

# The general practice computer system project: a doctor's desktop for Australia

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## Abstract

The Australian Department of Health and Family Services engaged the IBM consulting practice to develop a functional specification and technical architecture for a General Practice computer system (GPCS) in January, 1997. The project was completed in September, 1997. This paper describes the rationale for development of the specification, the process that was undertaken and provides an overview of the completed specification and architecture. The paper also explores a number of issues related to computing in general practice which were raised during the consultative process, and considers factors which were found to be important in obtaining adoption and use of computer technology on the doctor's desk. © 1999 Elsevier Science Ireland Ltd. All rights reserved.

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## 1. Introduction

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 Government regarding the quality and consistency of General Practice, and en-

thusiasm on the part of the Royal Australian College of General Practice and the Australian Medical Association to improve the overall quality of patient care through, among other things, the increased use of supporting technology planning and strategise for an increased deployment of information technology in this arena has been underway for a number of years.

The paper describes a project, commissioned by the Australian Commonwealth Department of Health and Family Services, to

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develop functional specifications and a technical architecture for a General Practice computer system (GPCS) which would assist the Australian medical software industry to develop products which would have significant positive impact on the adoption and use of information technology by doctors within General Practice.

## 2. Objectives of the project

The objectives of the GPCS project were as follows:

- To investigate and report on a broad range of issues surrounding the adoption and use of a GPCS.
- To develop functional requirement specification for a GPCS which will encourage widespread adoption and use by practising clinicians.
- To develop a high level technical architecture framework which would support implementation of the functional specification.
- To identify the mechanisms and standards required to enable migration from an initial release to later releases of a GPCS.

The scope of work for this assignment covered the following key requirements:

- Development of a functional requirements specification for a GPCS that encompasses the requirements of the General Practitioner community (including the rural practitioners).
- Identification of the scope of features to be included later releases of the GPCS.
- Identification of suitable standards to support both initial and later releases of the GPCS platforms.
- Development of a strategy for release management and implementation of the GPCS which provides both a comprehensive assessment of strategic, clinical prac-

tice, technical, and infrastructure issues, and a detailed options assessment and recommendations.

- Production of a report that documents the GPCS strategies, standards framework, stakeholder consultation outcomes, and strategic assessment of issues surrounding the GPCS.
- Development of a technical architecture framework which was an essential and integral part of this assignment in order to ensure that the functional requirements specification is capable of being ultimately delivered.

A central point regarding the objectives of the project was that all the activities were planned to be ‘practitioner centric’ with the consultation process being designed to elicit what was desired and required by practitioners. Only when these requirements were clear were discussions undertaken with the software providers, in the hope that the systems that are finally developed will closely meet practitioner requirements. It should, however, be pointed out that from the outset of the consultancy it was recognised that the true client for the work was the software industry.

## 3. Background and context

There has been interest in computing in General Practice for many years, and a number of projects were conducted in the late 1980’s and later to assess the use of comprehensive systems in this area. However, for a combination of factors only quite limited progress in a quantitative sense had occurred.

Of recent times, and especially since 1992, the Government and the medical profession have been co-operatively studying the introduction of information technology into the General Practice. The Information Manage-

ment Steering Group (which acts as a key adviser 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 Pharmaceutical Benefits Branch 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, electronic prescribing should be considered in the context of a clinical workbench. Subsequently, IBM Consulting Group recommended in the final report that ideally a clinical workbench ought to be introduced to 50% of Australian office based practices within approximately two years. These recommendations were considered by Government and a tender to conduct for the project described in this paper was released in late 1996.

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

It is understood that the Clinical and Administrative GPCS is 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 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 a broad range of diverse functions as part of the GPCS need to be properly assessed.

To permit the benefits identified in the IBM Consulting Group's previous report to be obtained as soon as possible, it was required that the functional scope of a quickly implementable GPCS be developed promptly.

#### 4. Consulting approach

The consultancy was divided into five phases which are shown in Fig. 1. The project began in earnest in February, 1997 and was completed in early September, 1997. The project was managed by a Project Steering Committee which was supported by a larger reference advisory board. Between these two groups, the project had access to and advice from all the key stakeholders for a project of this sort. The major deliverables of this consultancy were as follows:

- Project charter—defines the scope, objectives, critical success factors, deliverables, project management, reporting structure, project risks, timetable, project costs, and payment schedule.

