

## **ITEM FOR FINANCE COMMITTEE**

### **CAPTIAL WORKS RESERVE FUND**

### **HEAD 710 – COMPUTERISATION**

### **Department of Health**

### **New Subhead “Information Technology Enhancement Project of the Department of Health”**

Members are invited to approve the creation of a new commitment of \$1,057,134,000 for implementation of an information technology enhancement project for the Department of Health.

### **PROBLEM**

The Department of Health (DH) needs to enhance its information technology (IT) systems and increase the use of information and communications technology (ICT) so as to better provide services to the public, perform its role as regulator and the Government’s health advisor, and transform itself into a data-driven organisation in this digital age.

### **PROPOSAL**

2. The Director of Health, with the support of the Secretary for Food and Health and the Government Chief Information Officer, proposes to create a new commitment of \$1,057,134,000 for DH to implement a department-wide IT enhancement project to improve its delivery of clinical and healthcare services and performance of regulatory functions, streamline its workflows to increase efficiency, and transform itself into a data-driven public organisation.

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## JUSTIFICATION

### Current Position

3. DH is the Government's health adviser and executive arm for various health policies, initiatives and statutory functions. It provides a wide range of promotive, preventive, curative and rehabilitative services to society as well as fosters community partnership and international collaboration on health.

4. As at December 2017, there were 41 main service units in DH distributed at 94 locations and 199 clinics/centres/units across Hong Kong. These service units can be broadly grouped under four service streams by their functions, namely Public Health Services, Clinical and Health Services, Health Regulatory Services, and Administration and Support Services.

5. While DH has developed and used various IT systems and mobile applications over the years to support its work and enhance efficiency and quality of services, there remains considerable room to optimise its IT landscape. Throughout the years, DH has not had an overall IT use and development strategy. Some service units continue to rely on manual operations and have to handle considerable paperwork. Some IT systems were developed a long time ago and can hardly meet present-day service demand. Different service units have separately developed more than 100 siloed, fragmented IT systems and tools at different times that are not comprehensively connected. Many of these systems and tools are also relatively basic and task-specific, thus providing little room for upgrade and collaboration. As a result, different technical architecture and data standards are in use and this has made creation of synergy, sharing of data and information, holistic development and maintenance, and use of the latest technology including data analytics difficult. The full potential of using IT to improve services and enhance efficiency and cost-effectiveness has yet to be fully realised at DH.

### The Information Systems Strategy Study

6. Realising that the status quo would not be sustainable in view of the increasing demand for quality service and the fast evolving healthcare landscape, DH commissioned in 2016 an Information Systems Strategy Study (ISSS) with a view to formulating an overarching strategy plan on the use of IT to better support DH's operations and enhance its capability to meet Hong Kong's healthcare needs and challenges in this digital era. The ISSS was completed in early 2018. Having reviewed DH's current use of IT, examined its business processes, technical

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infrastructure and IT governance, and assessed DH's current and future roles in Hong Kong's healthcare system, the consultant noted that DH has a wide digital gap to narrow. Even for service units that are already using IT systems and infrastructure, there are a number of shortcomings that have prevented them from harnessing the full potential of IT to help deliver services in a more efficient and cost-effective manner. The key issues/needs identified in the ISSS are set out below –

- (a) ***Manual workflows in need of automation:*** With limited system capabilities for automating processes, some of DH's service units still generally rely on paper-based and manual workflows for many day-to-day operations. Many standard procedures such as booking appointments, conducting questionnaires, performing record inspections, and compiling and retrieving reports and information are done manually. This leads to inefficiency and causes inconvenience to both patients and staff. There are also vulnerabilities to errors and misplacement of paper records.
- (b) ***Siloed and fragmented systems:*** Owing to the use of heterogeneous technical architecture and data standards over the years, DH's IT systems are siloed with limited interfacing. They have also been designed and developed using standalone architectural standards and independent components which are difficult to be re-applied to other systems and applications. This impedes the creation of synergy and development of value-added services from sharing common system infrastructure and user knowledge.
- (c) ***Ageing and de-supported systems:*** Many of DH's IT systems were developed over 15 years ago and there is now limited vendor support. The ageing systems hinder DH's ability to keep pace with the latest developments in innovative technology that can be useful for service enhancement and transformation. DH's internal IT teams need to work strenuously to prevent service delays and interruptions.
- (d) ***Limited data analytic capabilities:*** Most data in DH are kept in paper form or stored in unstructured electronic formats (e.g. simple Excel files). Data input, compilation and retrieval are largely manual processes. Furthermore, the absence of a common standard for saving and processing data makes information sharing and data analysis difficult and inefficient. The development of data analytics which can be useful for identifying information for improving healthcare services, informing healthcare policies and initiatives, and facilitating healthcare innovation is also greatly hindered.

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- (e) **Management planning:** In general, DH lacks an integrated, coordinated and overarching departmental IT strategy covering the development of IT and data analytics.

7. DH generally agrees with the observations made by the consultant. With reference to the consultant's recommendations, DH plans to implement a department-wide IT enhancement project to comprehensively increase the use of IT in service delivery, performance of regulatory roles and departmental management, with a view to enhancing service quality and efficiency and transforming itself into a data-driven public organisation. Details are provided in the ensuing paragraphs.

### **DH's IT Enhancement Project**

8. DH proposes the first stage of “**Strategic Plan to Re-engineer and Transform Public Services**” (SPRINT-1), which is an implementation plan of a holistic portfolio of IT projects and activities for the Department to grasp the opportunities offered by the latest technological advancements. As an overview, SPRINT-1 will be underpinned by three major pillars, namely (a) IT infrastructure enhancements; (b) service and process enhancements; and (c) development of data analytics capability.

