ITEM FOR FINANCE COMMITTEE

CAPTIAL WORKS RESERVE FUND
HEAD 710 – COMPUTERISATON
Government Secretariat: Education Bureau
New Subhead "Infrastructure enhancement for Education Information System"

> Members are invited to approve a new commitment of $157,017,000 for enhancing the information technology infrastructure of the Education Information System of the Education Bureau.

PROBLEM

The Education Bureau (EDB) needs to enhance the existing information technology (IT) infrastructure of the Education Information System (EdIS) to upkeep the quality of existing services supported by the EdIS and harness improvement opportunities for future growth in service capacity.

PROPOSAL

2.   The Secretary for Education, with the support of the Government Chief Information Officer (GCIO), proposes to create a new commitment of $157,017,000 for enhancing the IT infrastructure of the EdIS.

JUSTIFICATION

3.   EDB is currently using the EdIS, which comprises seven computer systems, to support its core business functions and the relevant operational, administrative and management processes such as registration of schools, teachers and school managers, enforcement of universal basic education, allocation and placement of school places for primary 1, secondary 1 and secondary 4 applicants,

/processing …..

Encl. 1

processing of school fee applications, calculation of school staff entitlements, monitoring resources and services provided to schools, etc. Details of the seven computer systems are at Enclosure 1. At present, the systems maintain records for over 700 000 students, 50 000 teachers, and 4 000 schools and educational institutions.

4.   The major components of EdIS' existing IT infrastructure, namely the mainframe, midrange, personal computer (PC) and local area network (LAN) platforms, have been in use since 1995. While the EdIS has helped us meet our business needs with a high degree of reliability over the years, we need to address various constraints of the existing IT infrastructure in good time in order to cope with the anticipated change in business needs and requirements in future. The constraints of the existing systems are set out in paragraphs 5 to 9 below.

Technical limitations of the existing mainframe platform

5.   As the existing mainframe machine, hosted by commercial data centre operator, is approaching the end of its serviceable life, the supply of related products and qualified support staff with appropriate technical skills for maintenance of the existing platform is increasingly limited in the market. The maintenance of the computer systems will become more difficult and less cost-effective. Besides, as mainframe applications are text-based, the user interface is not as user-friendly as the newer web-based applications.

Lack of a holistic view of data amongst systems

6.   Under the existing IT infrastructure, information on students, teachers, schools and school places allocation is managed in different computer systems. The current design does not support a holistic view of data amongst computer systems and limits the integration and sharing of data between the mainframe, midrange and PC/LAN systems.

7.   Due to the above constraints, correlation of different information, if needed for operational and policy formulation purposes, must be manually conducted. For instance, users responsible for Secondary One Allocation (SOA) need to access the Web-based School Information Management System separately to verify the corresponding planned class structure details before they can update the number of school places available for allocation via the SOA system. Another example is that as electronic school surveys running under the PC platform cannot be automatically cross-checked with information on schools and students in the mainframe and midrange systems, EDB and schools concerned are required to manually process and verify survey data. These procedures involve substantial time and staffing resources that could have been put to other gainful uses.

/Limited …..

Limited system processing capabilities

8.   The existing mode of operation and capabilities of EdIS cannot fully meet the increasing service demand and evolving business needs. Many EdIS functions are conducted in batch mode running on mainframe. The long or even overnight turnaround time of some of the batch functions, such as the capturing of student enrolment information, updating of student particulars, and the need to manually follow up on data rejections via another batch processing cycle affect work efficiency and our ability to cope with rising service demands in the long run.

9.   Besides, the existing end-user query tool usually processes information queries in batch mode. It also requires the use of specific data structure and language syntax for retrieving certain data. It is inconvenient to retrieve information from the computer systems using the existing query tool, which may affect the efficiency in handling information queries.

DETAILS OF THE PROPOSAL

The proposed infrastructure enhancement and the expected benefits

10.   Having undertaken a feasibility study to review the existing IT infrastructure and identify the possible enhancement areas, we propose, with the support of the GCIO, to redevelop the EdIS into an integrated computer system on an upgraded IT infrastructure with the latest technology, open standards and best practices with a view to keeping pace with IT developments and supporting the changing business requirements of EDB. The expected benefits of the proposed enhancement are set out in paragraphs 11 to 14 below.