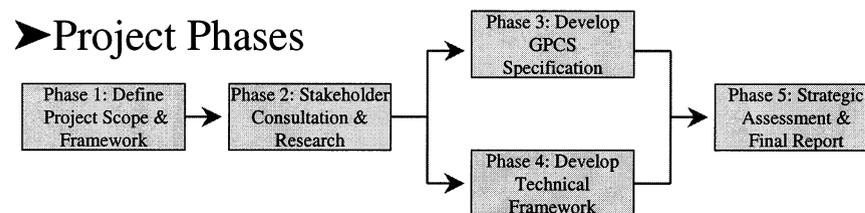


Fig. 1. GPCS Consultancy—project approach and phases.

- Clinical and administrative general practitioner computer system scope definition report—this report documents the customer value management (CVM) workshop outcomes and provides recommendations regarding the scope of the GPCS from the customer (stakeholder) perspective.
- Technical framework for the clinical and administrative general practitioner computer system—this framework provides a technical architecture in sufficient detail to enable highly modular and interoperable applications that form the GPCS releases to be developed for implementation.
- Functional requirements specification for the clinical and administrative general practitioner computer system—this specification was at a sufficient detail level for a tender to acquire and evaluate application systems against a set of requirements.
- Final consultancy report—This report documents the outcomes of the strategic assessment, the release strategy from the GPCS, major findings and outcomes from the Phase Two stakeholder analysis and background research, options analysis, recommendations, and next steps. At the specific request of Government an implementation plan to have the GPCS developed and deployed was not developed.

The project made extensive use of a World Wide Web site to facilitate communication between those involved in the development of the project deliverables across all states of the Commonwealth and all the deliverables for this project will be available for download after review and approval by the project steering committee. The site was found at <http://doctorsdesk.asstc.com.au>. The web site used existing off-the-shelf technology to assist with achieving broad input and ownership of the project amongst the major stakeholders and community at large. The site was developed with the following objectives:

- To advertise the scope, benefits and framework for the consultancy, to seek public comment and to place draft deliverables (following some quality review by stakeholders) up for public review as they are produced.
- To provide a secure (password protected) project area for distribution of draft key deliverables and discussion papers to stakeholders for comment and to provide a channel for stakeholder feedback and input throughout the consultancy.
- To provide links to other web sites of interest.
- To facilitate discussion and dialogue between those involved in the consultancy.

The following Fig. 2 shows the full range of functions carried provided by the site.

The web site exceeded all the author's expectations in terms of utility and number of accesses to the public site and there is little doubt the site made a major contribution to the success of the project.

In the course of the project there was very considerable involvement from a very wide range of practitioners. In all over 100 general practitioners (in all States) and ten or so specialists contributed directly to the project as well as a range or representative stakeholders from medical, government and industry organisations. The consultancy was also supported by two specialist groups. The first was the GP expert panel made up of six practitioners who had special information technology expertise and the second was a technical review team made up of technical expertise drawn from the medical software industry.

While interesting work was conducted during all phases of the engagement, the customer value management (CVM) workshops where practitioners were encouraged to identify what would really make a difference to their clinical lives, were especially interesting

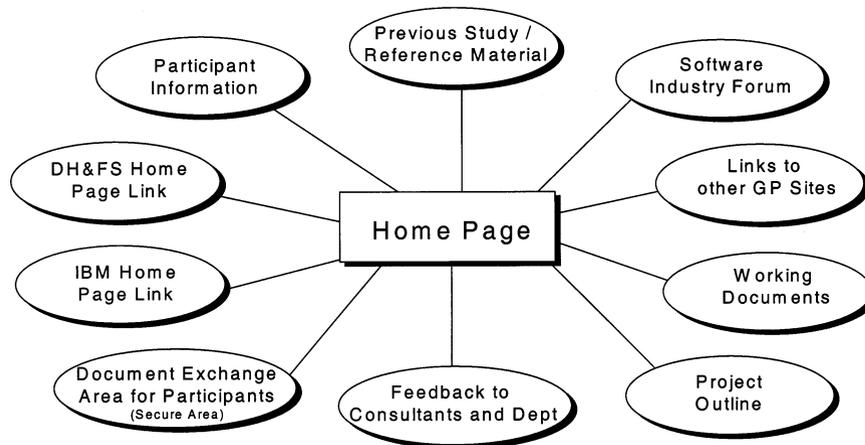


Fig. 2. Site map of GPCS web site.

and useful. (A full report of the outcomes of this work is on the project web site and is available for download and review)

## 5. Overview of functional specification

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:

- To enable detailed functional requirements that address the needs and expectations identified during the stakeholder consultation to be produced.
- To provide the necessary linkage between the needs and expectations of practitioners and the key applications/functional areas.

The functional framework (refer to the figure 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. 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:

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.