9. On **IT infrastructure enhancements**, DH will promote the use of IT and automation, shared system infrastructure and common platforms among service units where feasible to achieve cost optimisation, process efficiency, data standardisation, and knowledge sharing. Service units will be able to collaborate more effectively, accelerate reviews and approvals, capture, store and share information electronically, reduce redundant data entries, and better enforce standard operating procedures. Resources for IT development will also be re-organised to strengthen IT governance and security provision.

10. On **service and process enhancements**, e-services and mobile applications will be expanded to bring greater convenience to the public. More IT solutions will be adopted to better support business processes and use of technology to replace paper-based workflow and redundant manual operations. Furthermore, the Clinical Information Management System<sup>1</sup> (CIMS) will be developed into a

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<sup>1</sup> The current CIMS was first launched in 2014 and supports the operation of Antenatal Service of Family Health Service, Clinical Genetic Service, Dental Service, Families Clinics, Social Hygiene Service and Special Preventive Programme. It is an IT system with common modules for supporting key clinical processes such as appointment booking, patient registration, diagnosis, laboratory tests, drug prescription, etc. It also serves as a centralised patient database for these six services.

better integrated system for storing comprehensive, life-long electronic health records (eHRs) for patients in DH and fully interfaced with the territory-wide Electronic Health Record Sharing System<sup>2</sup> (eHRSS) for sharing eHRs within the sharable scope<sup>3</sup> among participating public and private healthcare providers (HCPs), including the Hospital Authority (HA).

11. On *development of data analytics capability*, linked and interoperable electronic platforms will be established among service units to support information collection and sharing, as well as data analysis and reporting. A departmental data standard will be defined to ensure consistency of data structure and enhance data governance. In addition to building up DH's data analytics and data management capacities, enhancements in this area will also help improve the monitoring and planning of health services, inform healthcare policies and initiatives, and facilitate healthcare innovation. DH will also be in a better position to open up its data for public and researchers' use as appropriate.

### ***Projects under SPRINT-1***

Encl. 1 12. To meet the objectives under the above three pillars, the proposed SPRINT-1 will comprise four key initiatives encompassing 35 projects (full list set out at Enclosure 1). These initiatives include –

Initiative 1 – Clinical Services Improvement

Initiative 2 – Business Support and Enablement

Initiative 3 – IT Operations Enablement

Initiative 4 – Studies for Future Developments

The major projects of these initiatives are highlighted below.

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<sup>2</sup> The Government-led eHRSS was launched in March 2016 for HCPs in the public and private sectors to share and view patients' health data and records on a "need-to-know" basis, subject to patients' express and informed consent. It aims to promote public-private collaboration, facilitate continuity of care and improve the quality and cost-effectiveness of healthcare. As of early May 2018, over 750 000 patients had joined the system. As for HCPs, DH, the Hospital Authority, all 12 private hospitals and more than 1 500 other private HCPs had joined.

<sup>3</sup> The sharable scope of the eHRSS includes: (a) personal identification and demographic data; (b) allergies and adverse drug reactions; (c) diagnosis, procedures and medication; (d) encounters/appointments; (e) clinical note/summary; (f) birth and immunisation records; (g) laboratory and radiology reports; (h) other investigation reports; and (i) healthcare referrals.

*Initiative 1 – Clinical Services Improvement*

13. There are two major projects to be undertaken under Initiative 1, namely CIMS enhancement and extension and replacement of the System for Managing the Assessment of Student Health (SMASH) and the Internet Service for SMASH (wSMASH).

## (i) CIMS Enhancement and Extension

14. The existing CIMS, currently covering only six of DH's clinical services of some 70 clinics, will be enhanced and expanded to serve as the backbone of DH's IT systems for delivery of clinical and healthcare services. It will eventually cover 14 of DH's clinical services<sup>4</sup> spanning over 150 clinics and service locations. The enhanced CIMS will provide a wide range of clinical and administrative functions tailored for DH's clinical services, such as appointment booking, patient registration, taking medical records, ordering laboratory tests, making drug prescriptions, preparing medical reports, and generating statistical and management reports, etc. The system will be built with suitable applications and modules to suit the workflows of DH's clinics, in particular, those providing health assessment and preventive services to the public, such as Child Health Service and Elderly Health Service, for which the unique workflows require customised system design.

15. In addition to performing as DH's local electronic medical record (eMR) system, the enhanced CIMS will also form a centralised repository of patient records and be fully interfaced with the eHRSS to enable DH to view and share patients' eHRs within the sharable scope with other participating HCPs in the public and private sectors, including HA. Upon full implementation of the enhanced CIMS, all clinical service units (except Methadone Clinics) with over 170 clinics will have their local eMR systems fully connected to the eHRSS. It is expected that the number of medical records to be shared from DH to the eHRSS will increase from the current 30 000 entries per month to 200 000 entries per month in 2024, and further to 400 000 entries per month in 2026. This full-fledged integration of the CIMS with the eHRSS aligns with the Government's policy to implement territory-wide eHR sharing, and is expected to better facilitate continuity of care, enable more public-private sector collaboration, and enhance the quality and cost-effectiveness of healthcare services.

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<sup>4</sup> They are Child Assessment Service, Clinical Genetic Service, Dental Service, Elderly Health Service, Family Health Service (Antenatal Service, Child Health Service, Family Planning Service, Postnatal Service, and Woman Health Service), Professional Development and Quality Assurance, Social Hygiene Service, Special Preventive Programme, Travel Health Service and Tuberculosis and Chest Service.

16. Furthermore, the centralised and comprehensive eHR repository on the CIMS will provide the raw inputs necessary for building up DH's data analytic capabilities and stepping up its role as the Government's adviser for health policies. There will be more opportunities for innovative use of health data for public and researchers' use where appropriate. The improved volume, veracity and variety of data will also enable DH to use contemporary data analytic techniques to perform more robust and predictive analysis in health-related studies for informing healthcare policies. Examples include improving forecast on the health of the population and requirements for health services in relation to the ageing population and environmental changes, as well as studying the local models/patterns of communicable and non-communicable diseases.

