1.0 and 2.0 provide the objectives and context for this Report.

Section 3.0 outlines the process adopted in the development of the GPCS Consultancy Report and review of documentation.

Section 4.0 presents the key findings from the literature research on General Practice Computing Systems and relevant world-wide project initiatives conducted during phases 2-5 of this consultancy.

Sec*tion 5.0* consolidates the key findings arising from the stakeholder consultation conducted during phases 2-4 of this consultancy (documented in previous reports) and presents the major conclusions drawn from analysis of these findings.

Sections 6.0 provides a brief overview of the Functional Requirements Specification and major implications of this specification.

Section 7.0 provides a brief overview of the Technical Framework for the GPCS and major implications arising from the technical architecture.

Section 8.0 presents the functional scope of GPCS releases based on a comprehensive set of evaluation criteria that considers functional need, technology maturity and availability, degree of difficulty to develop, estimated cost to develop and implement, existence and impact of known constraints, and timeframe to develop.

Finally, *Section 9.0* presents our concluding remarks on automation of General Practice with regard to:

a. the scale of the contribution that automation of General Practice can make to the overall efficiency and effectiveness of General Practice and the overall quality of patient care provided to the Australian population.
b. the major barriers and issues impacting the successful implementation and widespread adoption of the GPCS by practitioners within an acceptable (short) timeframe.

The authors of this Report wish to acknowledge the valuable contribution of the GP Expert Panel throughout the consultancy and the stakeholder consultation and workshop participants and contributors. In addition, we would like to acknowledge the quality review and contribution provided by the Project Steering Committee and Reference Advisory Board members. *Appendix A* provides a list of the project GP Expert Panel and project committee members. The IBM Consulting Group consultants that contributed to this consultancy are detailed in *Appendix B.*

Paul Clarke, Senior Consultant
David More, Health Industry Specialist
IBM Consulting Group

Section 1.0 Scope and Objectives of the Report

The purpose of this Report is to consolidate the literature research and stakeholder consultation findings and clearly articulate the benefits and importance of automation of General Practice, and the barriers and issues impacting the successful implementation and widespread adoption of the GPCS by practitioners within an acceptable (short) timeframe.

The specific objectives of this Report are to:

- Provide a summary of the key findings arising from the stakeholder consultation process conducted in order to ascertain the state of the existing Australian General Practice business environment, existing policy, legislative, infrastructure, operational and other major barriers and constraints impacting adoption of IT by practitioners.

- Present the key findings from extensive global literature research conducted on General Practice Computing Systems.

- Present the recommended functional scope of GPCS applications / functions for the initial and subsequent releases based on assessment of a broad range of criteria.

- Present the case for automation of General Practice and the impact of the complex set of issues identified in this consultancy that need to be addressed in order to achieve widespread adoption and use of the GPCS.

Section 2.0 Background and Context

For a number of years it has been recognised that the adoption and use of computers by general practitioners in clinical practice in Australia was very much lower than that seen on other advanced democracies, especially in Europe[1-6]. Because of a range of concerns held by the Commonwealth Government regarding the quality and consistency of General Practice, and enthusiasm on the part of the Royal Australian College of General Practice (RACGP) and the Australian Medical Association (AMA) to improve the overall quality of patient care through, among other things, planning and strategizing for an increased deployment of information technology in this arena has been underway for a number of years.

Since at least 1992, the Government and the medical profession have been co-operatively studying the introduction of Information Technology into General Practice. The Information Management Steering Group (IMSG), which acts as a key advisory body on these matters to the Commonwealth Government, was established in 1993 and recommended that a common business specification statement for GP systems be produced.

In September 1995, the IBM Consulting Group was commissioned by the Department of Health and Family Services (DH&FS) Pharmaceutical Benefits Branch (PBB) to investigate the optimal use of Information Technology in the support of Electronic Prescribing and the provision of electronic medicines information.

While undertaking this engagement, it was recognised that rather than treat Electronic Prescribing in isolation, it should be considered in the context of a Clinical Workbench. Subsequently, the IBM Consulting Group recommended in the Final Report presented to the PBB in March 1996, that ideally a Clinical Workbench should be introduced to 50% of Australian office-based practices within approximately two years. This Report identified a significant net benefit to the Australian community to be realised from widespread adoption and use of electronic prescribing as part of the Clinical Workbench. The recommendations of this consultancy were considered by Government and a tender to conduct this consultancy was released in late 1996.

The scope of the system to be specified by this consultancy was broadened to encompass the provision of administrative support in the addition to providing clinical support for General Practitioners as recommended in the previous report.

The IBM Consulting Group understands the Clinical & Administrative General Practice Computer System (GPCS) to be a set of application functions or closely linked / integrated software applications (including clinical and administrative) that combine a high level of functionality and utility with a user-friendly and consistent user-interface to support high quality and efficient clinical practice. It is further recognised that seamless access to a range of information based services are highly desirable features and that the scope and feasibility of including a broad range of diverse functions as part of the GPCS needs to be properly assessed.

To permit the benefits identified in the IBM Consulting Group's Final Report to be obtained as soon as possible, it was recommended that the functional scope of an implementable GPCS be developed promptly. The GPCS consultancy began proper in February 1997 and was completed in August 1997.

[1] Cacek, Joseph: *A Survey of the Attitudes of Australian General Practitioners to Computerisation of Medical Records*. Thesis for Master of Family Medicine, Monash University, Victoria, 1995.

[2] Health Insurance Commission, (1997) Personal Communication and data quoted in Thomas, Craig (reference 6 below). Canberra, 1997.

[3] IBM Consulting Group*: GPCS Scope Definition and Stakeholder Consultation Report*. Sydney, June 1997.

[4] MacIsaac, Peter & Amin, Neil: *Information Technology in U.K. General Practice - A Personal View*. *Informatics in Health Care* (Australia), October, 1996.

[5] Munday, Nigel: *A Study of the Use of Information Technology in South Australian Private Medical Practice*. MBA Project Thesis, University of Adelaide, South Australia, 1995.

[6] Thomas, Craig (1997): *The Computerised Practice Push, Medical Observer Business*. pp28-32. April-May, 1997.

Section 3.0 Consulting Approach and Methodology

3.1 Overview of the Consultancy Process

As described in detail in the *Project Charter*, the overall consultancy process adopted for this project consisted of five phases The approach used to produce the GPCS Consultancy Report, which is the major deliverable of Phase Five of this consultancy, involved several major streams of activity:

a. *Background global literature research on doctor's desktop offerings, relevant projects and useful existing and emerging standards.* This activity was initiated during Phase Two and continued through Phase Five of the consultancy to identify relevant global (and local) initiatives and current projects involving application and standards development and implementation. This Report considers the most significant research findings impacting the functional specification and issues surrounding adoption and use of the GPCS. *Section 4.0* documents the major findings from this research.

b. *Overall analysis of stakeholder consultation findings.* A comprehensive analysis of the findings from all stakeholder consultation conducted during this consultancy (as documented in the preceding consultancy reports) was performed and the key conclusions to be drawn from this analysis are documented in *Section 5.0* of this Report.

c. *Development of the recommended GPCS functional scope.* This step involved production of a functional migration release strategy for the GPCS as presented in *Section 8.0*.

d. *Development / Completion of the Draft GPCS Consultancy Report.*

e. *Review by the DH&FS.* The draft Report was reviewed by the DH&FS prior to release to the PSC and RAB.

f. *Quality review and Finalisation of the GPCS Consultancy Report.* This step involves review of the draft Report by the Project Reference Advisory Board and Project Steering Committee and following review and endorsement by the Project Steering Committee, the Report will be issued as a final version.

3.2 Reference Documentation

The major reference documentation for this Report includes:

- GPCS Scope Definition and Stakeholder Consultation Report[1]
- Functional Requirements Specification Report[1]
- Technical Framework and Architecture Report[1]
- Project Charter
- Stakeholder Consultation Transcripts

In addition, references from the literature research are provided in *Section 4.6* and other specific references are made in footnotes where appropriate.

[1] These documents are provided as *Attachments* to this Report.

Section 4.0 Research Findings on Primary Care Computing Systems

4.1 Purpose of this Section

This section of the report provides the contextual background on which the functional specification for the GPCS was developed and brings together a range of information which assists in understanding the issues surrounding the GPCS which extend beyond the specification itself.

This section also provides the background research conducted on those issues seen as important to the eventual successful development and implementation of the system specified elsewhere in these pages.

4.2 Background and Context

4.2.1 Why a GPCS is Needed

There are a wide range of stakeholders in the development of the specification and technical architecture for the GPCS. Among the important ones are:

- The Practitioners
- The Royal Australian College of General Practitioners
- The Australian Medical Association
- The Consumer and Patient
- The Medical Software Industry
- The Commonwealth Government

Each of these stakeholders has a different view of the priority and shape of the GPCS, but all are agreed that the time for improved automation of General Practice, that will benefit all of the stakeholders mentioned above, has well and truly arrived. The GPCS specification is intended to be the first step in the emergence of a new breed of General Practice systems which are intended to be useful enough and attractive enough to have the vast majority of practitioners decide to implement them.

The Commonwealth Government, and the Department of Health and Family Services in particular, has a number of major initiatives which target an improvement in the overall quality of care delivered by General Practice. These initiatives are based on the premise that an improvement in the quality of General Practice delivery can both improve the health of the Australian Community while at the same time reducing the overall cost of heath care to the Budget.

The Department, while being satisfied with the standards and quality of the best General Practice, is concerned that there is very considerable variation in the quality and consistency of care delivered and that present clinical practice is not evidenced-based to the degree desired. It is also recognised that minimising that variation and encouraging consistency at a good quality of care would go a long way to achieving many policy goals.

A well designed GPCS can make major contributions to these goals through:

- Provision of Clinical Decision Support based on approved therapeutic guidelines
- Simplification of detection of potential side effects and drug interactions
- Prompting of a patient's need for preventative therapy and immunisation
- Reducing the incidence of duplication of ordered services (eg Pathology tests)
- Provision of information which can be used for assessment of clinical outcomes
- Improving the quality and timeliness of communication between practitioners

It is also clear that there is broad recognition that implementation of programs in the areas of immunisation, evidence-based medicine, outcome based funding and care co-ordination will be either delayed or much more costly without reasonable levels of GP automation.

It is important to recognise that there is significant evidence to support the view that such systems can make a significant difference to the quality and consistency of patient care. Key among this is a recent paper which evaluated 98 randomised clinical trials assessing the efficacy of clinical information systems. This study concluded that there was strong and statistically significant evidence that in General Practice there are at least four effective computer supported interventions. These are patient and physician reminders, decision support of treatment planning and interactive patient eduction. (Balas EA et al, 1996[1])

The broad range of benefits that practitioners can receive is well illustrated in the *Table 4.1* below. While the table is of U.S. origin, the vast majority of benefits identified here would be applicable to the Australian situation once the GPCS was implemented.

Table 4.1: Range of Benefits Realisable from Implementation of Advanced GPCS Class Systems

Benefit Type	Tangible Financial Benefits	Intangible Financial Benefits	Non-Financial Benefits
Productivity Enhancements	* Reduction in chart pulls cuts labor costs in medical records. * Interfaces reduce labor costs for personnel involved in coding, billing, manually retrieving lab results, referral coordination. * Reduced transcription costs. * Malpractice premium savings. * Less dictation time, faster documentation of encounters. * Improved charge capture, documenting home health management. * Reduced nurse intake time. * Faster billing reduces cash cycle, delayed receivables. • Document storage space, costs reduced.	* Scheduling of resources becomes more efficient. * Easier QA and UR reporting. * Less time on copying, filing, faxing and transmitting data. Lower supply costs. * Fewer lab results lost, repeat tests. * Aggregate patient data improves financial forecasting, risk assumption. * Automation of referral process and more appropriate use of specialists.	

Table 4.1: Range of Benefits Realisable from Implementation of Advanced GPCS Class Systems (continued)

Benefit Type	Tangible Financial Benefits	Intangible Financial Benefits	Non-Financial Benefits
Quality of Care Improvements	* Guidelines reduce expensive variations in patient treatment. * Less time searching through records for relevant patient information. * Reduction in the cost of having to repeat lab tests.	* Reduced medication errors, adverse drug interactions. * Improved primary and preventive care (through automated reminders, protocols and alerts) reduces disease management costs, specialty and inpatient care. * Availability of chart vastly improved. * Improved data analysis, outcomes measurement, population-based care. * Remote access to patient charts. * Summary screen helps prevent overlooked patient information. • Ease of providing summary information helps specialists with care.	* Improved quality of documentation and legibility. * Improved outcomes reporting. * Less information falls through the cracks in a continuum of care.
Improved Customer Service Satisfaction		* Less need for repeat lab testing. * Ease of getting medication refills authorized; faster turnaround time on refill requests. • Less paperwork as patients move throughout the health system.	* Confidence their doctor is using the best information technology available. * Improved communication with pre-formatted letters, educational handouts, etc.
Increased Professional Satisfaction	* More time to spend with patients.	* Reduction in paperwork. * Improved communication and less time consumed with routine information exchange.	* Increased satisfaction with availability, documentation of records, efficiency of chart reviews and signing, etc. * Ease of covering for other providers' patients. • Ease of tracking referred patients.

