

Framework	Top Category	Subcategories	Specification
NASSS Framework[1]	Condition	- Nature of condition or illness - Comorbidities, sociocultural influences	- What is the nature of the condition or illness? - What are the relevant sociocultural factors and comorbidities?
	Technology	- Material features - Type of data generated - Knowledge needed to use - Technology supply model	- What are the key features of the technology? - What kind of knowledge does the technology bring into play? - What knowledge and/or support is required to use the technology? - What is the technology supply model?
	Value Proposition	- Supply-side value (to developer) - Demand-side value (to patient)	- What is the developer's business case for the technology (supply-side value)? - What is its desirability, efficacy, safety, and cost effectiveness (demand-side value)?
	Adopters	- Staff (role, identity) - Patient (simple vs complex input) - Carers (available nature of input)	- What changes in staff roles, practices, and identities are implied? - What is expected of the patient (and/or immediate caregiver)—and is this achievable by, and acceptable to, them? - What is assumed about the extended network of lay caregivers?
	Organisation	- Capacity to innovate (leadership etc.) - Readiness for this technology (change) - Nature of adoption/ Funding decision - Extend of change needed to routines - Work needed to implement change	- What is the organisation's capacity to innovate? - How ready is the organisation for this technology-supported change? - How easy will the adoption and funding decision be? - What changes will be needed in team interactions and routines? - What work is involved in implementation and who will do it?
	Wider System	- Political/ policy - Regulatory/ legal - Professional	What is the political, economic, regulatory, professional (eg, medicolegal), and

	Embedding and adaption over time	• Socio-cultural • Scope for adaption over time • Organisational resilience	sociocultural context for program rollout? • How much scope is there for adapting and coevolving the technology and the service over time? • How resilient is the organisation to handling critical events and adapting to unforeseen eventualities?
MAST Manual [2]	Preceding consideration Health problem and characteristics of the application	• Purpose of the telemedicine application? • Relevant alternatives? • International, national, regional or local level of assessment? • Maturity of the application • Health problem • Description of the application • Technical characteristics	• Definition of target condition/disease • Symptoms, consequences • Number of patients (epidemiology) • Burden of disease, resource use • Current management of health condition • Existing quality standards • Relations to other conditions or treatments. (Does the service have implications for treatment of competing disease) • Change in patient segments (will the service increase or decrease the group of patients who can benefit from or will get the service offered) • Features of the application • Tools required for using the application • Training and information needed for utilizing the application (staff and patients) • Maturity of the telemedicine application (life cycle) • Division of responsibility for the technical solution between involved organisations. • Regulatory status • Technical platform • Market situation • Infrastructure requirements • Interoperability: Integration needs (EPR, devices, with current

		• applications, technical standards etc.) • Technical support • Technical environment • Standard situation • User support • Back-up systems and procedures
Safety	• Clinical safety (patients and staff) • Technical safety (technical reliability)	• What are the direct or indirect harms when using the telemedicine application? • What is the scope of the harms? • What are the types of harms? • Are there estimates of incidence of harms? • What is the timing of onset of harms? • What is the duration and severity of the harms? • What can be done to minimise the harms? • Is there a backup system and how does it work? • What do the Service Level Agreements cover? • Does the technology experience interference and what are the consequences? • How is the safety compared to alternative technologies? • How is security of data and the database (data privacy) and quality of data managed? - encryption/cryptography - data storage and ownership - data ownership
Clinical effectiveness	• Effects on mortality • Effects on morbidity • Physical health • Mental health • Effects on health related quality of life (HRQL) • Behavioural outcomes (e.g. exercise) • Utilization of health services	
Patient perspectives	• Satisfaction and acceptance • Understanding of information • Confidence (in the treatment) • Ability to use the application • Access and accessibility • Empowerment, self-efficacy	

Economic aspects	Economic evaluation (societal perspective)	- Amounts of resources used when delivering the assessed telemedicine application and its comparators in the health care sector and other sectors (e.g.): - Investments in equipment - Training of staff - Maintenance - Unit costs or prices for each resource used - Related changes in use of health care resources (e.g.): - Primary care - Emergency unit
	Business case (institutional level)	- Expenditures per year (including expenditures related to the resource use described in the cost estimation above) - Revenue per year: - Activity (number of patients or services) - Reimbursement (e.g. DRG-rate) per service or patient
Organisational aspects	- Sensitivity analysis (Risk analysis) - Process	- Workflow - Staff, training and resources - Interaction and communication
	Structure	- Spread of technology, centralization or decentralization - Economy (see domain on economic aspects)
Socio-cultural, ethical and legal aspects	- Culture - Management - Ethical issues	- Attitude and culture - Overall questions: Does the application challenge religious, cultural or moral beliefs? - Potential ethical problems, e.g. giving the responsibility to the Patients - Autonomy: Is the patient's autonomy challenged or increased? - Equity
	Legal issues	- Clinical accreditation - Information governance - Professional liability