Clinical managers group—these are comprised of:

- Pharmaceutical therapy managers, which provide a range of applications/functions covering all aspects of the planning, deliv-

ery, 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.

The constitution of the application groupings of this framework were further refined through development of the detailed requirements, on-going research, GP expert panel review and the outcomes from the JAD sessions conducted during Phase Three of this consultancy (Fig. 3).

It should be noted that the term ‘manager’ in the GPCS functional framework represents a system application or function that is capable of seamless interoperation and co-opera-

tive information interchange with other GPCS system applications/functions in order to carry out its specified function(s).

Under the four main functional groupings at the top of the framework are the functional areas that support the transactions being undertaken, allow the system configuration to be defined, manage security for the system and provide links to the external world of hospitals, specialists, diagnostic service providers, etc.

The detailed functional specification covers over 500 functional points which are grouped in 55 separate functional areas. Also included in the detailed specification are detailed application linkages, constraints to delivery of the functionality and links to a set of application assessment scenarios developed for the project.

## 6. Overview of technical architecture

To support the functional framework outlined above a technical architecture framework has also been developed. This was developed by analysis of the functional spe-

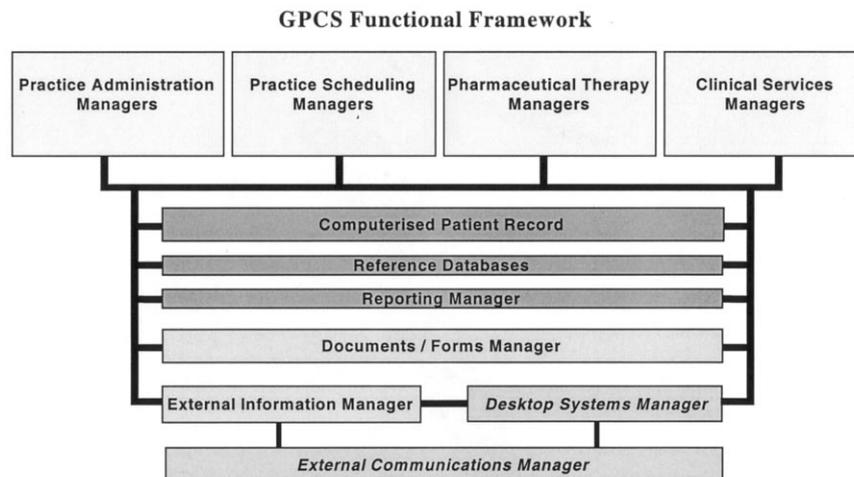


Fig. 3. GPCS—functional framework.

cification for technical implication and subsequent evolution of a technical architecture that would meet the needs identified. Table 1 shows an outline of the requirements in the key areas. Note that the technical framework focuses on the underlying shared services needed to support the applications and to address the functionality identified above.

Consideration of these requirements led to the development of the technical architecture, which is shown diagrammatically in Fig. 4.

In addition to development of the architecture considerable work was also done on identifying the appropriate technical standards for later implementation of the GPCS, and also to identify where no standards were available to work could be done to encourage their development. Major gaps were identified in the areas of secure data transmission, encryption, and clinical coding among others. The architecture building blocks that comprise the GPCS technical framework have been placed in a number of categories. The categories are as follows:

- Business functions—those building blocks 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 word processing 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.

Table 1

Key requirements that impact the technical architecture

Area	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 datasets
Practitioner mobility	Use in non-practice locations (e.g., home visits, nursing homes, hospitals, working from home) The ability to access, share /interchange data between locations Use in solo, group, and multidisciplinary practices, multiple practice locations, and both rural and metropolitan areas

Table 1 (Continued)

Area	Requirement
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

- System platforms—this category provides the functions in support of the operating systems and hardware.

The building blocks defined for the GPCS technical framework are depicted in the following diagram. The focus here is on the building blocks that comprise the business function support, services, and platform areas of the framework. At the conceptual

level of the framework the business functions have been treated as a single functional area referred to as the business function managers.

It will be seen that the architecture naturally divides into three layers, a platform layers, a middle application services layer, and an application/presentation layer. These layers enable simple implementation of a wide range of approaches to client/server and network enabled application delivery.

## 7. Comments on issues relevant to the GPCS

In developing this GPCS specification, one of the key issues has been to understand what attributes of a computer system or the environment in which they are to be implemented drive either adoption or rejection of the new information technology by practitioners.