(Source: MedicaLogic Inc.: *A Return-on-Investment Analysis: Electronic Medical Records in the Outpatient Setting.* 1996)

The Australian Medical Association's Pru Power [Quoted in Thomas (1997)[2]] is very clear that she sees the GP automation as vital for General Practice to retain its central role in patient care delivery through into the next millennium, and that the changes in GP funding, with an increasing move to blended payments, will make the need for automation increasingly urgent.

The Royal Australian College of General Practitioners has recently been working with the AMA to define goals for GP computerisation and these groups have suggested they would like to see of the order of 90% of practitioners using 'entry level' clinical systems (such as prescribing) by the year 2000 (AMA / RACGP, 1997[3])

The Australian Health Insurance Commission has been working for the last few years to implement an electronic claims system which would avoid the paper based claims process which is still used by approximately 80% of practices for making their Medicare claims. Elimination of the paper flow and data entry effort has been estimated to be able to save the HIC some thousands per annum for each practitioner using the system. Recognising that there are potentially over 30,000 users of an effective and integrated claims system the interest the HIC has in the GPCS project is obvious. Less obvious are other benefits which may flow from having GPs and the HIC connected effectively including easier billing reconciliation, simple update of the various billing schedules and provision of a range of clinical and administrative feedback to the practitioner in a secure fashion.

For the patient (and consumer) of health care the basic thrust of improving the consistency and quality of the care received is obviously attractive. There are, however, a range of other consumer side benefits including having the doctor be able to simply and quickly print out relevant health information for the patient and have the patient be able to work with the doctor to verify and review their medical record as it is entered on the computer.

4.2.2 Major Projects World-Wide

The health care industry globally is sufficiently large, and of sufficient importance, to ensure there is considerable effort and investment being made in Information Technology to support health care delivery. With very few exceptions Primary Care / General Practice did not see much of this effort or investment until the emergence of the micro-computer, the focus up until that time having been in the Hospital Sector by and large. By the 1980's and later there was increasing recognition of the place of computers in office based practice and by 1990 the most significant textbook in the field (Shortliffe et al, 1990[4]) included a chapter devoted to the topic. Further experience in the area was also obtained from work undertaken in the context of development of a range of hospital outpatient systems.

In the last decade significant research and effort has been emerging from three major sources; United Kingdom, Europe and the United States.

In the United States and Canada the American Medical Informatics Association (AMIA) (http://www.amia.org), their journals and the conferences they run provide the best overview of what is emerging. There is a specific AMIA Family Practice / Primary Care Working Group and a Newsletter is produced 2-3 times a year (http://www.med.ufl.edu/medinfo/pcnews). Review of the current and past issues of this newsletter and other AMIA Proceedings reveal a range of interests and concerns that are similar to those in Australia. Much of the discussion covers topics like coding, portable computers, term sets and decision support and it is clear that no major topics which would influence the functional specification or technical architecture have been overlooked. It is also clear that the whole area of vocabularies and coding is still very much 'work in progress', with no clear consensus direction having emerged.

Also of interest, and covered, in detail in the standards section of the Functional Requirements Specification Report and in *Section 4.5* of this Report, is the work being undertaken on development of standards for electronic health records. This work is again also work in progress rather than a finished product. The major entities involved in standards development work in these areas include:

- The National Library of Medicine
- The Computer Based Patient Record Institute
- American Society for Testing and Materials

In addition, major standards influencing bodies engaged in Electronic Health Record research and other related activities include:

- The Medical Record Institute
- The American Medical Informatics Association.

In Europe, a co-ordinated research and development program has been underway for a number of years under the auspices of the European Commission. The Directorate General XIII has responsibility for Telecommunications and Information Markets and it was realised that as the single market evolved there would be a need for a coherent European Infrastructure for Health Information. This implied both working out what was required and standardising on practical workable and effective solutions. After preliminary research and definition of what was required a set of exploratory and more developed projects were funded between 1987 and 1994 as the Advanced Informatics in Medicine (AIM) projects. The third framework concluded in 1994/5 and a fourth framework is underway from 1995 to 1998. A feeling for the scale of these projects can be gained from the fact that the 2 year exploratory program involved 43 projects and cost 20M ECU (1 ECU=.80$US). The total investment in the entire set of projects up to the end of the fourth framework will be well over $A200 million.

Among the specifically relevant projects for Primary Care have been:

GEHR – The Good European Health Record which has provided a major contribution to this consultancy's consideration of Electronic Health Records and which now form the basis of a European Pre-standard on such records.

DILEMMA – A project which undertook logic engineering in General Practice (among other areas) and produced decision support systems which were informed by information contained in an Electronic Health Record.

EPIC – Developed technological approaches to support the delivery of integrated health care in a local health care system using a shared care database to which all carers had access.

GALEN – Generalised Architecture for Language Encyclopaedias and Nomenclature in Medicine – A three year project to develop practical tools for managing medical language and terminology in a multi-lingual environment. The Terminology Server that resulted from this project is now being deployed in a wide range of practical and useful applications in areas such as coding, decision support and information retrieval.

GALEN-IN-USE has been taking the material developed by the Galen Project and embedding it in a range of clinical products.

GAMES-II – A General Architecture for Medical Knowledge-Based Systems- This project addressed the issues of knowledge base construction and decision support based on the knowledge base.

ISAAC – Integrated System Architecture for Advanced Primary Care – Defined a functional model describing General Practice across Europe and is now the basis of commercial systems being deployed in southern Europe.

OPADE – Optimisation of Drug Prescription using Advanced Informatics – A project which developed a prescribing package with flexible and configurable decision support.

PRESTIGE – Patient Record Supporting Telematics and Guidelines. A project to implement and evaluate guideline based decision support at the practitioner level.

PRIMACARA – Concerted Action on Telematics Used in Primary Health Care – Reviewed the place, role and requirements for information and communications technology in Europe.

Current Information on all the projects is best obtained from the European Health Telematics Observatory (http://www.ehto.be). This site includes a full list of projects, reference to appropriate other sites and other current information.

In addition to this major initiative and its sub-projects there are also a range of projects being sponsored by national governments. The range of projects being conducted by the Sowerby Unit for Primary Care Informatics at the University of Newcastle (http://www.ncl.ak.uk/~nphcare) is impressive and shows the benefit that can be derived from even quite small amounts of funding. The PRODIGY (Prescribing RatiOnally with Decision support In General-practice studY) is one such example where a great deal has been learned about both the support of quality use of medicines and the place of decision support from one really quite small project involving a little over 100 practitioners. (Purves & Sowerby, 1996[5])

Also it is possible to get a view of the valuable work being undertaken in a variety of smaller sites by consideration of the UK 1996 Healthcare IT Effectiveness Awards. (Hemming, 1996[6]) Among the winners were projects involving:

- Improvement of Information Exchange in the Community
- Demonstration of substantial cost savings from electronic prescribing with decision support
- Development of radiology guidelines which are incorporated in order pathways
- Radio networking to provide a virtual nursing home
- Diagnostic test ordering and results reporting by electronic linkages to 100 practices

In Australia, despite the lack of major funding for health informatics, there have been some attempts to undertake research in the Primary Care Informatics area. Major contributors have been the RACGP, most especially with the creation and support of the RACGP Computer Fellow position and their support for the regular Computer Conferences and the academic departments of General Practice and medical informatics where many of the current contributors are or have been based.

The progressive growth over the years of attendance at the Computer Conference is a very significant pointer to a rising level of practitioner interest in the area. Of most value to date, in the broadest sense has been the work done by the RACGP in co-ordination of the Computer Assisted Practice Project (CAPP) (1987-1993). This project provided valuable insights into many issues related to computerisation of Australian General Practice (MacIsaac et al, 1994[7]).

4.3 The State of the Art in General Practice Computing

4.3.1 The Australian Scene

Australia has been considerably slower than other advanced countries in computerising General Practice. While the available figures vary to some degree [Thomas (1997)[2], MacIsaac & Amin, (1996)[8], HIC (1997)[9], Cacek,(1995)[10]], surveys conducted in the last few years, indicate that the following:

- Approximately 60% of practices have Computerised Patient Billing Systems
- Approximately 20% of practices are using electronic claims transmission (MedClaims)
- Between 10 and 20% of practices are using a computerised prescribing package
- Considerably less than 10% of practices are using anything that could be described as a Computerised Medical Record or other major clinically orientated applications.

This rate of uptake of computerised medical record systems is similar to that observed in the US [Wilson, 1997[11]] and the stated barriers to further adoption are also similar [Treister, 1996[12]]. This pattern of use reflects the financial incentives that presently exist in Australian General Practice. Computers have been adopted and used in this environment where the practitioner can see a financial benefit, either directly, or through being able to increase patient throughput which in the fee-for-service situation can directly increase income. Use of any application that is not going to have a direct impact on the practice 'bottom line', in the absence of other modifying factors, will remain the preserve of the 'computer enthusiast'.

This view has been very recently confirmed in the GPCS Scope Definition and Stakeholder Consultation Report of this engagement, although it must be highlighted that there is an increasing recognition that the benefits obtainable for General Practice through introduction of the use of computers on the General Practitioner's desk now mean that the level of financial subsidy required for mass adoption to occur may be dropping.

This overall pattern of use was confirmed by a more detailed review of the use of computers in 12 practices conducted by Munday (1995) [13].

Also contributing to the present slow adoption of Information Technology in General Practice are a range of other factors (refer to the GPCS Scope Definition and Stakeholder Consultation Report and to the Electronic Prescribing consultancy reports (1996) [14]). These include, importantly, the high cost of initial computerisation of practices, the lack of obvious compelling benefits for which the practitioner is the recipient and a degree of rational scepticism of unnecessary change (See for example DIMS, 1997[15]).

It seems likely that little will change until better alignment is obtained between those paying for computerisation of General Practice and the recipients of the benefits of this computerisation, although with improvements in the ease of use, functionality and reliability of systems in the last few years the issue is gradually abating.

It should also be noted that the participants in the RACGP CAPP were quite convinced of the value of a range of attributes of the system used in that project to improve the quality and consistency of preventive measures taken by practitioners, obtaining dramatic improvements in immunisation and screening rates in very short periods. These benefits to patients were separate from the wide range of practice efficiency and financial benefits identified. (MacIsaac et al, 1994[7])

It is of interest that Cacek (1995) [10] reports that in a sample of GP's who were randomly selected, and appeared to be a reasonably representative sample of the whole GP population, almost half reported having a PC as at home which was used for word processing, spreadsheets, games and the like. A significant majority of GP's between the ages of 41 and 50 reported PC ownership, almost certainly reflecting ownership at least partly driven by the secondary school requirements of their children. These levels of ownership and use (80%+ using word-processing and almost half using databases) challenge the traditional suggestions about GP's being 'frightened of computers', 'computer phobic' and the like.

As far as the products being used, there having been no expectations being set by Government, the Colleges or the AMA as to what should be the application set used by practices and no attempt to set any clearly defined standards regarding comprehensiveness, technical quality, support levels etc the software industry has developed a wide range of different products, none of which have really achieved widespread market acceptance. The only exception to this has been the emergence of two increasingly widely used prescribing packages which have addressed a clear need and both of which have had a level of financial support during development funded from non-traditional and relatively deep pockets.

In essence, and it is acknowledged by the medical practice software industry, that the industry is still virtually a 'cottage industry' with few companies having reached the size, and developed the client base, required for long term financial viability and investment in on-going, state of the art research and development. It is also true that those major specialist overseas organisations that have reviewed the medical practice software market in Australia have to date opted not to become involved. A major intended outcome of this engagement is to provide guidance to this emerging industry as to what they must do in both software product and support terms to grow and reach the size and market position required.