Enhanced business agility and extensibility

11.   The new EdIS, with its upgraded IT infrastructure, will overcome the constraints of the existing mainframe platform. On the one hand, it will maintain all existing functions and stability level of the systems, particularly the school places allocation systems. On the other hand, the upgraded IT infrastructure will be more scalable and flexible to cater for new business requirements, as well as better equipped for implementing new services with electronic means to improve service quality for students and parents. For example, the new EdIS can be readily extended to support the delivery of school places allocation results by electronic/mobile means as contingency measures in bad weather conditions where schools or allocation centres for result collection may be closed. With the upgraded IT infrastructure, the feasibility of joining-up with relevant government bureaux and departments to facilitate school registration applications from the public through electronic means can also be explored.

/Enhanced …..

Enhanced operational efficiency and management support capabilities

12.   The introduction of the new IT infrastructure and more advanced software tools will enable the new EdIS to provide a unified platform and central information repository on students, teachers and schools. The limitation on the inter-operability of different systems of the existing EdIS, where each computer system requires separate user authentication, has its own convention of operation and only allows access to its own set of data, will no longer exist. Various kinds of users, including EDB staff, school users, parents and students, can access the computer systems in a flexible and secure fashion. Access control will be implemented to ensure that authenticated users with different authority levels can only get access to certain functions or data items on a need basis. Other improvements to the operational efficiency and management support functions are as follows –

(a)   improved work efficiency of both schools and EDB by providing a holistic view of all data with a unified user interface and a more comprehensive and flexible way for information searching by authenticated users among different business functions. For example, it will be easier and quicker to conduct on-line enquiry on detailed information of a particular school such as planned class structure, student details and teacher particulars. Data collection exercises from schools will also be done more efficiently, as schools' efforts in manual collation and compilation of the required data will be saved;

(b)   enhanced data accuracy with more stringent validations and checking across computer systems, such as the checking between the Web-based School Administration and Management System (WebSAMS) being used in schools and the Student Information Management System of EdIS. This will save effort of schools and EDB in handling irregularities, such as data inconsistencies between systems;

(c)   support for traditional and simplified Chinese and conforming to the prevailing standard (i.e. ISO10646), hence facilitating data exchange among computer systems of EDB and other government bureaux/departments, subject to compliance with relevant government regulations and requirements on data access;

(d)   support for more advanced end-user query tools to make data extractions more efficient for analysis and decision making of EDB. With more advanced tools, queries can be run in online mode instead of batch mode to enable timely response to ad hoc urgent request for data extractions or analysis; and

(e)   better control of batch job processing and execution, and reduction of turnaround time and failure rate. For example, student information can be downloaded in a more timely manner with online mode instead of batch mode. Advanced batch job control features such as parameter checking, which are not available in the existing system, can help identify irregularities in the job request such as missing job control parameters expeditiously.

Improved system integration

13.   Apart from the interface with the WebSAMS being used in schools, the existing EdIS has cross-departmental system interface/exchange with the Student Financial Assistance Agency (SFAA) and the Hong Kong Examinations and Assessment Authority (HKEAA). Specifically, the cross-departmental system interface has enabled SFAA to confirm students' enrolment information through matching with EDB's central student database for the purpose of disbursing grants under the School Textbook Assistance Scheme (instead of relying on manual checking with schools) with effect from the 2010/11 school year. This has substantially reduced the administrative work on the part of schools. Riding on this platform, we are now working with SFAA to further strengthen the two-way electronic communication on students' information with schools so as to minimise manual efforts involved in handling other types of financial assistance for needy students, including the Examination Fee Remission Scheme and Student Travel Subsidy System. With the technology of the new EdIS, the interface will be enhanced to facilitate data exchange with SFAA (and HKEAA where necessary) for administering different student financial assistance schemes in a more efficient manner.