17. Lastly, to enhance clinical workflows and bring greater convenience to service users, new functions/features will be developed and incorporated in the CIMS for improving efficiency and user experience. Examples include sharing of radiology images, enhanced online booking and telephone hotline system, mobile devices and applications, expansion of e-services, workflow integration across clinics, dispensaries and laboratories, and features for facilitating ethnic minorities to use DH's services, etc. The CIMS will also be able to support the extraction of card face data stored in the new Smart Identity Card to facilitate patient registration.

(ii) Replacement of SMASH and wSMASH

18. The existing SMASH is used for providing promotive and preventive healthcare to over 680 000 primary and secondary school students through a wide range of health services such as physical examinations and health screenings as well as health counselling and education at 12 Student Health Service Centres and three Special Assessment Centres. The wSMASH is the online system for making enquiries and making/changing appointments. As SMASH and wSMASH were respectively developed 23 and 12 years ago, they are ageing and becoming de-supported. They also lack the capacity and technical functions to cope with the latest service demands. Currently, they run on isolated networks which do not allow real-time data synchronisation. There is thus a pressing need to develop a revamped and consolidated system as their replacement so as to expand service capacities, strengthen system security, improve system maintainability and enable more e-services such as electronic enrolment, one-stop portal for appointment scheduling, health information and edutainment and self-service kiosks.

*Initiative 2 – Business Support and Enablement*

19. In view that DH is a public-facing organisation at the frontline of Hong Kong's healthcare system and often has to communicate with and disseminate information to the public, there is a need for the Department to be

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supported by efficient and reliable business support and enablement systems/networks. After reviewing the current workflow of incident reporting and complaint handling in DH, it is proposed that two new systems, namely the Incident Reporting System and the Departmental Enquiry/Complaint Management System, be developed under Initiative 2. In building these two systems, shared platforms for common administrative and support processes will be developed to improve operational efficiency.

20. The Incident Reporting System, for reporting and processing adverse events and incidents within the Department, will be established so as to enable more efficient and accurate reporting and dissemination of information and to expedite the tracking and analysis of adverse events and incidents. The system will provide a standardised and intuitive user interface to assist frontline healthcare staff to report any suspected adverse events and incidents in their clinics/services. Digitising the reporting process not only obviates the need for processing excessive paper work, but also shortens response time and allows appropriate and timely actions to be taken. Furthermore, the system enables reports, reviews and analyses to be readily compiled and generated, which are important sources of information for improving the quality of service, preventing incident recurrence and enhancing patient safety.

21. On the other hand, the Departmental Enquiry/Complaint Management System will be developed so as to better support and streamline the complaint handling and management process to facilitate better service delivery and identification of areas for service improvement. Currently, complaints and enquiries to DH are all handled manually and considerable effort is required to keep track of these enquiries and complaints, such as using email and fax to distribute the cases to case officers and issuing reminders to them, etc. It is also time consuming and cumbersome to manually comb through paper files in order to locate a particular record. This new System will be able to improve the current workflow, enhance efficiency and bring greater convenience to users. For frontline staff, the system will substantially reduce the time used for distributing cases, issuing reminders, and checking of past records, etc. The overall workflow can also be greatly streamlined. For management of services, the structural data available from the system will make easy the preparation of statistical reports and analyses, and help piece together a holistic picture of DH's operations, as well as highlight areas that are in need of greater attention for formulating strategic improvement plans.

### *Initiative 3 – IT Operations Enablement*

22. With the increasing need to use IT for operations to enable electronic records and automation, a robust and resilient IT infrastructure will be critical to DH. Currently, due to the siloed nature of the multiple small-scale systems, each

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system needs to maintain its own servers, data centre hosting service, network service and helpdesk service. Resources are thus not deployed and utilised in the most efficient manner. Furthermore, the small capacity of the individual systems greatly limits scalability, which in turn restricts the adoption of more advanced hardware and support services. There is also little or no room for implementation of IT monitoring tools, which is a crucial element for maintaining a stable and high performance system.

23. By consolidating the hardware and services of different systems and pooling resources, a more robust and resilient IT infrastructure can be set up to support the implementation and operation of the various new systems proposed, with maintenance costs kept in check. For example, a centralised helpdesk using common infrastructure will be set up to provide user support to different systems. This will bring more convenience to users, as a single contact point can be approached for enquiries and requests for multiple IT issues. Also, consolidation and enhancement projects on data centres, communication networks and IT monitoring tools will be conducted to provide common platforms and high speed networks to meet future system requirements. An example is the transmission of radiology images on the CIMS, which calls for a high capacity network that cannot be supported by any of the existing network systems in DH. Also included in this initiative are projects that will streamline and safeguard IT operations, such as convenient yet secure use of mobile devices by frontline staff, single sign-on to different systems, internal cloud storage and email add-on tools for secured storage, sharing and transmissions of data and files, etc.

#### *Initiative 4 – Studies for Future Developments*

24. DH's IT development should be an ongoing and continuous effort, spanning beyond the scope and horizon of SPRINT-1. The enhancements also need to be arranged in a synchronised manner and on a departmental scale in order to harness the full potential of IT and reap the benefits. Hence, to pave the way for considering future development, SPRINT-1 comprises consultancy studies on more complex projects and initiatives, planned to be undertaken at a later and more opportune stage. These consultancy studies include the Data Architecture Study (DAS) and a feasibility study for the Shared Licensing and Monitoring System (SLMS).