4.3.2 Europe and the United Kingdom

The United Kingdom's National Health Service has been interested in computerisation for many years, the first Government program being the 'Micros for GP's' initiative which was conducted in 1982. However the real growth in computerisation happened in the years 1987 to 1994 when the percentage of computerised practices in England and Wales rose from 10% to 83%. According to a publication from the Royal College of General Practice Information Sheet (RCGP, 1995[16]) there were four major factors in this very steep rise in computerisation. These were:

- The rapid decrease in the cost of computer hardware and software, and the significant increase in the power of such systems

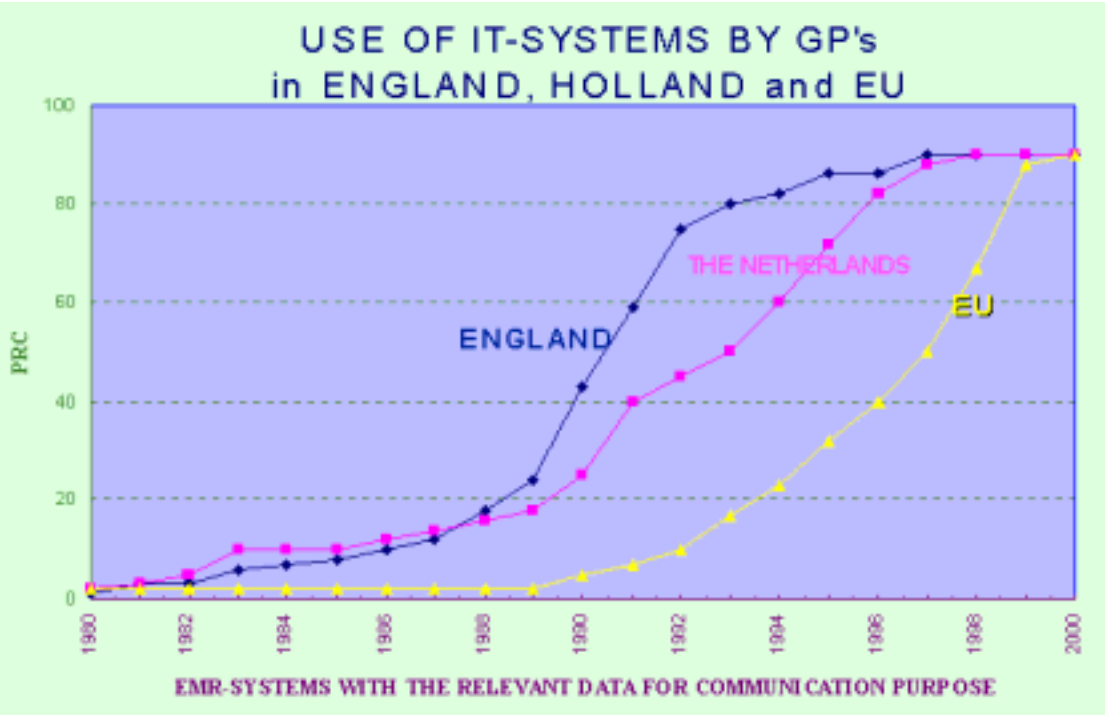
- The introduction of the 'no cost' computer schemes in 1987

- The introduction of the new GP contract and the publication of the "Health of the Nation" in 1991 with it's emphasis on information collection and analysis, particularly in relation to health promotion targets, and

- The agreement by the Department of Health in 1990 to reimburse part of the cost of purchasing and maintaining computers in General Practice.

The impact of these policies, and similar approaches adopted in other places in Europe is seen in the following graph.

Figure 4.1: Computer Usage by GP's in the EU



(Source: EHTO World Wide Web Repository – http://www.ehto.be/aim/volume1/conclusions.html)

It should be remembered that there will be a cost associated with achieving such high levels of use, however at present it seems likely that such a major investment will be undertaken with the proportion of total Health Expenditure spent on IT reaching 3% by the year 2000 in Europe (EHTO, 1997[17]).

Taken as a whole these steps were clearly an adequate policy solution to the requirement to achieve a significant level of practice automation. In recent times a variety of initiatives have been undertaken to expand the role of the installed computers and to encourage networked connection for the computers. It is understood that in Scotland significant funding is being provided for Integrated Services Digital Network (ISDN) connection and servers to permit linkage of practices to a secure National Health Services Network for e-mail transmission and receipt and information transmission to a variety of health services and agencies (G. Flaherty, 1997[18]).

It is of interest that as early as 1993 over 80% of practices were using computers for patient registration, repeat prescribing and recall / reminders. Penetration of even these basic functions to this level can only, when combined with the additional basic health data being collected, have a substantial positive impact on the overall health of the UK population.

A clear view of UK General Practice Computing is also provided by the three chapters on Computers in General Practice found in the booklet 'The ABC of Medical Computing' which was originally published in the British Medical Journal. (Lee, N & Millman , 1995[19]) It is of note that at the time of writing the modern General Practice system was described as having the following basic features:

- Age-sex register
- Comprehensive clinical records
- Acute and repeat prescribing

- Call and recall systems
- Complex reporting modules for
  - Practice Management
  - Clinical Audit
- Word processing linked to database
- Email between users
- Electronic links to family health services authorities and hospital pathology laboratories

Optional Extras were seen as including:

- Appointment systems
- Fundholding software
- Various "expert systems"
- Portable computers for home visits

In summary, what emerges overall is that both the UK and most of Western Europe have concluded that IT in General Practice is good for a nation's health and are investing whatever is required to have it implemented and used.

4.3.3 The United States

As with many other things the United States has a very broad range of approaches and uses of information technology in the primary care area of the health sector. In addition it is clear that the decade of the 90's is one of tumultuous change in the US Health Care sector. This enormous tide of change is having an significant impact on the office based practice market. (Office based practice is the closest match that can be made to the General Practice of Australia, as many US practitioners have a primary and specialist role for individual patients and much primary care in the use is Hospital or Emergency Room based.)

At present there are a number of major transitions going on the United States as medical practice, indeed, virtually all health service delivery, is reshaped and restructured. Among the transitions we are seeing in the nature of US practice management systems are the following.

Table 4.2 Practice Management System Trends

State Until Recently	Future Direction
Accounting Centric	Clinically Focussed – Accounting Information derived from Clinical Data
Non Windowed, Non Client Server	Windows and Client Server
No Outside Communication	Rich communication capabilities
Supported Fee for Service Billing	Supports Fee for Service, Managed Care and other variants
Provided by many small companies	Provided by 20-30 large specialist companies
Purchased by Small Practices	Purchased by integrated delivery systems, PHO's and larger practices

(Source: Dunbrack, L.,1996)

The functionality of the systems is moving from the traditional back office accounting applications to:

- Front-desk applications
- Managed Care capabilities
- Physician connectivity to external organisations (payers, labs etc)
- Medical Record and Clinical Process support
- Functionality to support a management services organisation

Also relevant in the context of considerations regarding the future of the Australian medical software industry are the present estimates of scale and level of investment. The US has approximately 700,000 MD's of which 400,000 are in office based practice (Encyclopaedia Britannica, 1996[20]) and of whom 14% are in general family practice. It is estimated that the practice management market is worth $700M at present (1997) and that this will rise to $1.0 Billion by 1999. This implies an average investment of $A2400 per annum in practice management systems with the expectation that it will rise to $A3000 per annum over the next 2-3 years (Dunbrack, L, 1996[21]).

The rapid growth of the practice management market is attributed to the recognition by American physicians that in the new tougher and leaner health care system of the late 90's quality technology support is going to be vital for both clinical and financial survival.

The interested reader is referred to the Healthcare Computing Publications Home page (http://www.healthcarecomputing.com/) where details of over 1300 health care computing products are provided in searchable form in an on-line directory of medical software. Review of the details obtained from this site of the major US practice management system vendors clearly shows a significant number of providers which offer very full function systems including comprehensive electronic medical records for practices ranging from 3-1000 end-users.

The American College of Physicians (ACP) is a major supporter of the implementation of computer systems in office based practice and has a wide range of specialist resources available for its members and the public on its web site (http://www.acponline.org) as well as typically having a number or articles each month in its general monthly publication the ACP Observer. The interest in the area is sufficient that the ACP publish a series of books on information technology and to have established a permanent department (with five staff) called the Clinical Information Management Department within the College.

It is of interest to note that at present it is estimated that 5% of US physicians are currently using full electronic records in their practices, but that this figure is now rising rapidly because of the rapidly rising information requirements of the managed care organisations, which are very difficult to manage other that by use of a computerised record. At present about 30 of the approximately 700 software packages in the US have strong medical records components. (Wilson, 1997[11]). Costs are however still quite high with the major vendors charging $US20,000 per physician for a full electronic medical record system. The major issues to be assessed, beyond the functionality of the medical records system were said to be:

- System Support – Access, timeliness and quality
- Reporting
- Software Update Application
- Data Entry Error Trapping
- Audit Trails and Security
- System Data Import and Export Capability.

This list closely mirrors, and confirms, the findings in this area presented in the previous deliverables for this engagement.

A final point to be made about the US situation is that the era of the Internet has truly arrived for health sector with, of a population of health care providers, 80% having email access and only a few percent less having World Wide Web connectivity. (Doyle, 1997[22])

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4.4 Analysis of Required GPCS Standards

From extensive global literature research and stakeholder consultation, a recommended *Standards Framework for the GPCS* was described in detail in the GPCS Functional Requirements Specification Report - Section 7.0, which consists of eight critical standards required to support the development and implementation of the GPCS from a functional perspective, and to enable significant benefits to be achieved in quality of patient care, practitioner effectiveness and practice efficiency.

It is apparent that, as in the case of privacy and confidentiality, data security and data protection, in addition to the need for adequate standards, legislative changes maybe necessary to provide the necessary framework to support these standards and ensure adequate safeguards are in place.

The key elements of this Standards Framework are as follows:

1. **Electronic Health Record Architecture**

   In order to ensure optimal data management and interoperation between GPCS applications / functional components, it is vitally important that the GPCS is based on a standard electronic health record architecture.

   The recommended architecture for the GPCS is the *Good European Health Record (GEHR)* [23], which, in our considered view, is the most appropriate and comprehensive health record architecture currently in existence. Details of the GEHR are provided in the *Functional Requirements Specification Report*. In addition, further discussion of electronic health record architectures and related standards is presented in *Section 4.5* below.

2. **Primary Care Data Set**

   There is an urgent need to develop a comprehensive data set for primary care, which would, together with a standard electronic health record architecture, enable the requirement for maximal and seamless interoperation between GPCS applications / functions to be fully addressed. The patient demographics is a vital component / subset of this data set. The IBM Consulting Group has developed a draft minimum demographic data set suitable for use with the GPCS (refer to *the Functional Requirements Specification Report*).

3. Clinical Data Coding Standards

From the stakeholder consultation conducted during this consultancy, the need to determine a national clinical coding standard for the GPCS is most apparent when consideration is given to the ability of the GPCS decision support systems to maximally leverage the information contained in the electronic health record in order to provide timely, interactive, highly useful and relevant patient health related information to the practitioner.

After due consideration, the IBM Consulting Group has concluded that, in consultation with the clinical community, the system developers should determine the suitability of present clinical coding systems for the purpose of decision support and make appropriate recommendations as to whether currently available coding systems are adequate or a new coding system needs to be devised to fully support decision support capabilities of the GPCS.

Determination of other coding systems required for other purposes (eg clinical research, interpractice comparison, morbidity coding) is not considered fundamental to the operation of the GPCS, however, the GPCS has been specified to enable multiple coding systems to coexist, to enable a high degree of flexibility for practitioners.

4. Knowledge-base Design Guidelines

These Guidelines are necessary in order to ensure consistency in the electronic format of medical and drug therapy knowledge-bases, and a high level of inter-operation with the GPCS decision support systems can be achieved. Work on these guidelines should be commenced as soon as possible to enable ultimate delivery of GPCS compliant knowledge-bases in an acceptable timeframe.

5. GPCS Interoperation Standard

An important requirement of the GPCS is that the functional module / application components are highly interoperable and where possible support ‘plug and play’ module selection and seamless integration of multi-vendor GPCS application offerings. For this to be achieved, compliance with standardised technical interoperation principles, messaging formats and application programmer interface requirements will be necessary.

Development of this standard, is however constrained by the practicalities related to testing the interoperation design, which necessitates linkage of development of this standard with a development project.

6. National Privacy Code of Practice for the Health Sector

In order to ensure that the potential benefits of improved patient care delivery and health outcomes can be achieved through a networked connected GPCS (which enables appropriately secure transmission of personal health information between patient authorised health professionals and agencies), a standard code of practice for the health sector (public and private) that addresses the complex privacy and confidentiality issues is required along with appropriate enabling legislation under existing state and federal privacy acts (where appropriate).

7. Data Security and Data Protection Standards

For a full function GPCS to be used by practitioners as intended, adequate safeguards need to be included in the GPCS to enable protection and preservation of the integrity of the data held in the GPCS databases, comprehensive data security to ensure an appropriate level of security / authorisation for access to and modification of data, and to enable secure use of public networks.

Comprehensive standards with enabling legislation that fully address the issues of data security and data protection are needed to provide the required safeguards.

8. Data Communication Standards

It is almost certain that the use of networked applications and the transmission of patient health data by GPs to many levels of the healthcare system will increase rapidly over the next few years. The IBM Consulting Group recommends that the HL-7 standard[24], be adopted as the primary external GPCS health data communication standard, based on a number of factors, including:

- Convergence of this standard with the EDIFACT, OLE and CORBA standards (especially with Version 3.0 due for release in 1998).