		• Social issues	• Patient control – consent, access • Changes in the patients role in major life areas (e.g. social life, working life) • Patients’ relatives and others’ understanding of the technology • Societal, political context and changes. Will the service influences the general model for the delivery of healthcare service if deployed • Changes in responsibility. Are the patients and/or relatives capable of handling their responsibility? • Gender issues. Has the service any consequences on the position of gender?
	Transferability Assessment	• Cross-border • Scalability • Generalizability	
Infoway benefits evaluation Framework [3]	System Quality	• Functionality • Performance • Security	• Type of feature and level of decision support • Accessibility (distance and availability) reliability (down time, system response time) • Type of features
	Information Quality	• Content • Availability	• Completeness, accuracy, relevance, comprehension • Timeliness, reliability and consistency of information when and where needed
	Service Quality	• Responsiveness	• User training, ongoing technical support and availability of support
	Use	• Use/behaviour pattern • Self-reported use • Intention to use	• Frequency, duration, location, type or nature and flexibility of actual usage • Frequency, duration, location, type or nature and flexibility of perceived usage • Proportion of and factors for current non-user to become user
	User Satisfaction	• Competency • User Satisfaction • Ease of use	• Knowledge, skills and experience • Perceived expectations, value, information/system/service quality and use of the system (including provider – patient interaction, preference, comfort and experience) • User friendliness and learnability
	Net Benefits	• Quality	• Patient Safety

		• Access • Productivity	• Appropriateness/effectiveness • Health outcomes • Ability of patient/provider to access service • Patient and caregiver participation • Efficiency • Care coordination • Net Cost
	Organisational Context Factors	• Strategy • Culture • Business Process	
HITREF [4]	Structural Quality	• Organizational Support/ Capacity • Hardware • Software • Functionality	
	Quality of Information Logistics	• Completeness/ Correctness of data • Costs of information processing • User satisfaction • Patient privacy • Patient satisfaction with HIT	
	Unintended Consequences/ Benefits	• Diffusion • Unintended Consequences/ Benefits	
	Effects on Outcome Quality of Care	• Patient outcome • Costs of patient care • Patient satisfaction with care • Patient related knowledge	
	Effects on Quality Processes	• Efficiency • Appropriateness of patient care • Organizational or social Quality • Clinical involvement in HIT Selection, Implementation, Training	
	Barriers or Facilitators to Adoption	• Barriers or Facilitators to Adoption	
Evaluation Framework for Fit-For-Purpose Connected Sensor Technologies [5]	Verification, analytical validation, and clinical validation		• Does the tool measure what it claims to measure? • Is the measurement appropriate for the target population?
	Security practices		• Does the manufacturer build with safety by design? Is there a disclosure policy? Software bill of materials?
	Data rights and governance		• Who has access to the data and when? Is the privacy policy publicly accessible?
	Utility and usability		• How is the tool worn? Battery life? Available technical support?

	Economic feasibility		What's the net benefit vs price? Is cost a one-time or a subscription model?
RE-AIM (expanded to clinical informatics) [6]	Reach (individual level)	- Absolute number - proportion - representativeness of individuals who are willing to participate in a given initiative, intervention, or program	- What percentage of the target population came into contact with or began program? - Did program reach those most in need? - Were participants representative of your practice setting?
	Efficacy/effectiveness (individual level)	Impact of an intervention on: - Important outcomes - Potential negative effects - Quality of life - Economic outcomes	- Did program achieve key targeted outcomes? - Did it produce unintended adverse consequences? - How did it affect quality of life? - What did the program cost as implemented and what would it cost in your setting?
	Adoption (setting and/or organizational level)	- Absolute number - proportion, - representativeness of settings and intervention agents (people who deliver the program) who are willing to initiate a program	- Did low-resource organizations serving high-risk populations use it? - Did program help the organization address its primary mission? - Is program consistent with your values and priorities?
	Implementation (setting and/or organizational level)	Intervention agents' fidelity to the various elements of an intervention's protocol, including consistency of delivery as intended and the time and cost of the intervention; individual level—clients' use of the intervention strategies	- How many staff members delivered? - Did different levels of staff implement the program successfully? - Were different program components delivered as intended?
	Maintenance (individual and setting and/or organizational levels)	Extent to which a program or policy becomes institutionalized or part of the routine organizational practices and policies; individual level—long-term effects of a program on outcomes for 6 or more month after the most recent intervention contact	- Did program produce lasting effects at individual level? - Did organizations sustain the program over time? - How did the program evolve? - Did those persons and settings that showed maintenance include those most in need?
Adapted nursing care performance framework [7]	Acquiring, Deploying, and Maintaining Resources	Time and Efficiency	- Time Management - Time Spent for Patient Care - Documentation Time
	Transforming Resources into Services	Nurses' Practice Environment	- Knowledge Updating and Utilization - Information Quality and Access - Nurse Autonomy - Intra- and Interprofessional Collaboration