25. As one of the key targets of DH's IT enhancement project is to transform the Department into a data driven organisation, the DAS will be conducted to help DH ensure alignment in data standards, interpretation and utilisation across service units, all of which will form the basis for enhancing

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synergy and interoperability across different systems. It will also form the bedrock for formulating DH's overarching strategy for data analytics in the longer run. As for the SLMS, it is envisaged to replace the various systems built for individual services and be the single platform for the public and HCPs to apply for various licences and registrations through electronic means, and for DH to standardise regulatory work and enhance its services. It is expected that the SLMS will provide the benefits of a common platform as seen in the CIMS, including more efficient use of resources, maintaining more structured and high quality data, streamlining workflows, enabling a holistic view of service performance, and providing better user experience to both DH staff and the public.

26. In view of the scale and complexity of the relevant subjects described above, and the need to dovetail with the development and operation of the systems under SPRINT-1, we consider that it would be prudent to first conduct DAS and a feasibility study for the SLMS before taking forward the developments.

### ***Project Implementation***

#### *HA as Technical Agency for Initiative 1 - Clinical Services Improvement*

27. Initiative 1 – Clinical Services Improvement is a territory-wide, healthcare-centric IT development proposal. It will be one of the largest scale health IT development projects undertaken in Hong Kong, and its development requires heavy input of clinical expertise. The fine technical details may well have material implications on the clinical usability of the systems and components concerned and impact on patient safety. In view of the complexity of the proposal and the large amount of patient records and personal data involved, it is prudent to engage a reliable technical agency with a sound track record and thorough understanding of the local healthcare scene to assist in the relevant development and management tasks which are critical and delicate in nature. As considered in the ISSS, HA would be suitable to take up this role.

28. Since 1995, HA has progressively developed and refined its Clinical Management System (CMS) for managing its patients' eHRs. With the comprehensive electronic patient records (ePRs) of over 10 million patients, the CMS is the largest integrated ePR system in Hong Kong, and probably one of the most advanced and successful of its kind globally in terms of coverage, functionalities and complexity. Since 2009, HA has also been the Government's technical agency for the development and operation of the eHRSS. As such, HA's expertise and know-how in relation to the CMS and eHRSS will be a crucial asset to be leveraged upon, and the direct transfer of knowledge by HA as the technical

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agency would be the most cost-effective and efficient way of helping DH develop the components of Clinical Services Improvement and build up its capacity. A Project Steering Committee will be established, with members from DH, HA, the Food and Health Bureau and relevant stakeholders, to steer, coordinate and manage project implementation.

### *Engagement of the Private Sector*

29. It should be noted that while HA will serve as the technical agency for Initiative 1 – Clinical Services Improvement, DH and HA will outsource to the private sector, including small and medium enterprises, a substantial portion of the development and study work of all the initiatives under SPRINT-1. Such tasks do not only include purchase of products and commissioning of studies but also engagement of contractors and technical staff and procurement of services such as development and management of self-contained sub-systems<sup>5</sup>. The outsourcing will allow DH and HA to tap the know-how and experience of the private sector; more importantly, it also allows the private sector contractors to acquire knowledge relating to clinical systems and the intellectual property (IP) rights associated with the systems. In line with established government policy, the ownership of the IP rights created in such IT systems can be vested in the contractors who develop them, except where the IP rights need to be retained by the Government for public interest, legal or regulatory reasons, as appropriate.<sup>6</sup> DH and HA will continue to uphold clinical safety, patient privacy and data and system security in the process in accordance with the applicable privacy and IT legislation and regulations. Holistically speaking, it is estimated that close to \$790 million, or about three-quarters of the total capital project cost of about \$1,057 million, will be sourced from the private sector, providing it with business opportunities and IP rights for exploitation and facilitating know-how exchange between the public and private sectors, wherever feasible. We consider that this will strike a proper balance between gainful use of HA's clinical and health informatics expertise and productive engagement of the private sector under the proposed project.

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<sup>5</sup> Examples of self-contained sub-systems include (i) Centralised Interactive Voice Response Sub-System; (ii) Digital X-ray/Imaging sub-system; (iii) Clinical Measuring Device sub-system to CIMS; (iv) Interface sub-system to Cervical Screening Information System; (v) Interface sub-system of Communicable Disease Information System to CIMS; and (vi) Interface sub-system of SMASH to CIMS.

<sup>6</sup> Conditions of vesting the IP rights in the contractors include giving the Government a perpetual and royalty-free licence to use, modify and duplicate the IT systems; offering IP licences to users on reasonable terms and conditions; and compliance with the criteria of Open Source Definition under reasonable terms and conditions (so as to benefit a wider community).

**ANTICIPATED BENEFITS**

30. It is expected that the implementation of SPRINT-1 will bring about the following qualitative benefits to DH and the community –

***Operational benefits***

- (a) **Improved operational efficiency:** An integrated service platform supported by standardised technical architecture and data standards will enhance operational efficiency and allow greater and more effective interface, collaboration and information sharing across various DH service units.
- (b) **More workflow automation:** A greater degree of workflow automation can improve operational efficiency, achieve greater cost-effectiveness, and reduce manual work, duplicated efforts and potential errors in day-to-day operational and support functions.
- (c) **Better service availability:** By using up-to-date technologies and robust architectural design, the risks associated with running decommissioned and unsupported technologies will be reduced, thus lowering the likelihood of service delays and interruptions.
- (d) **Increased scalability:** A more flexible architecture design will enable improved scalability to cater for system improvement and development. System capacities can be expanded with less time and effort, empowering DH to respond more rapidly and effectively to evolving service needs and healthcare challenges.
- (e) **Higher data analytics capabilities:** The adoption of advanced data analytics on a unified platform will enable DH to more efficiently and effectively analyse health information/data and compile statistics for informing healthcare policies. The availability of reliable and structured data will be useful for informing healthcare research and innovation.
- (f) **Improved management structure:** With more efficient allocation of IT resources through the implementation of an overarching IT strategy, there will be more synergy across service units for project implementation.