- Scope and level of activity in Australia including:
  - Standards Australia IT14/6/4 Health Informatics Communication Subcommittee efforts to refine the HL-7 standard and develop implementation guidelines for specific areas of healthcare use in Australia such as pathology, pharmacy, and hospital patient administration
  - Adoption and implementation of HL-7 by a number of health agencies and pathology providers
  - Convergence of the National Consultative Group For Private Healthcare EDI (NCG) AHS standards with HL-7 under Standards Australia IT/14/6/4 Subcommittee

- The significant growth in implementation of the HL-7 standard internationally and the recognition of HL-7 as an accredited standards organisation by ANSI.

Table 4.2 below identifies those standards requiring development to support the development and implementation of the GPCS.

Table 4.2: GPCS Standards Framework - Status of Required Standards

GPCS Standard	Suitability of Existing Standard(s)	Development Needed	When Required	Comments
Electronic Health Record Architecture	Yes	No	Currently Available	GEHR architecture / TC-251 Electronic Healthcare Record Architecture: Final Draft European Prestandard PT1-011
Primary Care Data Set / GPCS Data Dictionary	No	**Yes**	**Required Now**	GPCS Minimum Demographic Data Set already developed
Clinical Coding Standard for GPCS Decision Support	Not known	**Not known**	**Not Known**	Assessment of suitability of current coding systems for use with decision support needs to be undertaken by software developers in close consultation with the clinical community
Clinical Coding Standard for Primary Care	Yes	No	Currently available	The GPCS must support multiple coding systems currently available for clinical research, interpractice comparison, morbidity coding etc
Knowledge-base Guidelines	No	**Yes**	**Required Now**	Needed to drive GPCS Decision Support Systems
GPCS Interoperation Standard	No	N/A	N/A	Development of this standard is dependent on linkage to a development project to prove interoperation capability
National Privacy Code of Practice for the Health Sector	No	**Yes**	**Required Now**	• Amendment of existing state and Commonwealth Privacy Acts needed to provide legislative support framework • Code of Practice should reference existing relevant standards (eg AS4400)
Data Security and Data Protection Standards	No	**Yes**	**Required Now**	• Comprehensive standards with all the necessary safeguards need to be developed in Australia • Legislative changes needed to ensure necessary safeguards and compliance
Data Communication Standards	Yes	No	Currently Available	HL-7 Health Data Communication Standard

4.5 Electronic Health Record Standards

The purpose of this section is to provide an overview of significant international initiatives regarding the development of electronic health record (EHR) architectures, and relevant standards development of EHR content and structure definition and relevant information frameworks / models. This section is intended to augment the detailed discussion of GPCS standards provided in the functional Requirements Specification Report. References **[25,26,27]** provide a more comprehensive discussion of standards development activities.

4.5.1 Electronic Health Record Architectures

From extensive research, the IBM Consulting Group has concluded that the following initiatives on EHR architectures are most relevant to the development of a GPCS:

- The *Good European Health Record (GEHR) Architecture*[23], which was developed from 1990-1994, and sponsored by the European Commission Health Telematics Programme (AIM, 3rd Framework project). This is by far the most comprehensive and complete architecture presently in existence and includes a detailed object model and message exchange format.

- The *European CEN/TC 251 PT1-011 Electronic Healthcare Record Architecture pre-standard* (1995)[28]. This standard, has adopted an almost identical structure to GEHR but with slightly different terminology.

- The 5 million ECU (approximately $A7.5Million) *Synapses* project[29], (an EC Health Telematics AIM 4th Framework 3 year project), which is presently in-progress, based in Dublin and with participants from 12 EU countries, aims to draw together and build on the GEHR, CEN/TC 251 PT1-011 and generic components of other specialised architectures to create a "*Federated Healthcare Record Architecture*"(FHCR). As part of this process, it is intended that the Common Object Model and Object Dictionary for the FHCR will be developed.

In the U.S., the Computer-based Patient Record Institute(CPRI) and the American Society for Testing and Materials (ASTM) Committee E31 on Healthcare Informatics, have been active developing EHR guidelines and standards respectively, but as yet no comprehensive architectural framework has been developed and published, despite recognition by the CPRI in 1991of the need for "CPR Framework Standards" [30].

The CPRI has however, published numerous Position Papers, Guidelines and other useful documentation on relevant EHR topics including functionality, performance and security requirements[25,27,31]. The ASTM Committee E31 has developed a number of EHR content and record standards that are highly relevant in the context of EHR development[25,27] (refer *to Section 4.5.2* below).

4.5.2 EHR Standards

The European CEN/TC 251 has published two pre-standards of relevance here; PT1-011 (described above) and *PT1-010 Medical Informatics Healthcare Information Framework* (1995) [32], which defines a framework in terms of three interrelated views - a healthcare domain view (models healthcare processes and objects), technology view (technology architecture) and a performance requirements view (functionality, reliability etc).

There are in addition, two highly germane healthcare technology architectures mentioned in the Technology Framework and Architecture Report; *CEN/TC251 PT1-013 Healthcare Information Systems Architecture* (1995), [33] which further defines the technology architecture of the PT1-010 Framework and provides a conceptual model for interaction of healthcare applications through public and stable interfaces; and the European Commission Groupe RICHE project (September 1996) which has developed *the RICHE Reference Architecture*,[34] whilst ostensibly focused on hospital information systems, is 'open systems'

based and provides an architecture that addresses distributed healthcare environment requirements.

In Australia, the RACGP has produced some relevant standards for EHR systems[35,36], however these standards specify only very broad requirements for components of the EHR and do not provide or recommend a coherent standardised architecture for the EHR.

In the U.S., AMIA published a Position Paper in JAMIA in February 1994 on standards for the creation of an Electronic Medical Record (EMR) and sharing of patient data[37]. In this paper, AMIA strongly endorsed the utilisation of existing and tested standards for developers and users of EMRs, despite imperfections, in order to advance the standardisation process for the improvement in efficiency and quality of health care. The approach to standardisation outlined by AMIA was subsequently adopted by ANSI Healthcare Informatics Standards Planning Panel (HISPP), and its successor, ANSI Healthcare Informatics Standards Board (HISB), which is the primary organisation co-ordinating healthcare informatics standards development efforts within the U.S.[27]. ANSI-HISB co-ordinates the efforts of a large number of voluntary and accredited standards development organisations including ASTM E31, HL7, NCPDP, IEEE 1157 MEDIX and Accredited Standards Committee (ASC) X12.

AMIA has essentially positioned itself as a standards influencing body rather then a standards development organisation and is, along with the CPRI and Medical Records Institute (MRI) most active in promoting progress of standards development to support 'electronic medical record' systems.

The Computer-based Patient Record Institute (CPRI), as indicated above, has published a number of relevant documents resulting from a variety of activities including efforts to promote common definitions and concepts for EHR systems[27], evaluation of clinical coding systems[38], and investigation into the confidentiality, privacy and data security issues surrounding use of EHR systems[27,39]. The CPRI has also produced guidelines for Computer-based Patient Record Description of Content, which essentially provides detailed information about the dimensions of the CPR (EHR) in terms of information content, representation and time span.[31]

Of particular interest, is the CPRI paper on the Computer-based Patient Record System Description of Functionality[40] which describes the CPR (EHR) system as having six dimensions: CPR (EHR), application functions, operational processes, related data and knowledge-bases, legal and administrative characteristics. It is clear from this paper that there is a high level of consistency between the GPCS approach (based on the GEHR architecture) and the CPRI overview of functional and related requirements of CPR (EHR) systems.

The other major EHR standards influencing body in the U.S. is the MRI, which has assumed a leading role in co-ordinating EHR standards in the U.S. through participation in standards development organisations and public education of standards in health care informatics and new developments[41].

The ASTM is a major ANSI accredited standards development organisation which, through its Committee E31 on Healthcare Informatics, has been most prolific in producing a range of standards including some particularly relevant EHR standards[25,27] developed by the E31.19 Sub-committee.

The revised ASTM E1384-96 Standard Description for Content and Structure of the Computer-based Patient Record provides a guideline for EHR development, advocating

standard content expressed in a uniform manner and identifying a common information framework for patient records in multiple settings. It does not, however, provide the specificity or detail of a data dictionary. This standard is closely tied with ASTM 1633-95 Standard Specification for Coded Values for the Computer-based Patient Record (which provides specified coded values and in combination with ASTM E1384 provides an overall data model) and uses some HL-7 Version 2.2 data elements and a limited number of master tables. In addition, further guidance is provided in ASTM 1769-95 Standard Guide for Properties of Electronic Health Records and Record Systems which defines the requirements, properties and attributes of an EHR.

Also, as mentioned in the Functional Requirements Specification - Section 7.0 GPCS Standards Framework, there are a range of associated standards that need to be considered including the ASTM 1460 Specification for Defining and Sharing Modular Knowledge Bases (Arden Syntax) and a number of significant data security standards published by the E31.12, E31.17 and E31.20 Sub-committees.

4.5.2 Other Relevant Standards

There are a number of other relevant standards that need mentioning in the context of the GPCS [25,27]:

- *The Institute of Electrical and Electronics Engineers (IEEE) P1157.1 (MEDIX) Joint Working Group for a Common Data Model* has published two drafts of a standard framework (1994 and 1996) for the development of standardised components of an overall object-oriented information model to be used in health care data interchange. This healthcare information model has been mapped to other standardised data transaction interchange formats including ANSI X.12 EDI and ISO 9735 EDIFACT.

- *The National Electrical Manufacturers Association (NEMA) Digital Imaging Communication in Medicine (DICOM)* Standards Committee has developed a standard generic digital format and transfer protocol for biomedical images and image-related information which is being widely adopted not only by diagnostic imaging / radiology disciplines, but also by pathology, internal medicine and dentistry. It is the dominant data interchange message standard in biomedical imaging and is an important technical standard recommended for the GPCS (refer to Technical Framework and Architecture Report).

- *The HL-7 Version Reference Information Model*, which is currently in draft development, is intended to provide an object-oriented data model for the health care domain in general, but with particular reference to clinical care activities.

Finally, also worth mentioning is the Computer-based Oral Health Record (COHR) currently under development by the American Dental Association (ADA) which is focused on delivering a clinical data architecture and fully attributed logical data model.

4.6 References

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Section 5.0 Stakeholder Consultation Analysis Overview

5.1 Introduction

The overall consultancy key findings and conclusions resulting from the Stakeholder Consultation Process is presented in *Section 5.2* below. These findings and conclusions are the result of a detailed analysis of the key issues surrounding and impacting on the development, adoption and use of the GPCS.

This analysis is based on information derived from extensive consultation and literature research covering:

a. A broad range of stakeholders involving interviews, Issue Focus Group and Rural Issue Focus Group sessions.

b. A substantial number of practitioners across Australia (more than 120 in total) involving a series of Customer Value Management workshops to identify the basic needs of practitioners with regard to the GPCS, and Joint Application Design workshops focused on development and review of functional requirements and identification of barriers and issues impacting the delivery of the required functionality.

c. Research on GPCS applications and standards development conducted through Phases 2-5 of this consultancy.

Overall, practitioner involvement in the consultative process reflected a broad range of computer literacy, including experienced, novice and non-users, and a reasonable gender balance and representation of specific user groups such as rural practitioners, locums and practice managers.

The detailed findings resulting from the stakeholder consultation conducted during Phases Two and Three of this consultancy are documented in the GPCS Scope Definition and Consultation Report - Section 5.0, Functional Requirements Specification Report - Section 4.0, and Technical Framework and Architecture Report - Section 4.0 respectively (attachments to this Report). *Section 4.0* above of this Report details the findings from the literature research.

5.2 Overall Consultancy Key Findings and Conclusions

5.2.1 Adoption and Use of a GPCS

We have found:

- The present levels of computerisation of General Practice continues to be significantly less than most of the advanced western democracies and there is evidence in the literature that raising this level will result in significant improvements in the health of the community.

- From development of the GPCS Functional Requirements Specification, it is apparent that an adequate breadth and quality of General Practice software (as perceived by practitioners) does not presently exist in this country and this is significantly impacting rates of adoption and use.

- The most significant barriers to computerisation are not technology related issues.

- Evidence that Government policy decisions and funding can profoundly alter practitioner adoption and use of computers.

- Evidence also exists that simply funding the acquisition and installation of computers for practitioners does not lead to widespread adoption and use.

- There are a range of infrastructure, standards, policy and legislative issues that need to be addressed before the full value and benefits of the GPCS can be realised by all major stakeholders.

- The medical software industry has, thus far, failed to deliver systems to General Practice that are sufficiently attractive for substantial adoption to occur in the clinical areas where the potential for the greatest benefit resides.

- Widespread practitioner concern with the overall performance and value delivered by the providers of General Practice software.

- Practitioners have a track record of adoption of technology where benefits are easily demonstrable and contribute to the financial viability of the practice.

- There is statistically significant evidence in the literature demonstrating at least four effective computer supported interventions in General Practice including patient and practitioner reminders, decision support of treatment planning and interactive patient education.

- The significant barriers to adoption of computers identified in our previous Electronic Prescribing consultancy (1996) are essentially unchanged and still present.