What has been learned has served to very much confirm what was already know as well

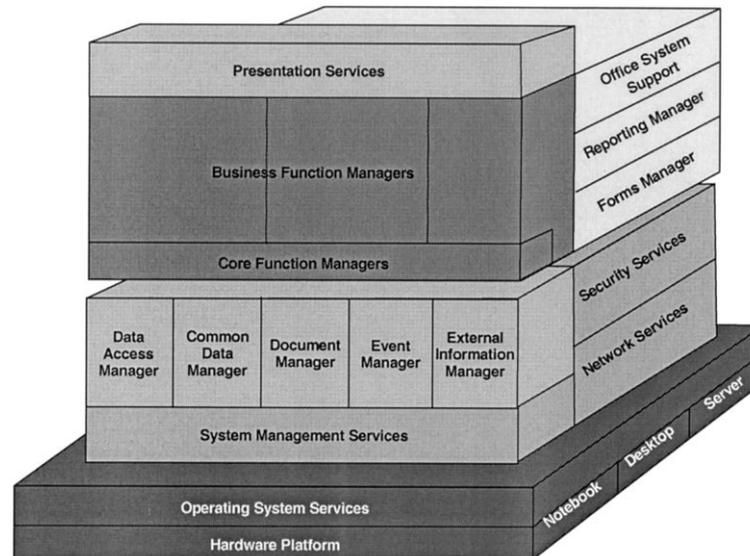


Fig. 4. GPCS—high-level technical architecture.

as to provide some interesting new perspectives. In providing this condensed outline of our consulting findings, I will consider two key questions. The first is ‘what are the benefits general practitioners are seeking from computers that would, if present, will send them off to a software vendor?’ and the second is ‘what attributes does a computer system have to have to be successful in the eyes of the GP?’. Among the benefits being sought are the following:

- Greater access to information on how the practice is performing, both financially and clinically, and as regards to 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 and 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.

Among the attributes required in the system that can deliver these benefits are:

- 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 so that 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 a 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.

Overall, there was also the strong impression from the more than 100 General Practitioners who were consulted with that if such benefits could be obtained that there would be a considerable impact on the overall health of the Australian population.

The other clear implication of this project has been the need for a concerted effort to address a range of issues that are not directly

related to the specification or development of a GPCS but which must be fully addressed if the desired benefits of such a system are to be realised. These issues include:

- A secure network infrastructure on which the GPCS can be based and which can provide the network services required for the GPCS to operate.
- Development and/or acquisition of appropriate knowledge resources (guidelines, protocols, formularies etc.).
- Development of appropriate communications standards which will enable communication between the GPCS and pathology, radiology, and other providers to be delivered.
- Development of standards for data protection, security, and encryption which will achieve public confidence.
- Development of a comprehensive General Practice minimum data set which is consistent and complementary to the National Health Data Dictionary and which will maximise the interoperability between GPCS applications and external applications.
- Resolution and harmonisation of legislative and policy barriers to the effective use of a GPCS. These barriers currently include:
  - Approach to funding the GPCS.
  - Harmonisation of the various state and Federal Government Health Acts and Regulations, Drug and Poisons Acts, and Evidence Act with regard to enabling electronic signatures.
  - Current gaps and inconsistencies in privacy legislation and lack of a national code of practice for health professionals in the health sector.
  - Data ownership.
  - Clinical data and disease coding.
- Resolution of issues related to forms production and management which are be-

yond the control of the individual practitioner.

While the software industry and developers can take the emerging specification and begin to work towards it, without concerted planning and investment in the other areas identified above it is unlikely that any substantial benefit will be achieved.

It is also important to recognise that having the specification is only one small step along the way to actual effective implementation of improved General Practice computing in Australia.

## 8. The future

As of September, 1997 and now the engagement is complete, all the documentation produced is currently available at the project web site (until at least the end of 1998, and after that by contacting the authors of the study). It is clear enough, in our view, what is required by the clinicians as far as computerised practice support is concerned and the baton now passes to the medical software industry, Government, and the organisational stakeholders to resolve to move the project forward. It is our belief there is the basis of some superb systems contained in the documentation developed for this project and we look forward to seeing the actual working systems.

## Acknowledgements

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## References

- [1] J. Cacek, 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, Personal Communication and data quoted in Thomas (1997) Canberra, 1997.
- [3] IBM Consulting Group, Stakeholder Consultation Report for GPCS Specification Consultancy IBM (Australia), Sydney.
- [4] P. MacIsaac, N. Amin, Information technology in UK general practice—a personal view, *Inf. Health Care (Aust.)* October (1996).
- [5] N. Munday, A Study of the Use of Information Technology in South Australian Private Medical Practice, MBA Project Thesis, University of Adelaide, South Australia, 1995.
- [6] C. Thomas, The computerised practice push, *Med. Obs. Bus.* April–May (1997) 28–32.