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*Social benefits*

- (g) **Enhanced quality of healthcare services:** The service transformation to be brought about by SPRINT-1 will provide better quality, streamlined and user-oriented services for patients and other service users. Furthermore, the quality, timeliness, responsiveness and capacity of public services will be greatly improved due to better use of data in service planning and monitoring. Better connection with the eHRSS will also enable information sharing with other HCPs and facilitate continuity of care for patients.
- (h) **Informing healthcare policies:** The adoption of advanced data analytics will enable DH to assume a more prominent role in informing healthcare policies and early identification of trends, algorithms and actionable insights for specific groups or the general population in the prevention and control of health risks and diseases. In a broader sense, DH can more effectively adapt to future changes in relation to service requirements, policy directions and healthcare needs.

**Savings and Cost Avoidance**

31. It is estimated that the implementation of SPRINT-1 will bring about one-off savings of \$62.6 million and recurrent savings of \$112.9 million from 2026-27 onwards, made up of –

- (a) notional recurrent staff cost savings of \$81.4 million as a result of savings on fragmented staff efforts due to improved operational efficiency;
- (b) realisable recurrent savings of \$19.4 million as a result of savings on maintenance of hardware and software of existing systems and dataline rental; and
- (c) one-off (\$62.6 million) and recurrent (\$12.1 million) cost avoidance resulting from avoidance of technology refreshment/enhancement for existing systems, additional storage space for physical records and other consumables.

32. A cost and benefit analysis of the implementation of the proposal is at  
Encl. 2 Enclosure 2.

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**FINANCIAL IMPLICATIONS****Non-Recurrent Expenditure**

33. The estimated non-recurrent expenditure for the development of SPRINT-1 from the fourth quarter of 2018 to 2024 and its nursing in 2025 is \$1,057.134 million. In view of the scale of the project, we will follow a building block approach. The actual work programme and cash flow may have to be adjusted during the course of development. Breakdown by initiative is provided below –

<b>Initiative</b>	<b>Funding Requirement (\$ Million)</b>
Initiative 1 – Clinical Services Improvement	800
Initiative 2 – Business Support and Enablement	19
Initiative 3 – IT Operations Enablement	133
Initiative 4 – Studies for Future Developments	32
Contingency	73
<b>Total</b>	<b>1,057</b>

34. Breakdown of the cost estimates by key expenditure item is as follows –

<b>Item</b>	<b>2018-19</b>	<b>2019-20</b>	<b>2020-21</b>	<b>2021-22</b>	<b>2022-23</b>	<b>2023-24</b>	<b>2024-25</b>	<b>2025-26</b>	<b>Total</b>
	<b>\$'000</b>	<b>\$'000</b>	<b>\$'000</b>	<b>\$'000</b>	<b>\$'000</b>	<b>\$'000</b>	<b>\$'000</b>	<b>\$'000</b>	<b>\$'000</b>
(a) Hardware	-	14,359	17,014	15,554	26,435	29,620	15,379	718	119,079
(b) Software	-	12,021	17,348	15,118	21,598	23,767	17,120	330	107,302
(c) Communication Network	-	3,300	2,640	6,300	7,221	6,640	5,916	240	32,257
(d) Implementation Services	1,532	103,305	147,753	95,083	107,242	113,561	88,564	32,523	689,563
(e) Site Preparation	-	1,254	3,135	4,180	6,718	6,225	6,553	-	28,065
(f) Training	-	-	900	1,080	1,098	1,025	1,096	332	5,531
(g) Data Centre Hosting Services	-	41	81	-	810	810	-	-	1,742
(h) Contingency	115	10,048	14,132	10,275	12,804	13,592	10,074	2,555	73,595
<b>Total</b>	<b>1,647</b>	<b>144,328</b>	<b>203,003</b>	<b>147,590</b>	<b>183,926</b>	<b>195,240</b>	<b>144,702</b>	<b>36,698</b>	<b>1,057,134</b>

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35. On paragraph 34(a) above, the estimate of \$119.1 million is for procurement of computer hardware and equipment, including computer servers, workstations, storage, network equipment, and other information processing equipment.

36. On paragraph 34(b) above, the estimate of \$107.3 million is for procurement of computer software, including operating system software, database licences, application development software, and network monitoring software.

37. On paragraph 34(c) above, the estimate of \$32.3 million is the set-up cost of communication network for the clinics/centres/offices covered by the enhanced CIMS, as well as DH's network infrastructure and new data centres.

38. On paragraph 34(d) above, the estimate of \$689.6 million is for procurement of agency services and professional and consultancy services, including feasibility study, system analysis and design, development, testing, installation and training, etc.

39. On paragraph 34(e) above, the estimate of \$28.1 million is for the site preparation of clinics, centres, offices, new data centres and computer room facilities, etc. covered by the enhanced CIMS.

40. On paragraph 34(f) above, the estimate of \$5.5 million is for training DH staff on the operations of the enhanced CIMS and other new IT systems.

41. On paragraph 34(g) above, the estimate of \$1.7 million is for acquisition of data centre hosting services during implementation and initial rollout for the new IT systems.

42. On paragraph 34(h) above, the estimate of \$73.6 million represents an approximately 7.5% contingency on items set out in paragraphs 34 (a) to (g) above.

### **Other Non-recurrent Expenditure**

43. The planning, development, coordination and implementation of SPRINT-1 will require a project team comprising staff with expertise in policy and legal issues, medical and clinical services, project management, health informatics

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and IT. This will entail additional non-recurrent staff costs of about \$17.5 million for engaging Analyst/Programmer Grade staff from 2018-19 to 2023-24. DH will absorb the requirements from within its resources. There may also be other non-recurrent staff costs, and DH will review the requirements as the project progresses.