- The cause of low adoption of computers by practitioners is multi-factorial and includes at least:

    - Poor functional fit of existing software with practitioner requirements
    - Poor quality of user interfaces with many systems and the low perceived level and quality of vendor system support and training provided
    - The unstructured and complex nature of General Practice
    - Concern by practitioners with the one-time and on-going costs of computerisation
    - Lack of specific funding as part of a larger adoption strategy
    - Lack of an adequate co-ordinated effort by Government and professional bodies to encourage adoption through education, training and payment
    - A perceived real imbalance in the benefits and costs between major stakeholders
    - A range of human factors such as fear, uncertainty and doubt
    - Practitioner technophobia
    - Practitioner change toxicity – ‘too much change too soon’

- Lack of demonstrable quality support services and variable medical software industry performance
- The perverse incentive issue – the structural linkage between short consultation time and profitability for practitioners which computers may impact negatively

- It is clear from the U.K. experience with computerisation of General Practice, that an appropriate policy framework and incentives will significantly impact the quantum and rate of adoption of computers by practitioners.

And this has lead us to conclude that:

Conclusion A-1:

There is a strong linkage between perceived level of benefits to practitioners and the preparedness of practitioners to invest for themselves in new information technology.

Conclusion A-2:

The desired levels of adoption of General Practice software are unlikely to occur in the short to medium term unless the breadth and quality of available software is significantly improved.

Conclusion A-3:

In the absence of a well planned adoption strategy which is effectively managed and implemented, it is unlikely that a high level of adoption can be achieved and the associated benefits flows will meet expectations.

Conclusion A-4:

The GPCS project is critically dependent for its success on a range of interlinked factors (including infrastructure, knowledge resources, standards, policy and legislation, and GPCS development) being successfully co-ordinated and brought to completion.

5.2.2 GPCS Functional and Technical Position

We have found:

- The GPCS must intrinsically address a number of critical requirements including speed, reliability, ease of use and robustness, data entry, data integrity, data security and protection, software and information currency, data portability and practitioner mobility, in addition to providing an application suite with a very broad range of functions to a significant depth.

- Consistency in the U.S. and U.K. literature with the required functional attributes of a GPCS.

- The functionality represented in the Functional Requirements Specification is, to the best of our knowledge, fully available in a number of systems marketed overseas and there are a range of offerings which have virtually complete GPCS functionality provided by single companies.

- Further consistency in the U.S. and U.K. literature with our consultancy findings with regard to the major non-functional issues of a GPCS. These issues include system support, reporting, software currency, data entry, audit trails and security, and system data portability.

- A properly architected Electronic Health Record possessing the attributes described in the Functional Requirements Specification Report, was found to be central to the effective use of a GPCS and the delivery of improved quality of patient care supported by sophisticated decision support linked to both the EHR and appropriate medicine knowledge-bases.

- From our research and stakeholder consultation, we identified a need to develop a comprehensive data set for primary care which specifically addresses the requirements of the GPCS.

- A suitable clinical coding system is required to effectively support the GPCS Decision Support capability, and the detailed work necessary to identify what would be optimal for decision support has yet to be undertaken.

- Maintenance of the GPCS, its specifications and standards, supporting databases and information (dictionaries, knowledge-bases etc) is a significant issue to be addressed in development of GPCS compliant products.

- Development of 'plug and play' application modules with a high level of interoperation, will be a technically challenging task, requiring a high level of software industry co-operation, will be expensive to deliver, and will almost certainly impose complex support issues and high support costs for end-users.

- A high level of data portability, and associated investment protection, can only be achieved through development of a GPCS based on a defined, comprehensive data dictionary and electronic health record architecture.

- The GPCS as specified in the Functional Requirements Specification Report is technically feasible assuming the appropriate information sources are available to support its operation.

And this has lead us to conclude that:

Conclusion A-5:

Overall, the systems specified here if properly realised (i.e. developed and implemented) could make a significant difference to the quality of care delivered by General Practitioners in Australia.

Conclusion A-6:

From a functional perspective, the requirements specified represent a carefully considered, balanced set of requirements that are grounded in a thorough consultation process with a large number of practitioners.

Conclusion A-7:

From our findings and strategic assessment, the development of the GPCS would not pose a problem for a properly structured, well managed and resourced medical software industry.

Conclusion A-8:

Unless there is a high level of software industry co-operation and concerted effort to develop the necessary interoperation standards and development / test platform in a reasonable timeframe, 'plug and play' module interoperation ought not be attempted until the first generation of functionally compliant GPCS's have been delivered and proved robust, reliable and successful.

Conclusion A-9:

From our strategic analysis, at a minimum, standards work will be required to:

a. Develop a GPCS data dictionary
b. Develop appropriate knowledge guidelines and resources
c. Develop a national code of practice for health information management in the health sector
d. Develop comprehensive data security and data protection standards
e. Properly assess the suitability of current clinical coding systems to support GPCS Decision Support and if required develop a suitable coding standard (refer to *Table 4.2* above).

Conclusion A-10:

The successful delivery of the GPCS as specified in a reasonable and acceptable timeframe to the key Stakeholders will be a complex undertaking requiring a high level of co-ordination and management of a large range of critical and diverse tasks.

Conclusion A-11:

From our research to date, the IBM Consulting Group has concluded that a comprehensive GPCS data dictionary is needed and that the baseline scope for a full GPCS data set / dictionary should at least provide a standardised organisation of the clinical record and needs to specifically define a number of essential basic health record elements and structured data collections (as discussed in the *Functional Requirements Specification - Section 7.4 Primary Care Data Set Requirements*).

5.3 Findings on Stakeholder Requirements

In addition to our findings and conclusions outlined above, we have also found the key requirements of the major stakeholders with regard to automation of General Practice to be as follows:

Doctors

Key Requirements:

1. Systems which deliver the following benefits:

    - Improved practice efficiency and throughput with a positive impact on the quality of care delivered.

    - Greater access to information on how the practice is performing both financially, clinically and as regards patient satisfaction to ensure ongoing practice viability and profitability.

    - Diminution of risk through the provision of alert and reminder systems which will not only let the practitioner know when screening or immunisation is required, but also warn if the results of screening tests are not received within a reasonable period to prevent patients 'falling through the cracks'.

    - Confidence that patient treatment is being delivered optimally through the provision of easy and simple to use access to treatment guidelines and recommendations from recognised authoritative sources (e.g. the RACGP or the NH&MRC).

    - Avoidance of, or improvement in the effort involved in the production of, forms which are required by a range of different entities for everything from test ordering to Medicare claims. A system that can use the patient information that has already been captured to produce all the different forms , and just require the unique areas to be completed, would be of enormous value and benefit.

    - Reduction in the time and effort required to produce legible, properly formatted prescriptions which have been checked for all the risks of drug interactions and other predictable side effects.

    - Much enhanced connection and flow in information from the General Practice to and from diagnostic test providers, hospitals, specialists, other GP's and patients.

    - Expansion of and an increase in the role of the General Practitioner through provision of tools which permit the GP to function better as the overall co-ordinator and manager of a patient's care.

2. In the provision of these benefits, the system needs the following attributes:

    - Easily affordable and at least cash flow neutral overall.

- A robust, reliable, high integrity computerised patient record (covering both the patient health record and financial record)

- A patient data capture interface that is highly efficient, accurate and requires minimal time for effective use

- Full support for practitioner mobility where possible and affordable.

- To be professionally supported at a level that ensures minimum disruption to practice operation when failures occur, and total freedom to move from an older to a newer better system without losing any data (i.e. not locked in to a financially unstable or functionally inadequate system(s)).

- Ease of use and enough flexibility that the system can be set up to accurately reflect the way the practitioner delivers patient care.

- Lack of intrusion in use with the communication between the patient and the doctor, but with the capability to share with the patient information being captured to the both patient and doctor are comfortable with what is in the system.

- A very high degree of reliability and no time during working hours when the system cannot be used.

- Speed, so that no matter what the task the computer never causes the doctor to be waiting for it to complete an interactive task.

- The capability to address the issues of patient confidentiality and privacy while permitting secure authorised information flows between other health care providers and patients.

3. Continuing influence as the agenda for health moves towards much more the integrated health system model.

4. Support of an ongoing role for General Practitioners as the centre of the care delivery universe

5. Preservation of the small business / fee for service model.

6. Funding either for information or for technology support to encourage adoption.

7. High level of GP automation as soon as possible.

Consumers

Key Requirements:

1. Maximum quality time with practitioner.

2. The use of IT must not in any way interfere with the consultation process.

3. Desire the practitioner to be very up to date and current with all medical trends.

4. Production of a quality, contained, transportable and understandable health record as part of the contract of care, with easy access their record when needed.

5. Seamless information flow between authorised health care providers so the whole experience is transparent.

6. Want their health information to be used appropriately for research and other similar activities if it will help the community as a whole.

7. Want to be sure personal private information is only used in identified form for legitimate authorised uses.

Government

Key Requirements:

1. Improved Consistency and Quality of Care – assisted by decision support, evidence-based medicine, drug interaction detection and timed alerts / reminders for screening etc.

2. Detailed reliable information on the way General Practice is performing and the outcomes it is achieving in terms of population health, disease prevention etc

3. Better co-ordination of care delivery through improved communications and information sharing between all service delivery groups

4. Improved rational use of medicines and other expensive resources

5. Access to quality information to assist with introduction of changes based on Evidence Based Medical research and similar initiatives

6. Access as quickly as possible to the economic and health care impacts / benefits of automation of General Practice.

7. Reduction in the cost of doing business through much greater use of electronic commerce and more deployment of MedClaims etc.

8. Development of Infrastructure to enable much improved data collection from general practice and to improve communication in both directions.

9. Retain their pre-eminent place in the health funding and payments arena

10. The HIC want a universal patient identifier to assist with cost control, clinical monitoring and fraud prevention.

Medical Software Industry

Key Requirements:

1. To establish a viable business model into the future.

2. To be able to attract the payments for support and training that are required to deliver a decent standard of service.

3. To have clear standards guidelines to develop to in all relevant areas.

4. To have access to the information and knowledge resources required for systems in forms that are useful for immediate use.

5. To be free from issues of business viability and development costs having the controlling effect on what is offered to practitioners.

6. To be able to trade according to normal business principles without having to give software away, or engage in unrelated activities (eg health fund, drug advertising) to achieve adoption and use.

7. For innovative, niche and small to medium sized players to have unconstrained access to the market.

Section 6.0 Overview and Implications of the Functional Requirements Specification

The purpose of this section is provide a high level overview of the scope and intended use of the specification, and its implications (refer to the *Functional Requirements Specification Report* for the detail).

6.1 GPCS Functional Framework

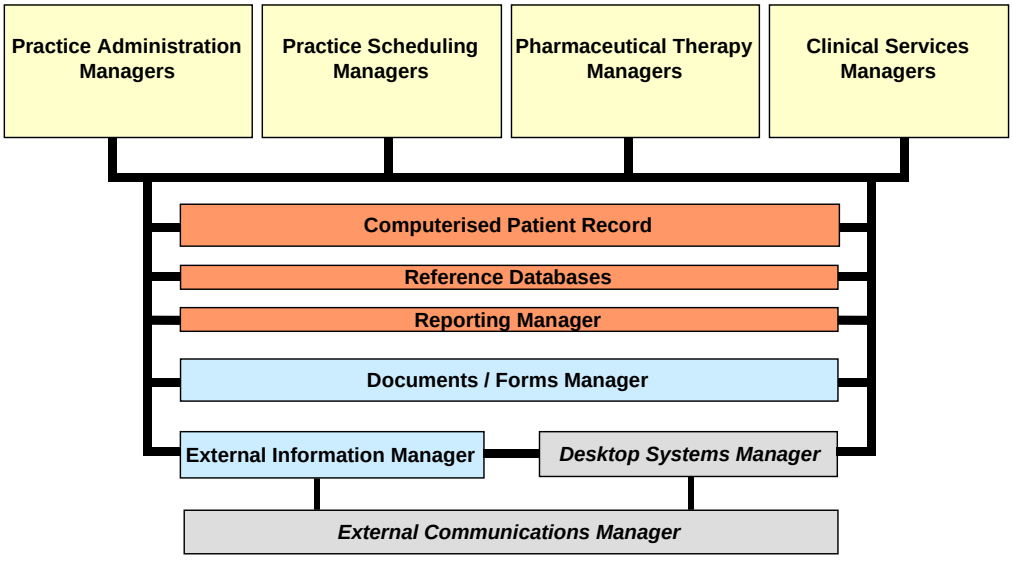
A robust functional framework was developed, based on literature research and analysis of findings from the stakeholder consultation conducted during Phase Two of this consultancy, and with the following objectives:

a. To enable detailed functional requirements that address the needs and expectations identified during the stakeholder consultation to be produced.

b. To provide the necessary linkage between the needs and expectations of practitioners and the key applications / functional areas.