Streamlined business processes

14.   The upgraded EdIS will help streamline the business processes of EDB, such as identification of suspected non-attendance cases reported by schools at the beginning of each school year, communication with schools through electronic means such as reminding schools to complete school surveys on time.

Security measures

15.   The enhanced EdIS will have a central database for keeping the particulars of students and teachers as well as school places allocation results. EDB will strictly comply with relevant government regulations and requirements when handling these particulars. Security measures will be implemented to protect data privacy, such as encryption of sensitive data when stored in the database and during

transmission on the Internet. Detailed security and data privacy assessments will be conducted before implementation of the enhancement project. Security risk assessments and audit will also be conducted periodically so as to ensure that the security level of the data centres and the operation of the IT systems are in strict compliance with the Government's prevailing IT security policies and guidelines.

16.   In carrying out the migration of computer systems to the new IT infrastructure, EDB will ensure that all data stored in the existing computer systems will be thoroughly removed. The hard disks will be de-magnetised and physically destroyed before they are disposed of. EDB will ensure that these physically destroyed hard disks and other unserviceable computers and accessories like printers, monitors, routers and modems will be disposed of in accordance with relevant government procedures.

Cost savings/avoidance

17.   The infrastructure enhancement of EdIS will enable savings of an estimated non-recurrent cost of $7,352,000 in 2015-16 that would otherwise be required for upgrading system software on the mainframe platform.

18.   Moreover, we estimate that the proposed project will bring about annual savings of $31,918,000 in a full year from 2017-18 onwards, comprising –

  (a) **Realisable savings of $18,353,000 per annum, including –**

    (i) $7,630,000 of maintenance costs of the existing systems, including mainframe system hosting, hardware and software maintenance, printing services, computer operator services and external support services for midrange and PC/LAN platforms; and

    (ii) $10,723,000 of on-going support services expenditure for application maintenance and support of the existing systems.

  (b) **Notional savings of $12,445,000 per annum**

    These represent notional staff cost savings from productivity gain as a result of more efficient operations brought about by the upgraded IT infrastructure. Although such savings are not realisable by deletion of posts or deployment of the staff concerned to provide other services, the staff time saved may be used on other gainful purposes.

(c) **Cost avoidance of $1,120,000 per annum**

This represents the avoidance of additional software maintenance costs which would otherwise be required to support the upgraded mainframe system mentioned in paragraph 17.

Encl. 2   19.   A cost and benefit analysis of the proposed project is at Enclosure 2.

FINANCIAL IMPLICATIONS

Non-recurrent expenditure

20.   We estimate that the implementation of the proposed enhancement of the EdIS will require a total non-recurrent expenditure of $157,017,000 over five years from 2012-13 to 2016-17, with breakdown as follows –

	2012-13 $'000	2013-14 $'000	2014-15 $'000	2015-16 $'000	2016-17 $'000	Total $'000
(a) Hardware	-	-	1,617	9,759	-	11,376
(b) Software	-	-	3,493	10,558	-	14,051
(c) System hosting	-	-	1,018	2,035	925	3,978
(d) Communication network	-	-	34	81	39	154
(e) Implementation services	-	4,949	25,701	23,132	36,057	89,839
(f) Contract staff	-	1,843	4,755	5,053	2,964	14,615
(g) Consumables	-	-	33	33	-	66
(h) Accommodation[Note]	117	653	2,772	3,267	1,855	8,664
(i) Contingency	-	-	-	-	14,274	14,274
Total	**117**	**7,445**	**39,423**	**53,918**	**56,114**	**157,017**

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[Note] Regarding the $117,000 for accommodation in 2012-13, cash flow is required at an early stage for the provision of accommodation for the staff involved in the tendering process.

21. As regards paragraph 20(a), the estimate of $11,376,000 is for the acquisition of computer hardware, including servers, data storage devices, network equipment, backup and recovery equipment, and system development workstations.

22. As regards paragraph 20(b), the estimate of $14,051,000 is for the acquisition of computer software, including operating systems, virtualisation software, database management software, web application server software, enterprise printing software, system administration and monitoring software, job scheduling software, backup and recovery software, and system development tools.