### Recurrent Expenditure

44. The recurrent expenditure arising from SPRINT-1 will initially be around \$1.0 million in 2019-20 and progressively increase to about \$136.9 million in 2027-28 and onwards. The above recurrent requirements will be included and reflected in the annual estimates of DH in the relevant financial years. Breakdown of the estimates by expenditure item is as follows –

Item	2019-20 \$'000	2020-21 \$'000	2021-22 \$'000	2022-23 \$'000	2023-24 \$'000	2024-25 \$'000	2025-26 \$'000	2026-27 \$'000	2027-28 & onwards \$'000
(a) Hardware Maintenance	-	4,345	7,565	10,853	12,396	14,337	20,930	25,498	25,716
(b) Software Maintenance	-	6,588	10,848	12,127	14,153	17,484	23,183	27,490	27,490
(c) Communication Network	-	770	1,881	3,226	4,117	5,883	6,118	6,232	6,232
(d) On-going Support Services	1,024	3,931	10,650	13,410	20,491	41,553	54,707	76,515	76,515
(e) Data Centre Hosting Services	-	81	162	162	162	972	972	972	972
<b>Total</b>	<b>1,024</b>	<b>15,715</b>	<b>31,106</b>	<b>39,778</b>	<b>51,319</b>	<b>80,229</b>	<b>105,910</b>	<b>136,707</b>	<b>136,925</b>

45. On paragraph 44(a) above, the estimate of \$25.7 million is for hardware maintenance to sustain the new IT systems.

46. On paragraph 44(b) above, the estimate of \$27.5 million is for software maintenance to sustain the new IT systems and related licence fees.

47. On paragraph 44(c) above, the estimate of \$6.2 million is for communication network rental charges.

48. On paragraph 44(d) above, the estimate of \$76.5 million is for on-going service support of the new IT systems, including wages for contract staff and cost for agency services.

49. On paragraph 44(e) above, the estimate of \$1 million is for data centre hosting services for the new IT systems.

**/IMPLEMENTATION .....**



## IMPLEMENTATION PLAN

Encl. 3

50. Subject to funding approval, we plan to implement the proposed project according to the plan as provided at Enclosure 3. The table below provides a highlight of the plan –

Initiative	Target Start Date	Target End Date
Initiative 1 – Clinical Services Improvement	Q4 2018	Q4 2025
Initiative 2 – Business Support and Enablement	Q1 2019	Q4 2021
Initiative 3 – IT Operations Enhancement	Q1 2019	Q1 2025
Initiative 4 – Studies for Future Developments	Q1 2019	Q4 2020

## PUBLIC CONSULTATION

51. We consulted the Legislative Council Panel on Health Services on this IT enhancement project on 24 April 2018. Members were supportive of the proposal and had no objection to its submission to the Finance Committee for funding approval. As requested by Panel Members, we provided additional information on the interface of the clinical management systems of DH, HA and other HCPs; further details of the projects under SPRINT-1; and HA's role and support in Initiative 1 – Clinical Service Improvement. Such information has been included in this paper as appropriate.

## BACKGROUND

52. The Chief Executive has stated in the 2017 Policy Agenda that DH will put in place a comprehensive CIMS and other related systems so as to enhance its capability in meeting various public health challenges and deliver higher quality services to the public. DH will also re-engineer the resources for IT development, staffing structure and operation workflow to comprehensively increase the application of ICT and strengthen the development of public health data.

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## List of Projects under SPRINT-1

## Initiative 1 – Clinical Services Improvement

Project No.	Name of Project & Description	Target Start Date	Target End Date
	<b>Clinical Information Management System (CIMS) Extension</b>		
1.	<b>Development of CIMS Common Modules</b>  To upgrade system infrastructure, deploy new development platform, develop modules for common functions including appointment, attendance, payment, clinical documentation, medication order entry, assessment, clinical notes, imaging, investigation order entry, results notification, online appointment, referral, partner notification, reporting and user management and authentication, and incorporate basic mobile functionalities	Q4 2018	Q4 2025
2.	<b>Centralised Interactive Voice Response System (IVRS) &amp; IVRS to CIMS</b>  To install a centralised IVRS for all DH clinics, and establish an interface between the IVRS and CIMS	Q4 2018	Q4 2025
3.	<b>Digital X-ray/Imaging</b>  To enable DH to share digital images internally and externally, such as through the Electronic Health Record Sharing System (eHRSS)	Q4 2018	Q4 2024
4.	<b>Measuring Device to CIMS</b>  To establish an interface between various measuring devices and the CIMS	Q4 2018	Q4 2024

<b>Project No.</b>	<b>Name of Project &amp; Description</b>	<b>Target Start Date</b>	<b>Target End Date</b>
5.	<b>CIMS Migration to CIMS Stage 2</b>  To enhance Stage One CIMS based on the upcoming architecture standards utilising the new platform for Stage Two CIMS, so that the existing and new modules can have a similar look and feel and the user experience can be improved. New functionalities for Stage Two CIMS can also be incorporated to Stage One during the enhancement	Q4 2018	Q4 2025
6.	<b>CIMS for Cervical Screening Programme</b>  To develop a module within CIMS for all DH service units performing cervical screening to record and manage details about the encounter	Q4 2018	Q4 2025
7.	<b>CIMS for Child Assessment Service</b>  To develop a module within CIMS for Child Assessment Service of DH to capture data related to the clients of Child Assessment Centres and their treatments	Q4 2018	Q4 2025
8.	<b>CIMS Family Health Service – Child Health Service</b>  To develop a module within CIMS for Child Health Service of DH to capture data related to the clients of Child Health Service	Q4 2018	Q4 2025
9.	<b>CIMS Family Health Service – Family Planning Service</b>  To develop a module within CIMS for Family Planning Service of DH to capture data related to the clients of Family Planning Service	Q4 2018	Q4 2025
10.	<b>CIMS Family Health Service – Postnatal Service</b>  To develop a module within CIMS for Postnatal Service of DH to capture data related to the clients of Postnatal Service	Q4 2018	Q4 2025