The Functional Framework (refer to *Figure 6.1* below) consists of four major application groupings (termed 'Managers'), each of which is made of a number of individual applications / functions, and which are seen as being serviced by a layer of database, forms management, desktop systems management and communications infrastructure.

Figure 6.1: GPCS Functional Framework



This framework assumes that the practice user directly interacts with the applications / functions that constitute the four major application groupings. These application groupings, which represent broad logical collections of clinical and administrative applications / functions considered to be important for effective practice operations (as identified through the stakeholder consultation conducted during Phase Two of this consultancy), cover the following functional scope:

1. ***Administrative Managers Group*** - these are comprised of:

- **Practice Administration Managers,** which provide core patient registration, selection and task management functionality and comprehensive financial, billing, practice performance and other administrative management functions.

- **Practice Scheduling Managers** which consolidate all major patient, staff and resource scheduling functions of the GPCS and provide comprehensive preventive medicine and patient recall / reminder management functionality.

2. ***Clinical Managers Group*** - these are comprised of:

- **Pharmaceutical Therapy Managers** which provide a range of applications / functions covering all aspects of the planning, delivery and review of drug treatment. Included are the applications to manage information for doctor and patient, to manage medication history and create the new prescription, along with drug therapy decision support where appropriate.

- **Clinical Services Managers,** which provide a wide range of clinical functionality for the system. Included are all aspects of clinical record data capture and codification, clinical and statistical report management, patient management planning and delivery, in addition to presentation and management of medical and patient information, diagnostic test management and both static and dynamic decision support.

6.2 Scope and intended use of the Specification

The Functional Requirements Specification is intended to provide a standard to guide the software industry with development of GPCS products which fully address practitioner requirements and deliver the benefits outlined in the implementation strategy (*Section 8.0* of this Report).

The GPCS functional specification comprises four major areas as detailed in *Table 6.1* below. The specification describes approximately **480 detailed function points / requirements** covering the entire GPCS Functional Framework of 55 applications / functional components.

Appendix C of the Functional Requirements Specification (FRS) Report provides the detailed function points / requirements for the full GPCS and is presented within the context of the Functional Framework above.

Table 6.1: Scope of GPCS Functional Specification

Major Requirement Area	Number	Compliance Required	FRS Report Reference
1. GPCS Interoperation Principles	11	*Mandatory*	Section 6.1
2. Electronic Health Record Principle Attributes	12	*Mandatory*	Section 9.2
3. General Functional Requirements	31	*Mandatory*	Section 9.3
4. Detailed Functional Requirements	478	*As indicated for each individual function point*	Appendix C

6.3 Structure of Detailed Requirements Specification

The specification for each of the major application / functions identified in the full scope of the GPCS (refer to *Section 9.0*), has been produced using the structured format described below:

- ***Manager Objectives*** - describes the primary aim(s) of the major application / function.

- ***Functional Description Overview*** - provides an overview of what the application / function is intended to achieve.

- ***Functional Requirements*** - list the detailed function points / requirements, provide a relative ranking / priority of the function points (*H = High, M = Medium, L = Low*), in addition to flagging constraints / issues that may, or are currently known to, impact the successful delivery of the functionality described.

- ***Linkages*** - identifies the message communication to / from other GPCS application / functional components. It is assumed that all GPCS applications / functional modules link to the Desktop Systems Manager. Where this is not obvious in the specification, the role the Desktop Systems Manager plays has been explicitly mentioned.

- ***Constraints / Dependencies*** - details the strategic / policy, development and implementation issues that may, or are currently known to, impact the successful delivery of functionality detailed in individual function points that have been flagged appropriately.

- ***Functional Operational Assessment*** - identifies, where appropriate, a relevant detailed functional operation scenario described in Section 6.2 of the FRS Report. The scenarios are intended to demonstrate the intended functional relationship and interaction between the managers that constitute the GPCS Functional Framework and the external linkages that enable information exchange between various service providers and information sources / databases. The objective of including this section is to provide some guidance for development of detailed test cases / scripts which could be used as a basis for evaluation of key function points.

6.4 Function Point Relative Ranking Criteria

The relative ranking / priority of the individual function points detailed in the specification was made according to the following classification criteria:

Function Point Priority Ranking	Interpretation
High	Mandatory
Medium	Highly Desirable
Low	Desirable

High Priority (H) - the functionality specified by these function points is **mandatory** and addresses a basic or essential need for effective and efficient operation of the GPCS.

Medium Priority (M) - this category includes requirements that would provide considerable efficiency or productivity benefit to users and are therefore **highly desirable** by definition.

Low Priority (L) - this category is used to classify the "nice to have" or **desirable** requirements but which are not considered to be essential to the efficient, effective or safe operation of the GPCS.

6.5 Implications of this Specification

The GPCS described in the Functional Specification represents a system which has the capability to support a major improvements in the quality, efficiency and overall position of Australian General Practice. In development of the specification, a high level of practitioner input was achieved to ensure that the specification , as accurately as possible, truly reflects the current requirements of General Practitioners with regards to General Practice Computing Systems.

In addition, from our review of overseas medical software, it is clear that:

a. The functionality represented in the Functional Requirements Specification is fully available in a number of systems marketed overseas and there are a range of offerings which have virtually complete GPCS functionality provided by single companies.
b. The same functional issues that have been identified in this consultancy either have or are being addressed by overseas offerings.

It should be noted that there is nothing in the recommended initial release of the GPCS (refer to *Section 8.0*) that can be seen as being in any way beyond the capabilities of experienced developers of the Australian Medical Software Industry. What will be a major challenge for the industry, is the overall breadth and depth of the proposed system, combined with the requirement that ideally there will be the capability for development of modules by a range of vendors which will be easily and simply brought together in a way determined by the needs of an individual practice.

Further to this, from practitioners we consulted with, there is also a requirement for the GPCS to have the scope, reach and capability to meet not only immediate needs but to position them for painless expansion of their system well into the future.

Overall what is needed, is high quality implementation of this Specification to a standard that will dramatically accelerate uptake of the use of computers in General Practice.

Section 7.0 Overview and Implications of the Technical Framework

The purpose of this section is provide a high level overview of the scope and intended use of the specification, and its implications (refer to the *Technical Framework and Architecture Report* for the detail).

7.1 Scope and intended use of the Technical Framework

The scope and intended use of the Technical Framework is to provide the software industry with a technical architecture in sufficient detail to enable the development of a GPCS, which is capable of supporting modular and interoperable applications.

The underlying guiding principles on which this framework has been developed are:

- The framework must be standards driven and based, "open", highly flexible and multi-platform.
- Applications for the GPCS are to be designed as network enabled to ensure that the GPCS has the appropriate communications capabilities built in for network connection and information exchange.
- The ability to offer a scalable solution should be supported by the architecture.
- Emphasis on ease of use and enhancement to the GP's workflow and working practices.
- Emphasis should be placed on developing a Technical Framework that considers cost effectiveness as well as technology aspects.

7.2 Technical Requirements

The following *Table 7.1* presents the key areas in the Functional Requirements Specification which have technological implications and which are addressed by the Technical Framework and Architecture.

Table 7.1: Functional Requirements addressed by the Technical Framework

Technical Requirement	Functional Requirement
Reliability	Reliability and robustness of GPCS applications Data reliability
Connectivity / Integration	Linkage to Hospitals Linkage to pharmacies Linkage to other health practitioners and organisations Linkage to Diagnostic Service providers Provision of reliable comprehensive data communication capabilities
Modularity / Interoperation	User requirement for investment protection and choice of application Seamless integration of applications / modules from a range of sources
Data Integrity and Currency	Robustness of electronic health record and other GPCS databases (clinical and administrative) Evidentiary and legal requirements for electronic medical records The ability to ensure that all GPCS applications operate on current, reliable information
User Interface	Variable data input methods, including voice Fast, consistent, reliable, easy, simple to learn and use Transparency of usage to patients
Standards Framework	Data transmission / communication standards Technical / interoperation standards Patient demographics and standard clinical practice data sets
Practitioner Mobility	Use in non-practice locations (eg, home visits, nursing homes, hospitals, working from home) The ability to access, share / interchange data between locations Use in solo, group and multi-disciplinary practices, multiple practice locations and both rural and metropolitan areas
Security and Audit	Appropriate level of data security and protection Controlled access to patient data by authorised personnel Appropriate audit trails of information access and update
System Support	Reliable and foolproof backup and recovery of data and software Timely access to support covering hardware, software and applications

7.3 Description of the Technical Framework

The GPCS Technical Framework is described in terms of a number of product-independent architecture building blocks building blocks grouped into categories. These categories are themselves comprised of a number of building blocks as depicted in *Figure 7.1* below.

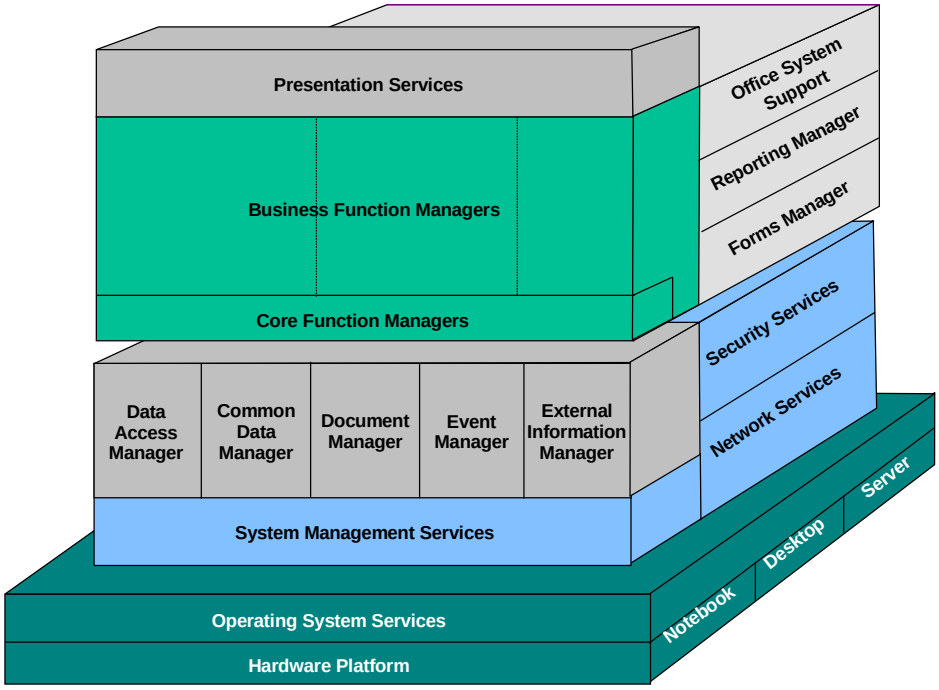
The categories are as follows:

- **Business Functions**
  Those building blocks / 'Managers' associated with the delivery of the primary business functions of the GPCS. The business functions are organised into groups of related function such as Practice Administration and Clinical Services.

- **Business Support Functions**
  Provides functions of a more general nature, such as office system support (eg word processing), forms management and reporting, that may support multiple business function groups.
- **Application Enabling Services**
  Provides the common application services, such as a Data Access Manager, to allow for the sharing and control of applications and data.
- **System Services**
  The core infrastructure services and functions are provided within this category including system management, network and security services.
- **System Platforms**
  This category provides the functions in support of the operating systems and hardware.

Refer to Section 5.0 of the Technical Framework and Architecture Report for more detail.

Figure 7.1: GPCS Technical Architecture



7.4 Implications of this Framework

The GPCS Technical Framework provides a suitable architecture from which the software industry can develop GPCS products.

It is clearly recognised that detailed technical design of the GPCS needs to be undertaken by developers. The objectives of this design are:

a. To provide optimal support for delivering the full scope of specified functionality.

b. To ensure relevance to the technical environment in which the GPCS will operate.
c. To provide intrinsic robustness and sophistication for the support of functionally rich and transactionally demanding GPCS applications.
d. To preserve the investments made by software developers and users by selection of strategic, long-lived platforms.

It is also recognised that development of highly interoperable / 'plug and play' applications will be a complex and technically challenging task that will require a high level of software industry co-operation, significant investment and considerable time to ensure reliable and robust systems are delivered.

Section 8.0 Recommended Functional Scope of GPCS Releases

8.1 Introduction

As presented in the Functional Requirements Specification Report, from the stakeholder consultation conducted during phases two and three of the consultancy, a number of key points need to be made regarding the rationale for incremental releases of the GPCS:

- It is clear that there will need to be an initial release which is functionally rich, followed by subsequent releases that incrementally build on the depth of functionality delivered in the initial release and provide additional applications / functional modules over time.

- There is a strong desire by practitioners for functional "plug and play" modularity which implies that users should have the ability to select modules from the four major clinical / administrative manager groupings, which application(s) / functional module(s) they wish to use, and then enable incremental implementation of applications / functions to suit the level of skill, comfort and utility required on an individual user (i.e. practitioners and other practice staff) as needed basis. This level of functional modularity would have a positive impact on adoption and usage of the GPCS by practitioners and would enable the GPCS to address the high priority needs of both the 'power' users and 'novice' users.

