For discussion
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Legislative Council Panel on Health Services

Information Technology Enhancement Project of the Department of Health

PURPOSE

This paper seeks Members' support for a department-wide information technology ("IT") enhancement project for the Department of Health ("DH") to improve its delivery of clinical and healthcare services and performance of regulatory functions, streamline its workflow to increase efficiency and transform itself into a data-driven public organisation.

BACKGROUND

2. 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.

3. As of 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. In 2016, service units under the Clinical and Health Services recorded over 6 million attendances and the Public Health Laboratory Service Branch conducted over 6 million laboratory tests. DH is also the principal enforcement agency for around 20 Ordinances. It handled over 500 000 licence and permit applications in 2016.

4. With such a high demand for public services, DH has over the years developed and used various IT systems and mobile applications to support its work and enhance efficiency and quality of services. However, there remains considerable room to optimise the IT landscape of the Department. DH does not have 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.

5. 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 earlier this year. The consultant recommended that DH should, for example, promote the use of shared systems and common platforms, enable more electronic records and services, improve information management and data analytics, and generally increase the use of IT in its workflow and management. DH generally agrees with the recommendations and 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.

JUSTIFICATIONS

Current position of DH's IT landscape

6. Having reviewed DH's current use of IT, examined its business processes, technical 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 those service units that are 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, etc., are done manually. This leads to inefficiency and causes inconvenience to both patients and staff. There are also vulnerabilities for 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.

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

Project overview

7. In view of the issues identified and recommendations made by the consultant in the ISSS, DH proposes the first stage of "**S**trategic **P**lan to **R**e-eng**in**eer and **T**ransform 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.

8. 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.

9. 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[1] ("CIMS") will be developed into a 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[2] ("eHRSS") for sharing eHRs among participating public and private healthcare providers ("HCPs").

10. 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.

Proposals under SPRINT-1

11. To meet the objectives under the above three pillars, the proposed SPRINT-1 will comprise four key initiatives encompassing 35 projects. These initiatives include –

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[1] 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.

[2] 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 April 2018, over 730 000 patients had joined the system. As for HCPs, DH, the Hospital Authority, all 12 private hospitals and about 1 500 other private HCPs had joined.

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.

Initiative 1 – Clinical Services Improvement

12. 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

13. The existing CIMS 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 DH's clinical services[3] spanning over 150 clinics and service locations. In addition to full integration with DH's administrative systems, the CIMS will also form a centralised repository of patient records and be fully interfaced with the eHRSS to enable DH to share and view patients' eHRs with other HCPs. Furthermore, new functions/features for enhancing clinical workflows and bringing convenience to services users will be developed, such as sharing of radiology images, enhanced online booking and telephone hotline system, mobile devices and applications, workflow integration across clinics, dispensaries and laboratories, 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. The centralised and comprehensive eHR repository on the CIMS will also 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.

[3] 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, School Immunisation Teams, Social Hygiene Service, Special Preventive Programme, and Tuberculosis and Chest Service.

(ii) Replacement of SMASH and wSMASH

14. 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

15. Two business support and enablement systems, namely the Incident Reporting System and the Departmental Enquiry/Complaint Management System, will be developed under Initiative 2. 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 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. In building these two systems, shared platforms for common administrative and support processes will be developed to improve operational efficiency.

Initiative 3 – IT Operations Enablement

16. 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. To support operation of the systems proposed under the different initiatives, infrastructure upgrade is necessary for improving performance, service availability and reliability, as well as catering for the growing support demand from within DH and the public. For example, to enable the sharing of radiology images on the CIMS, a high-performance and resilient network infrastructure is required to deliver stable and timely services for a large volume of data traffic. On the whole, the upgraded infrastructure not only provides more reliable support to the newly developed systems, but also benefits other existing DH systems as a result of improved reliability, connectivity and processing efficiency.

Initiative 4 – Studies for Future Developments

17. SPRINT-1 will also include the Data Architecture Study ("DAS") and a feasibility study for the Shared Licensing and Monitoring System ("SLMS") for development at a later stage. DAS will be conducted to help DH ensure alignment in data standards, interpretation and utilisation across service units, which will form the basis for enhancing synergy and interoperability across different systems. It will also help DH formulate an overarching strategy for data analytics in the longer run. SLMS is envisaged to 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. In view of the scale and complexity of the relevant subjects, 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 SLMS before the relevant developments.

Hospital Authority (HA) as technical agency for Clinical Services Improvement

18. 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.

19. 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. In gist, we are of the view that HA's expertise and know-how in relation to the CMS and eHRSS will be a crucial asset to be leveraged upon, and that the direct transfer of knowledge by HA as the technical 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.

20. It should be noted that while HA will serve as the technical agency, a substantial portion of the development and management work will be sourced from the private sector providing it with business opportunities, including for small and medium enterprises, wherever feasible. Such work may include purchasing hardware and software, procuring IT operational services (such as network services), hiring contractors and supplementary IT contract staff, conducting consultancy studies, outsourcing work assignments, etc.

ANTICIPATED BENEFITS

21. Successful implementation of SPRINT-1 is expected to bring about a host of qualitative benefits. From the operational perspective, there will

be improved efficiency and greater synergy as a result of the availability of an integrated service platform for different services and units, supported by standardised technical architecture and data standards, thus facilitating workflow automation, inter-service collaboration and data sharing. From the management and development perspective, there will be an overarching IT roadmap that will guide holistic developments and a more flexible architecture design that can cater for future growth and development. Better use of data analytics for service planning and monitoring, incident surveillance and informing policy formulation will also be made more feasible. From the service provision perspective, with improved efficiency, better employment of up-to-date technologies and increased use of e-services, the quality, responsiveness and capacity of public services will be improved. Connectivity with the eHRSS and other HCPs will be enhanced. There will also be more opportunities for opening up of public data for public and researchers' use where appropriate.

FINANCIAL IMPLICATIONS

Non-Recurrent Expenditure

22. The estimated non-current 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 –

Initiative	**Funding Requirement ($ Million)**
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

Initiative	Funding Requirement ($ Million)
Contingency	73
Total	**1,057**

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

Item	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
(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
Total	**1,647**	**144,328**	**203,003**	**147,590**	**183,926**	**195,240**	**144,702**	**36,698**	**1,057,134**

24. 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 and IT. DH will require additional non-recurrent staff cost of about $17.5 million for engaging Analyst/Programmer Grade staff from 2018-19 to 2023-24, and will absorb other new manpower requirements from within its resources to the extent possible. DH will review the manpower requirements as the project progresses. If needed, additional resources will be sought in accordance with the established mechanism.

Recurrent Expenditure

25. 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. 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
(a) 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
Total	**1,024**	**15,715**	**31,106**	**39,778**	**51,319**	**80,229**	**105,910**	**136,707**	**136,925**

Savings and Cost Avoidance

26. 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.

IMPLEMENTATION PLAN

27. Subject to Members' views on the proposal, we plan to seek funding approval from the Finance Committee according to the established mechanism in the second quarter of 2018 and implement the proposal according to the following schedule –

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

ADVICE SOUGHT

28. Members are invited to comment on and support the above proposal.

Food and Health Bureau
Department of Health
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