<b>Project No.</b>	<b>Name of Project &amp; Description</b>	<b>Target Start Date</b>	<b>Target End Date</b>
11.	<b>CIMS Family Health Service – Woman Health Service</b>  To develop a module within CIMS for Woman Health Service of DH to capture data related to the clients of Woman Health Service	Q4 2018	Q4 2025
12.	<b>CIMS Tuberculosis and Chest Services</b>  To develop a module within CIMS for Tuberculosis and Chest Services of DH to capture data related to the clients of Chest Clinics	Q4 2018	Q4 2025
13.	<b>CIMS Port Health Office's Travel Health Centres</b>  To develop a module within CIMS for Port Health Office of DH to capture data related to the clients of Travel Health Centres	Q4 2018	Q4 2025
14.	<b>CIMS Integration</b>  <b>CIMS to Laboratory Information System (LIS)</b>  To develop an interface between CIMS and LIS to enable laboratory request information and patient data to be transferred automatically for investigation order entry and eliminate the need for manual effort in preparing laboratory request forms	Q4 2018	Q4 2024
15.	<b>School Dental Care Service Management and Information in Linked Environment (SMILE) to CIMS</b>  To establish an interface between SMILE and CIMS such that CIMS will become the central repository for all DH patient data, and enable records to be shared with the eHRSS with patient consent	Q4 2018	Q4 2024

<b>Project No.</b>	<b>Name of Project &amp; Description</b>	<b>Target Start Date</b>	<b>Target End Date</b>
16.	<b>System for Managing the Assessment of Student Health (SMASH) to CIMS</b>  To establish an interface between SMASH and CIMS such that CIMS will become the central repository for all DH patient data, and enable records to be shared with the eHRSS with patient consent	Q4 2018	Q4 2024
17.	<b>CIMS Cervical Screening Programme (CIMS-CSP) to Cervical Screening Information System (CSIS)</b>  To establish an interface between the CIMS-CSP module and the existing CSIS to facilitate information exchange for the Cervical Screening Programme	Q4 2018	Q4 2024
18.	<b>CIMS to Communicable Disease Information System (CDIS)</b>  To establish an interface between CIMS and CDIS to enable all notifiable disease cases to be reported to Communicable Disease Division of DH immediately after being flagged in CIMS	Q4 2018	Q4 2024
	<b>Dental Information Technology (IT) Systems Implementation</b>		
19.	<b>Dental Software Replacement</b>  To purchase a new software to replace Computer-Assisted Simulation System for Orthognathic Surgery/Viewbox as both software are out of support	Q3 2019	Q2 2021
20.	<b>Dental Laboratory Software</b>  To purchase a new software to replace existing databases for the Dental Laboratory Service of DH and to enable a more organised and reliable way to manage and track dental laboratory cases	Q4 2018	Q4 2020

<b>Project No.</b>	<b>Name of Project &amp; Description</b>	<b>Target Start Date</b>	<b>Target End Date</b>
21.	<b>Dental CIMS and Imaging</b>  To migrate the existing Dental CIMS module to the new platform and infrastructure under Stage Two CIMS, incorporate new functionalities developed for common modules of Stage Two CIMS, establish interfaces to other systems as necessary, redesign user interfaces to better suit users' workflow, and enable Dental Service to digitise dental X-rays and share images with DH service units and the eHRSS in the future	Q4 2018	Q4 2024
22.	<b>Replacement of SMASH and the Internet Services for SMASH (wSMASH)</b>  To consolidate and replace both SMASH and wSMASH with a new system with prevailing technologies so as to strengthen system security and improve public services and efficiency of work	Q4 2018	Q4 2025

## **Initiative 2 – Business Support and Enablement**

<b>Project No.</b>	<b>Name of Project &amp; Description</b>	<b>Target Start Date</b>	<b>Target End Date</b>
23.	<b>Incident Reporting System</b>  To implement an Incident Reporting System to allow corresponding parties to report adverse events or incidents within DH, as well as facilitate the tracking and analysis of these events/incidents	Q1 2019	Q1 2021
24.	<b>Departmental Enquiry/Complaint Management System</b>  To develop a Departmental Enquiry/Complaint Management System to facilitate the management of the entire lifecycle of the enquiry/complaint management process	Q1 2020	Q4 2021

### Initiative 3 – IT Operations Enablement

Project No.	Name of Project & Description	Target Start Date	Target End Date
25.	<b>Centralised Helpdesk Establishment</b>  To establish a centralised helpdesk for DH that will enable all DH users to seek help on IT issues from a single point of contact and enable routing of calls to the appropriate handler	Q1 2019	Q1 2021
26.	<b>IT Infrastructure Consolidation and Enhancement</b>  <b>Infrastructure System Analysis &amp; Design</b>  To gather overarching requirements for the overall IT infrastructure design to define the architectural design of IT infrastructure as well as to assess the estimated scope, cost and timeline of the proposed solution to facilitate a more detailed definition of the project scope	Q1 2019	Q4 2020
27.	<b>New Data Centres</b>  To prepare two new data centres with implementation of the required software and hardware at both data centres to provide common computing platforms for future applications systems	Q1 2021	Q3 2024
28.	<b>Infrastructure Upgrade</b>  To provide high speed communication network and related services for connecting the IT components and equipment within data centres and between each data centre and clinics/centres/offices	Q1 2021	Q3 2024
29.	<b>IT Monitoring Tools</b>  To implement IT monitoring tools for the applications/systems, servers, network infrastructure, and end-user devices of DH to ensure reliability, service availability, and security	Q3 2021	Q3 2023