  It is, however, clearly recognised that this desired level of application interoperation is unlikely to be achieved in the short term given the complexity of supporting such solutions and the demands it would place on the software industry. It is also true that nothing in our recommendations prevent the industry from moving swiftly to meet this requirement.

- There are a number of existing barriers and issues that will constrain to a variable extent the ability to deliver and / or implement specific functionality required by practitioners.

- The development cost and capability of the software industry to make the required level of investment to deliver and fully support the required quality products in an acceptably short timeframe are significant issues that need to be taken into account.

8.2 Migration Path to GPCS Compliant Systems

The recommended migration strategy from existing / legacy systems to fully compliant GPCS systems has three key components:

1. **Phased incremental approach to delivery of the full GPCS functionality** - this will have an impact on the timeframe for transition between legacy systems to GPCS compliant systems.

2. **Development of the GPCS data dictionary and the setting of data portability targets for the software industry to comply with** - this will enable support of data transfer between legacy and new systems to be addressed and provide some investment protection for practitioners.

3. **Development of modular 'plug-and-play' GPCS application environment –** through software industry co-operation to develop the required interoperation standards and development / test platform to enable the desired level of application interoperation to be achieved.

8.3 GPCS Release Evaluation Criteria

The recommended mandatory scope of the initial and second GPCS release is detailed in *Table 8.1* following. As previously discussed in the Functional Requirements Specification Report, the following evaluation criteria has been used to determine the placement of applications / functions in the initial or subsequent release categories:

GPCS Release Evaluation Criteria

1. *Functional Need* (as determined from the individual ranking of function
2. *Technology Maturity* (i.e. whether the technology to deliver the specified function already exists or needs to be developed)
3. *Degree of Difficulty* to develop software that provides the specified functionality
4. *Known Constraints* impacting development or implementation
5. *Estimated Cost* to develop and implement
6. *Estimated Timeframe* to develop appropriate software

8.4 Functional Scope Specified for the GPCS

Table 8.1 below provides a list of the functional components of the GPCS and the functional scope specified for each component. This table is intended to enable easy identification of those functions / applications that require full or partial implementation based on the Release Evaluation Criteria 1-6 as described in *Section 8.1* above.

It should be noted that the results of analysis of evaluation criteria 1 and 2 are presented in the Functional Requirements Specification Report Section 11.0. Based on criteria 1 and 2 only, the IDEAL Initial Functional Release was determined and is presented in the table below along with the results of the analysis of criteria 3-6.

In the assessment of the evaluation criteria and scope of each release, the technical dependency of each functional component was considered, based on the linkages defined in the Functional Requirements Specification, to ensure that the set of functional components recommended for each release can in fact deliver the intended functionality where there is a cross-module / component dependency.

It is recommended that the delivery of full GPCS functionality be phased over 3 major releases. It is assumed that all functionality not delivered in Releases 1 and 2 will be delivered in Release 3. Clearly, it is most preferable for software developers to accelerate delivery of full function GPCS products in either Release 1 or across two releases only.

With regard to the recommended scope for releases, '*Partial*' should be interpreted to mean staged compliance where all high priority function points are addressed in the first release.

Table 8.1: Overview of Functional Completeness of the GPCS

Manager Grouping	Application / Function	*IDEAL INITIAL Functional Release (Full/Partial)*	Degree of Difficulty (H/M/L)	Known Major Constraints (Y/N)	Estimated Cost to Develop / Implement (H/M/L)	Estimated Timeframe to Deliver (Short /Medium/ Long)	Recommended Mandatory Initial Release (Yes/ Partial /No)	Recommended Mandatory Release 2 (Yes/ Partial/ No)
Practice Administration Managers	Patient and Organisation Registration	*Full*	Low	No	Low	Short	**Yes**	N/A
	Patient Selection and Task Management	*Full*	Low	No	Low	Short	**Yes**	N/A
	Patient Account Management	*Full*	Low	No	Medium	Medium	**Yes**	N/A
	Financial Management	*Full*	Low	No	Medium	Medium	**Yes**	N/A
	Practice Performance Management	*Partial*	Medium	No	Medium	Medium	**Partial**	**Yes**
	Supplies / Inventory Management	*Full*	Low	No	Low	Medium	No	No
	Customer Satisfaction Management	*Partial*	Low	No	Low	Short	No	**Yes**
	Payroll Administration	*Full*	Medium	No	Medium	Medium	No	No
Practice Scheduling Managers	Patient Appointment Scheduling & Management	*Full*	Medium	No	Medium	Medium	**Yes**	N/A
	Preventive Medicine Scheduling & Patient Recall Management	*Full*	Medium	No	Low	Short	**Yes**	N/A
	Resource Management & Staff Rostering	*Partial*	High	No	High	Long	No	No
Pharmaceutical Therapy Managers	Prescription Generation	*Full*	Low	No	Low	Short	**Yes**	N/A
	Medication History Management	*Partial*	Medium	No	Low	Medium	**Partial**	**Yes**
	Drug Dispensing Management	*Full*	Low	No	Low	Short	No	No

Table 8.1: Overview of Functional Completeness of the GPCS (continued)

Manager Grouping	Application / Function	*IDEAL INITIAL Functional Release (Full/Partial)*	Degree of Difficulty (H/M/L)	Known Major Constraints (Y/N)	Estimated Cost to Develop / Implement (H/M/L)	Estimated Timeframe to Deliver (Short /Medium/ Long)	Recommended Mandatory Initial Release (Yes/ Partial /No)	Recommended Mandatory Release 2 (Yes/ Partial/ No)
Pharmaceutical Therapy Managers	Patient Drug Information Generation	*Full*	Low	No	Low	Short	No	**Yes**
	Drug Information Management	*Full*	Medium	Yes	Medium	Long	**Partial**	**Partial**
	Drug Therapy Decision Support	*Full*	Medium	No	Medium	Medium	**Partial**	**Yes**
Clinical Services Managers	Patient Clinical History & Assessment	*Full*	Low	No	Low	Medium	No	**Yes**
	Decision Support (Static and Dynamic / Event-Driven)	*Partial*	High	Yes	High	Long	No	**Partial**
	Clinical Coding Management	*Partial*	Medium	No	Medium	Medium	No	**Partial**
	Diagnostic Test Management	*Full*	Medium	No	Medium	Medium	No	**Yes**
	Patient Management Planning & Delivery	*Full*	High	Yes	High	Medium	No	**Partial**
	Clinical Statistics & Report Management	*Full*	Low	No	Low	Short	No	**Partial**
	Medical Information Management	*Full*	High	Yes	High	Long	No	**Partial**
	Patient Education Management	*Full*	Low	Yes	Low	Short	No	**Partial**
Computerised Patient Record	Electronic Health Record	*Full*	High	Yes	High	Long	**Partial**	**Yes**
	Patient Financial Record	*Full*	Low	No	Low	Short	**Yes**	N/A
Reference Databases	Practice Configuration Database	*Full*	Low	No	Low	Short	**Yes**	N/A
	Clinical and Other Code Lists	*Full*	Low	Yes	Low	Short	**Partial**	**Yes**

Table 8.1: Overview of Functional Completeness of the GPCS (continued)

Manager Grouping	Application / Function	*IDEAL INITIAL Functional Release (Full/Partial)*	Degree of Difficulty (H/M/L)	Known Major Constraints (Y/N)	Estimated Cost to Develop / Implement (H/M/L)	Estimated Timeframe to Deliver (Short /Medium/ Long)	Recommended Mandatory Initial Release (Yes/ Partial /No)	Recommended Mandatory Release 2 (Yes/ Partial/ No)
Reference Databases	Diagnostic Services Databases	*Full*	Low	No	Low	Short	No	**Yes**
	Health Services Directory Database	*Full*	Low	Yes	Low	Short	No	**Yes**
	Organisations and External Providers Database	*Full*	Low	No	Low	Short	**Yes**	N/A
	Government Sourced Reference Databases	*Full*	Low	Yes	Low	Short	No	**Yes**
	Local Operational Databases	*Full*	Low	No	Low	Short	No	No
Reporting Manager	Clinical Summary Report Generation	*Full*	Low	No	Low	Short	**Partial**	**Yes**
	Ad-hoc and Routine Clinical Management Reporting	*Full*	Medium	No	Medium	Medium	**Partial**	**Partial**
	Administration / Practice Management Reporting	*Full*	Medium	No	Medium	Medium	**Partial**	**Partial**
	Linkage with Office Automation Tools	*Full*	Low	No	Low	Short	**Yes**	N/A
Documents / Forms Manager	Forms Generation	*Full*	Medium	No	Medium	Medium	No	**Yes**
	Document Management	*Full*	Medium	No	Medium	Medium	No	**Yes**
External Information Manager	Diagnostic Services Communication	*Full*	Low	Yes	Low	Short	No	**Yes**
	Hospital Information Exchange	*Partial*	Low	Yes	Medium	Medium	No	**Partial**
	Financial Information Transfer	*Partial*	Low	Yes	Medium	Short	**Partial**	**Yes**

Table 8.1: Overview of Functional Completeness of the GPCS (continued)

Manager Grouping	Application / Function	*IDEAL INITIAL Functional Release (Full/Partial)*	Degree of Difficulty (H/M/L)	Known Major Constraints (Yes/No)	Estimated Cost to Develop / Implement (H/M/L)	Estimated Timeframe to Deliver (Short /Medium/ Long)	Recommended Mandatory Initial Release (Yes/ Partial /No)	Recommended Mandatory Release 2 (Yes/ Partial/ No)
External Information Manager	Inter-practitioner Communication	*Full*	Low	Yes	Medium	Medium	**Partial**	**Yes**
	Other External Information Exchange	*Partial*	Low	Yes	Low	Short	**Partial**	**Yes**
Desktop Systems Manager	Desktop Systems Set-Up	*Full*	High	No	Medium	Medium	**Yes**	N/A
	Software Currency Maintenance	*Full*	Medium	No	Medium	Medium	**Yes**	N/A
	External Information Currency	*Full*	Medium	No	Medium	Medium	**Yes**	N/A
	Data Integrity Management	*Full*	High	No	High	Medium	**Yes**	N/A
	Desktop Security / Authorisation Management	*Full*	High	No	High	Medium	**Yes**	N/A
	Systems Back-Up and Maintenance	*Full*	Medium	No	Low	Medium	**Yes**	N/A
	Mobile Computing Data Management	*Full*	High	No	High	Medium	**Yes**	N/A
	Reference Database Management	*Full*	Low	No	Low	Short	**Yes**	N/A
External Communications Manager	Communications Message Exchange Protocols	*Full*	Medium	No	Medium	Medium	**Partial**	**Yes**
	Network Communications Protocols	*Full*	Low	No	Low	Short	**Yes**	N/A

Section 9.0 Overall Considerations for Automation of General Practice

9.1 Introduction

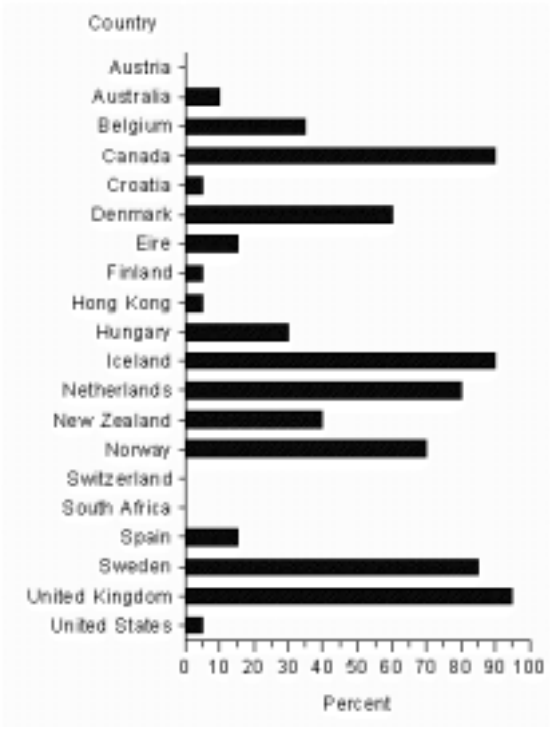
This section presents the context for understanding the broad range of complex issues that need to be appropriately addressed in order to progress the automation of General Practice from the present unsatisfactory levels to those commensurate with other OECD countries.

9.2 The Importance of Achieving Development of the Specified GPCS

This consultancy was commissioned by Government because of a recognition that there was inadequate information technology used by practitioners and that this would have significant future consequences on the Government's ability to achieve its major reform objectives (including the move to evidence-based medicine) within the Health Sector.

Figure 9.1 following illustrates the low use of computers by primary care doctors in Australia compared with other countries and as discussed in *Section 4.0*, remains very low. It should be noted that the level of usage of computers in the U.S. depicted in this diagram reflects the hospital based nature of U.S. acute primary care and grossly underestimates the office-based practitioner usage of technology.