23. As regards paragraph 20(c), the estimate of $3,978,000 is for the acquisition of data centre services from external service providers which include the setup and installation at external data centres and system hosting expenditure to be charged during the implementation stage.

24. As regards paragraph 20(d), the estimate of $154,000 is for the acquisition of communication network and related services for connecting the IT component and equipment in various offices/locations.

25. As regards paragraph 20(e), the estimate of $89,839,000 is for the acquisition of different services from external service providers to implement the project. Major implementation activities include system analysis and design, programming and testing, data conversion, training, system setup, security and privacy impact assessments, system nursing as well as project management within the respective implementation activities.

26. As regards paragraph 20(f), the estimate of $14,615,000 is for hiring of contract staff to supplement the in-house project management team to provide support in overall project management, monitoring and conducting system acceptance tests.

27. As regards paragraph 20(g), the estimate of $66,000 is for the acquisition of start-up consumables such as tapes for system backup.

28.   As regards paragraph 20(h), the estimate of $8,664,000 is for the provision of accommodation such as office space, file and general storage, and general office furniture and equipment for the staff involved in the implementation of the project, if needed.

29.   As regards paragraph 20(i), the estimate of $14,274,000 represents a 10% contingency on the items as set out in paragraphs 20(a) to 20(h) above.

30.   Given that the project will last for over four years, there may be changes to the costing model and we may make necessary variation or adjustment to the items as set out in paragraphs 21 to 29 above as appropriate.

Other non-recurrent expenditure

31.   The implementation of the proposed enhancement project will require setting up a project management team comprising in-house staff from EDB to oversee the overall management, mainly in the areas of project planning, monitoring and control, gathering and understanding user requirements, co-ordination of project deliverables, user testing and training. As the existing systems, in particular the school places allocation and placement systems, are complex and critically important to EDB, the project management team will be formed with in-house staff. The non-recurrent staff cost from 2012-13 to 2016-17 is estimated at $42,728,000 with cash flow as follows –

	2012-13 $'000	2013-14 $'000	2014-15 $'000	2015-16 $'000	2016-17 $'000	Total $'000
Staff cost	3,683	9,129	11,219	10,756	7,941	42,728

32.   The estimated staff cost represents a total of 454 man-months of departmental grade and IT professional grade staff. Additional time-limited posts, if necessary, will be sought and created through established mechanism.

Recurrent expenditure

33.   We estimate that the full recurrent expenditure for maintaining and running the new system will be $18,251,000 per annum from 2018-19 onwards, which will be fully met by annual realisable savings of $18,353,000 in paragraph 18(a) above. The breakdown of the recurrent expenditure is set out as follows –

	2016-17	2017-18	2018-19 and onwards
	$'000	$'000	$'000
(a) Hardware and software maintenance and consumables	2,651	3,003	4,396
(b) On-going support services	5,371	10,723	10,723
(c) System hosting and communication network	1,838	3,117	3,132
Total	**9,860**	**16,843**	**18,251**

34.		As regards paragraph 33(a), the estimated annual expenditure of $4,396,000 is the provision for hardware and software maintenance, software license fees and the acquisition of consumables such as tapes for backup storage media to support the new IT infrastructure.

35.		As regards paragraph 33(b), the estimated annual expenditure of $10,723,000 is for on-going support and maintenance services for the system applications.

36.		As regards paragraph 33(c), the estimated annual expenditure of $3,132,000 is for the hosting of the new EdIS at external data centres and communication network rental charges.

IMPLEMENTATION PLAN

37.		We plan to implement the proposed project according to the following schedule. Assuming that the tender for the implementation of the project can be awarded in 2013-14, the proposed project can start in 2013-14 and be completed in 2016-17 –

/**Activity** …..

	Activity	Target completion date
(a)	Tendering	October 2013
(b)	System analysis and design	January 2015
(c)	System development	December 2015
(d)	User acceptance	July 2016
(e)	Data conversion	August 2016
(f)	System live-run	September 2016
(g)	System nursing	February 2017

38.   We plan to set up a Project Steering Committee (PSC) chaired by a senior directorate officer in accordance with relevant government guidelines and procedures. The PSC will steer the project to ensure good project governance in various aspects including procurement procedures, project quality, progress and expenditure.