<b>Project No.</b>	<b>Name of Project &amp; Description</b>	<b>Target Start Date</b>	<b>Target End Date</b>
	<b>IT Operations Enhancement</b>		
30.	<b>Mobile Device Management</b>  To ensure the usage of mobile devices (such as laptops and handheld equipment) will comply with security policies to pave the way for greater use of mobile devices in DH to facilitate daily operations	Q2 2021	Q2 2023
31.	<b>Access Management</b>  To set up a centralised user repository, to enable single sign-on and to allow for integration with existing systems	Q3 2021	Q1 2025
32.	<b>Secured Internal Cloud Storage</b>  To implement a secured internal cloud storage for each DH staff as an option for the storage and sharing of files	Q3 2022	Q1 2024
33.	<b>Email Add-on Tool</b>  To implement a secure messaging solution to support DH service units to send sensitive data to external parties through emails	Q4 2022	Q2 2024

#### Initiative 4 – Studies for Future Developments

Project No.	Name of Project & Description	Target Start Date	Target End Date
34.	<b>Feasibility Study on the Shared Licensing and Monitoring System (SLMS)</b>  To conduct a study to assess the possibility, requirements and costs needed for implementation of SLMS as a holistic IT solution/support to Law Enforcement and Licensing Services in DH as well as a few other DH service units in relation to registration and licensing and case investigation work	Q2 2019	Q4 2020
35.	<b>Data Architecture Study</b>  To carry out a holistic study on the health data being kept across systems of DH, with a view to defining a detailed and central data architecture for potential data sharing with Strategic Business Partners and ensuring the data architecture can cope with DH's future business and operational needs and align with the open data policy promulgated in the Hong Kong Smart City Blueprint	Q1 2019	Q4 2020

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**Enclosure 2 to FCR(2018-19)17**

**Cost and Benefit Analysis for the Information Technology Enhancement Project of the Department of Health**

	Cashflow (\$'000)										Total
	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	
<b><u>Cost</u></b>											
<b><u>Non-recurrent</u></b>											
Capital Expenditure	1,647	144,328	203,003	147,590	183,926	195,240	144,702	36,698	-	-	1,057,134
Staff Cost <sup>1</sup>	3,455	25,741	25,741	25,741	25,741	25,741	-	-	-	-	132,160
Sub-total	5,102	170,069	228,744	173,331	209,667	220,981	144,702	36,698	-	-	1,189,294
<b><u>Recurrent</u></b>											
Expenditure	-	1,024	15,715	31,106	39,778	51,319	80,229	105,910	136,707	136,925	598,713
Staff Cost <sup>1</sup>	-	2,968	2,968	2,968	2,968	2,968	2,968	2,968	2,968	2,968	26,712
Accommodation Cost <sup>2</sup>	612	8,046	6,436	6,436	6,436	6,436	6,436	6,436	6,436	3,936	57,646
Sub-total	612	12,038	25,119	40,510	49,182	60,723	89,633	115,314	146,111	143,829	683,071
<b>Total cost</b>	<b>5,714</b>	<b>182,107</b>	<b>253,863</b>	<b>213,841</b>	<b>258,849</b>	<b>281,704</b>	<b>234,335</b>	<b>152,012</b>	<b>146,111</b>	<b>143,829</b>	<b>1,872,365</b>
<b><u>Savings</u></b>											
<b><u>Non-recurrent</u></b>											
Cost avoidance	-	-	-	-	-	-	41,000	21,628	-	-	62,628
Sub-total	-	-	-	-	-	-	41,000	21,628	-	-	62,628
<b><u>Recurrent</u></b>											
Realisable savings	-	-	-	6	9,826	10,486	10,511	15,616	19,424	19,424	85,293
Notional savings	-	-	5,019	17,544	20,826	22,782	39,368	75,082	81,390	81,390	343,401
Cost avoidance	-	-	531	908	908	908	10,700	11,190	12,070	12,070	49,285
Sub-total	-	-	5,550	18,458	31,560	34,176	60,579	101,888	112,884	112,884	477,979
<b>Total savings</b>	<b>-</b>	<b>-</b>	<b>5,550</b>	<b>18,458</b>	<b>31,560</b>	<b>34,176</b>	<b>101,579</b>	<b>123,516</b>	<b>112,884</b>	<b>112,884</b>	<b>540,607</b>
<b>Total shortfall</b>	<b>5,714</b>	<b>182,107</b>	<b>248,313</b>	<b>195,383</b>	<b>227,289</b>	<b>247,528</b>	<b>132,756</b>	<b>28,496</b>	<b>33,227</b>	<b>30,945</b>	<b>1,331,758</b>
<b>Net cumulative shortfall</b>	<b>5,714</b>	<b>187,821</b>	<b>436,134</b>	<b>631,517</b>	<b>858,806</b>	<b>1,106,334</b>	<b>1,239,090</b>	<b>1,267,586</b>	<b>1,300,813</b>	<b>1,331,758</b>	

**Notes:**

1. These are the estimated total non-recurrent/recurrent staff costs for the purpose of this cost-benefit analysis, including the initial additional non-recurrent staff cost of \$17.5 million for 2018-19 to 2023-24 as stated in paragraph 43 of the paper. DH will absorb the requirements from within its resources and review the manpower requirements as the project progresses.
2. Accommodation costs for non-recurrent and recurrent manpower will be absorbed by DH from within its resources. These are the estimated figures and will be reviewed vis-à-vis the manpower requirements as the project progresses.

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## Implementation Roadmap of SPRINT-1