Figure 9.1: Percent of primary care doctors who use computers systems, by country



(From: Coding and Nomenclatures: A Snapshot From Around the World, Wilson R.G. & Purves, I.N., December 1995.

The critical benefits which will be forgone by the major stakeholders unless a focused and concerted effort is mounted to attain rates of usage comparable with other Western nations include:

For the Practitioner

- Improved practice efficiency, profitability and throughput, through greater access to practice clinical and financial performance information which would have a positive impact on the quality of care delivered.

- Opportunity for vastly improved communications and information flow in and out of the practice to diagnostic test providers, hospitals, specialists, other practitioners and patients.

- Enhanced job satisfaction through confidence in the quality of care being delivered and obtaining an expanded role as the co-ordinator of patient care.

- Reduction in the risks of conducting General Practice through improved access to quality record keeping, use of electronic clinical guidelines, decision support and preventive medicine /patient recall and reminder systems.

For the Consumer

- Opportunity to receive improved care from a practitioner that is well supported by access to current information and knowledge resources, and electronic communication to other entities involved with the delivery of patient health care.

- Reduced inconvenience and cost through unnecessary or duplicated interventions.

- Production of a valuable, transportable, structured medical record as part of their service received.

- Confidence that all appropriate preventive strategies are in place to optimise their health.

- Confidence that the practitioner has the necessary support to effectively co-ordinate the delivery of their care and to ensure that each participant in their care has all the information necessary to effect the best outcome.

For the Government

- The capability to implement an effective outcomes based remuneration system which links payments to delivery of quality health care.

- The ability to access a rich set of primary care information which would enable much improved management of the health sector through enhanced understanding of what is actually happening in the primary care sector and secondary care activities recorded in primary care records.

- The ability to effectively implement co-ordinated care in the health sector through technology enabled information flow and management.

- The opportunity to use computer technology to provide a much greater consistency of care, through application of evidence-based medicine, rational use of medicines and decision support which will support the Government in addressing the structural inefficiencies in General Practice.

- Reduction of costs in wasteful duplication of services.

- The chance to realise significant health budget savings through the provision of improved health information which will reduce the frequency of a variety of adverse events and thus rates of hospitalisation and illness, to the benefit of the whole community.

For the Medical Software Industry

- The opportunity to access a larger market and attain a level of profitability and viability sufficient to sustain continued product research and development and enable provision of quality support services to practitioners.

- The opportunity for the Government or other stakeholders to invest in the necessary support infrastructure which, in the current environment, is not able to be profitably delivered by the industry, and which is both vital to enable the benefits of the specified GPCS to be fully realised, and which would lead to ongoing viability and profitability of the industry.

9.3 Barriers to Successful Implementation of the GPCS

From our research and stakeholder consultation, we have found a range of barriers which will impact the successful development, implementation and adoption of the GPCS:

- The software industry is not currently coherent and of the right scale to deliver a GPCS in a reasonable timeframe.

- There is basically no use of electronic health records in Australia except for a few enthusiasts (anecdotal information suggests no more than 1-2% of practices currently using electronic records).

- The benefits of using computers are not obvious to most GP's and without significant improvement in the perception of available benefits they will not invest.

- There is currently no secure private health network infrastructure being seriously developed in Australia.

- There are significant issues with privacy / confidentiality unless the right controls are in place to protect privacy and confidentiality of personal health information in the networked environment.

- There is a major issue with the lack of data portability and data preservation between systems in the General Practice computing environment.

- The ability to deliver useable, full functional and highly interoperable systems to practitioners is presently constrained by the absence of appropriate standards in the required areas.

- The current general practice systems are unable to meet the requirements for collection of improved information about what is happening in General Practice which is important to support initiatives in the areas of improvement of quality of patient care.

- The quality and integrity of electronic patient records are becoming increasingly important for medico-legal reasons.

- The small business attributes of current General Practice need careful consideration in the planning and implementation of the GPCS.

- Australian adoption of IT in General Practice has been very slow by international standards leading to a continuing small level of investment in the software industry.

- The current Australian General Practice business model discourages use of practice automation because of the emphasis on speed of patient throughput.

- The systems that are currently available do not fully meet present functional requirements of practitioners.

- General Practitioners want excellent systems for virtually nothing – this has been made worse by recent marketing activities of some leading vendors which has amounted to providing software to practitioners at minimal, if any, dollar cost.

- Low cost software providers are not supporting their installed products to the level and quality practitioners see as satisfactory.

- The software industry has seldom been profitable in its own right and has found it difficult to set prices at the levels which would permit profitability, continued investment, quality support and growth.

- The software industry has not been able to develop the required standards for data portability of information between systems.

9.4 Strategic Gaps

The IBM Consulting Group has identified the following strategic gaps which will need to be addressed if widespread automation of General Practice is to be achieved within a reasonable timeframe:

- Coherent and consistent policy and legislative framework to support electronic transmission of patient information between health service providers and agencies.

- Technical infrastructure for secure virtual private network communication between health service providers and agencies.

- Electronic knowledge-bases of medicine information to support the required decision support capability.

- Coherent and consistent policy framework with supporting standards to support widespread use of electronic forms throughout both public and private health sectors and other entities.

- Appropriate standards – primary care data set, privacy and confidentiality framework - code of practice for health sector to support patient health information interchange between health professionals and agencies (with supporting legislation), comprehensive data security and data protection standards (with supporting legislation), and an agreed national clinical coding systems for use with General Practice and the GPCS.

- An appropriate management framework for the implementation which will effectively address the complexity of the timely development and delivery of the GPCS.

9.5 GPCS Specification Related Issues Requiring Attention

From assessment of the issues impacting the development, adoption and use of the GPCS, and considering the overall scope and implications of the specifications produced in this consultancy, the following areas are seen to require appropriate consideration and action:

- The GPCS functional release strategy (refer to *Section 8.0*)

- Maintenance of the currency of the Functional Requirements Specification.

- Maintenance of the currency of the Technical Framework and Architecture

- The definition of a comprehensive GPCS data dictionary

- The approach to assessment of compliance with the Functional Requirements Specification and Technical Architecture which considers the needs of practitioners especially with respect to the quality of software products and support services provided.

9.6 Concluding Remarks

From our research, it is clear that there are compelling reasons for deployment of an information technology infrastructure in General Practice. The benefits that may accrue to the relevant stakeholders from automation of General Practice are significant and include:

- A higher level of consistency & quality of patient care.
- Confidence for the consumer that their practitioner has the necessary support and information to effectively co-ordinate the delivery of their care and to effect the best outcome.
- Greater access to information on how the practice is performing both clinically and financially.
- Diminution of risk to patient and practitioner through the provision of alert and reminder systems.
- Confidence for the practitioner that patient treatment is being delivered optimally.
- Avoidance of, or reduction in the effort involved, in the production of forms.
- Reduction in the time and effort required to produce legible, properly formatted prescriptions.
- Much enhanced connection and flow in information from the General Practice to and from diagnostic test providers, hospitals, specialists, other General Practitioners and patients.
- Expansion of and an increase in the co-ordinating role of the General Practitioner.

- Enhanced rural practitioner communication / retention.
- Reduced cost of claims management and benefits payment.
- Improved capability for clinical outcome based assessment, funding and disease management approaches to be implemented.
- Improved rational use of drugs, immunisation rates and cancer screening rates.

Our research has also shown that widespread implementation and adoption of GPCS compliant products would substantially enhance the benefits to be realised.

Overall there exists a significant challenge to advance the automation of General Practice in this country and address all the major stakeholder requirements referred to in *Section 5.3* above. In order to effectively meet this challenge and provide the environment that will encourage and support timely development of GPCS compliant products, a significant and highly co-ordinated effort is required. Such a high level of effort is required because of the complexity of the system specified and the broad range of complex issues and strategic gaps which will impact the successful development and adoption of the GPCS.

Separate from this Report, the IBM Consulting Group has also provided the Government advice regarding our view of the strategic implementation options and the optimum implementation approach to achieve General Practice automation in a reasonable timeframe.

Glossary of Key Terms and Concepts

The following key terms and concepts apply to all the consultancy reports:

Customer Value Management (CVM) is a business improvement approach which focuses on designing business systems around the needs and expectations of customers. It achieves this by identifying the needs and expectations of customers at the point at which they interact with a product or service offered by an organisation.

Decision Support is a generic term to describe the capability of any computer application that enhances a human's ability to make decisions.

Electronic Health Record (EHR) is a general term describing computer based patient record systems. There are numerous definitions published, however essentially, the EHR could be described as "electronically maintained information about an individual's lifetime health status and health care"(Source: Computer-based Patient Record Institute (CPRI)*: Computer-based Patient Record System Description of Functionality*. CPRI Work Group on CPR Description, U.S. August 1996) in the U.S. It should be noted that the EHR is also commonly referred to in the health informatics literature as the: Computerised Patient Record (CPR), Computerised Medical Record (CMR), Electronic Medical Record (EMR), Electronic Patient Record (EPR), Electronic Health Care Record (EHCR) and Clinical Data Repository (CDR).

Functional Requirements Specification (FRS) in the context of this consultancy, refers to the general requirements, interoperation principles, electronic health record principle attributes and the detailed functional requirements / function points as detailed in the *Functional Requirements Specification Report.*

General Practice Computing Systems (GPCS) refers to a highly integrated suite of software applications / modules that cover a broad range of practice administrative and clinical services functions.

GP Expert Panel refers to the group of experienced General Practitioners who worked with the IBM Consulting Group on this project and who contributed their specialist expertise in the area of primary care health informatics.

Interoperation refers to the capability of some software applications / modules to co-operatively exchange information and common system services to deliver an overall functional outcome.

Joint Application Design (JAD) refers to a software development technique which involves the conduct of workshops made up of end-users and designers for the purpose of defining functional and / or technical requirements.

'Plug-and-play' refers to a level of interoperation whereby software applications / modules may be easily interchanged for functionally equivalent ones.

Technical Architecture refers to a conceptual model of the technologies and building blocks required to support delivery of functional applications to end-users.

Appendix A: Project Panel and Committee Members

GP Expert Panel Members

Name	Position / Organisation
(Dr David Rowed - Chairman)	
Dr Gerard Flaherty	General Practitioner
Dr Malcolm Ireland	General Practitioner, Lecturer, General Practice, Newcastle University
Dr Teng Liaw	General Practitioner, Senior Lecturer, Department Public Health and Community Medicine
Dr Trevor Lord	General Practitioner
Dr Peter Schloeffel	General Practitioner

Project Steering Committee Members

Name	Organisation
Mr Patrick Colmer (Chairman)	DH&FS - General Practice Branch
Dr Peter Adkins	RACGP National Information Management Committee
Ms Jean Gifford	DH&FS - General Practice Branch
Ms Heather Grain	IMSG
Dr David Graham	DH&FS – Pharmaceutical Benefits Branch
Professor Michael Kidd	IMSG
Mr David Num Mr Gil Buerdlmayer	Health Insurance Commission - Electronic Commerce
Mr Alan Whitfield Mr Kevin Noonan	DH&FS - Information Services Division

Reference Advisory Board Members

Name	Organisation
(*All PSC Members Listed Above - Mr Patrick Colmer - Chairman*)	
Mr Simon Bryant	Department of Communications and the Arts
Mr Joe Christensen	Australian Institute of Health and Welfare
Mr Ross Davey	Medical Software Industry Association
Mr Peter Harlow	DH&FS - Health Service Outcomes Branch
Ms Sue Healy	Consumer Health Forum
Dr Digby Hoyal	Rural Doctor's Association of Australia
Dr Tony Jenkins Dr Patrick Bolton	Divisions Information Management Subcommittee
Ms Pru Power	Australian Medical Association
Dr Ron Tomlins	RACGP
Mr Peter Treseder	Standards Australia
Mr Peter Williams	NSW Health Department

Appendix B: IBM Consulting Group Team

The IBM Consulting Group project team that contributed to this consultancy were:

Kellyanne Chu, Associate Consultant (Project Support)
Paul Clarke, Senior Consultant (Health Industry Specialist; Engagement Manager)[1]
Mark Krajnc, Senior Consultant (CVM Specialist)
Ross Leighton, Senior Consultant (Technical Architecture Specialist)
August Lembong, Consultant (Project Support)
Dr David More, Health Industry Specialist[1]
Dr Geoff McDonnell, Managing Consultant (Quality Assurance)
Dr David Rowed, General Practice IT Consultant (Chairman, GP Expert Panel)
David Sketch, Senior Consultant (Information Technology Specialist)
Phillip Wing, General Manager, IBM Consulting Group (Quality Assurance)

[1] Principal Authors

Attachments

The following consultancy reports are available from the DH&FS General Practice Branch on request:

Attachment A-1: GPCS Scope Definition and Stakeholder Consultation Report

Attachment B-1: Functional Requirements Specification Report

Attachment C-1: Technical Framework and Architecture Report