39.   We will make use of the existing communication channels with the school sector on the use of IT facilities, including school councils and advisory committees, to gauge user requirements on a regular basis and to ensure the alignment of the project objectives with EDB's overall business requirements. The communication channels will be continued after system rollout to constantly obtain users' feedback on the systems.

PUBLIC CONSULTATION

40.   We consulted the Legislative Council Panel on Education on the proposal on 9 January 2012. Members supported the submission of the funding proposal to the Finance Committee (FC).

BACKGROUND

41.   In meeting its policy objectives, EDB has been implementing a number of education programmes such as school places allocation and placement systems, New Senior Secondary academic structure and curriculum, support services for newly arrived children from the Mainland, etc. EDB requires an efficient computer system to carry out these functions effectively.

42.   The FC approved vide FCR(93-94)78 in September 1993 the creation of a commitment of $282,350,000 on "Implementation of Information Systems Strategy" in the then Education Department (ED) for implementing nine projects, which include the EdIS (formerly known as Education Department Information System), under the five-year Information Systems Strategy Plan from 1993-1994 to 1997-98. The EdIS provided 1 300 ED officers with computers connected to the ED network and the Internet. FC further approved vide FCR(2000-01)37 in June 2000, among others, $59,933,000 for replacing and upgrading computers of the EdIS and expanding its coverage of users.

Education Bureau
April 2012

Existing Compositions of Education Information System

	Computer System	Platform
1.	Student Information Management System	Mainframe
2.	Primary One Admission System	Mainframe
3.	Secondary One Allocation System	Mainframe
4.	Secondary Four Placement System	Mainframe
5.	Web-based School Information Management System	Midrange & PC/LAN
6.	Web-based Teacher Information Management System	Midrange & PC/LAN
7.	Security Control System	Mainframe

Cost and Benefit Analysis of the Infrastructure Enhancement for Education Information System

	Cash flow ($'000)										
	2012-13	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**Total**
Cost											
Non-recurrent											
- Expenditure	117	7,445	39,423	53,918	56,114	-	-	-	-	-	157,017
- Staff cost	3,683	9,129	11,219	10,756	7,941	-	-	-	-	-	42,728
Sub-total	3,800	16,574	50,642	64,674	64,055	-	-	-	-	-	199,745
Recurrent											
- Expenditure	-	-	-	-	9,860	16,843	18,251	18,251	18,251	18,251	99,707
Sub-total	-	-	-	-	9,860	16,843	18,251	18,251	18,251	18,251	99,707
Total cost	**3,800**	**16,574**	**50,642**	**64,674**	**73,915**	**16,843**	**18,251**	**18,251**	**18,251**	**18,251**	**299,452**
Savings											
Non-recurrent											
- Cost avoidance	-	-	-	7,352	-	-	-	-	-	-	7,352
Sub-total	-	-	-	7,352	-	-	-	-	-	-	7,352
Recurrent											
- Realisable savings	-	-	-	-	9,822	18,353	18,353	18,353	18,353	18,353	101,587
- Notional savings	-	-	-	-	1,037	12,445	12,445	12,445	12,445	12,445	63,262
- Cost avoidance	-	-	-	280	1,120	1,120	1,120	1,120	1,120	1,120	7,000
Sub-total	-	-	-	280	11,979	31,918	31,918	31,918	31,918	31,918	171,849
Total savings	**-**	**-**	**-**	**7,632**	**11,979**	**31,918**	**31,918**	**31,918**	**31,918**	**31,918**	**179,201**
Net savings	**(3,800)**	**(16,574)**	**(50,642)**	**(57,042)**	**(61,936)**	**15,075**	**13,667**	**13,667**	**13,667**	**13,667**	**(120,251)**
Net cumulative savings	**(3,800)**	**(20,374)**	**(71,016)**	**(128,058)**	**(189,994)**	**(174,919)**	**(161,252)**	**(147,585)**	**(133,918)**	**(120,251)**	