		Nursing Processes	- Nurses' Competencies and Skills - Quality of Documentation - Nurse-Patient Relationship - Assessment, Care Planning, and Evaluation - Teaching of Patients and Families - Communication and Care Coordination
		Professional Satisfaction	- Nurses' Perspectives of the Quality of Care Provided - Satisfaction or Dissatisfaction of Nurses Using ICTs
	Producing Changes in Patients' Condition	Nursing-Sensitive Outcomes	- Patient Comfort and Quality of Life Related to Care - Empowerment - Functional Status - Satisfaction or Dissatisfaction of Patients of Using ICTs
Design and Evaluation Framework (Kowatsch)[8]	Ease of use		The degree to which effort is required to take advantage of the DHI (e. g., using common interaction paradigms).
	Content Quality		The degree to which the content of a DHI is accurate, timely, complete, relevant, and consistent (e. g., real-time location-based pollen warnings for asthmatics)
	Privacy & security		The degree to which the DHI considers legal requirements and aspects with respect to privacy and security aspects (e. g., a DHI is compliant with the General Data Protection Regulation).
	Accountability		The degree to which information about the DHI is made explicit for usage decisions (e. g., details of the intervention author of a DHI are accessible).
	Adherence		The ratio of actual usage to intended usage of a DHI (e. g., 4 out of 5 exercises are conducted per week).
	Aesthetics		

		The degree to which the DHI interface applies design elements, colors and fonts in a logical way (e. g., consistent use of colors, figures and fonts).
	Perceived benefit	The degree to which a person believes that using a DHI improves his or her health behavior/health condition (e. g., a believe that a DHI helps to increase physical activity)
	Effectiveness	The degree to which the DHI contributes to the enhancement of an individual's health behavior/condition (e. g., significant reduction of fat mass).
	Service Quality	The extent to which support of a DHI is provided (e. g., a technical support line is made available).
	Personalization	The degree to which the DHI adapts to the needs of an individual (e. g., the daily step goal of a DHI adapts to the capabilities of an individual).
	Perceived enjoyment	The degree to which an individual believes that using a DHI is engaging (e. g., the use of game elements and level designs in a DHI).
	Ethics	The degree to which the DHI addresses ethical aspects (e. g., the DHI was designed for individuals with various cultural backgrounds or disabilities).
	Safety	The extent to which the usage of a DHI is safe with respect to side effects (e. g., interactions with a DHI are limited to account for addiction behavior)
Digi HTA [9]	Company information	- Contact information of company. - What is the company's business model? - Are quality management systems in use? Which ones?
	Product information	The name of the product.

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- Short description of the product.
 - What is the product's readiness level (TRL levels 1–9)?
 - Which platforms and platform versions of the product are available?
 - Does the product have CE and/or FDA approval?
 - Is the product a medical device, and what classification does it have?
 - Is the product classified according to MDD or MDR requirements?
 - Does the product meet the electrical safety requirements for medical devices (if applicable)?
 - Does the use of the product require registration or login?
 - Does the use of the product require strong identification?
 - Does the company have any plans for post-market surveillance of the product?
 - What kind of product support does the company offer?
 - What is the intended use of the product?
 - What are the intended user groups?
 - What problem in the healthcare system is the product trying to solve?
 - Is the aim of the product to replace any existing healthcare services?
 - Does the introduction of the product cause any changes to the premises, information systems, or care processes?
 - Is the product already in use elsewhere in Finland or worldwide?
 - Where, and for how long?
 - What kind of support does the end user need to use the product?
 - If users need training, who organizes it? When? What is the language of training?
 - Does the company have instructions (e.g., a project plan) for healthcare service providers to ensure fluent introduction of the product?
 - What is the company's testing process?
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	• What is the company's process for handling error messages? • Does the company have the capacity to roll back to previous versions of the product? • Does the company have a process to proactively monitor the running of systems and system components to automatically identify faults and technical issues? • Does the company have a plan for decommissioning the product? • Has there been any downtime or impairment time in the use of the product during the last six months?
Cost	• What are the costs of using the product for a healthcare customer? • If the use of the product is free, what is the source of the company's income? • What kind of initial costs (estimated minimum and maximum values in detail) does the introduction of the product impose on the organization, including changes to buildings or facilities, a need for new devices and software, as well as needed training? • What are the maintenance costs (estimated minimum and maximum values) to the organization for the use of the product? • How often must devices or software versions related to the product be renewed? • Which uncertainties apply to these cost estimates?
Effectiveness	• Does the product provide clinical benefits? What are they? • Does the product provide benefits to the end users by improving their behavior related to their own health? How so? • Does the product provide benefits to the organization (like improving care processes)? How so? • What kind of evidence is available for

	effectiveness (case studies, randomized controlled trials, Cochrane reviews, etc.)? • Are there any ongoing studies to investigate the product's effectiveness? • Does any institution like the Duodecim Current Care Guidelines recommend the use of the product?
Clinical Safety	• Are there any risks, possible side effects, or other undesirable effects associated with using the product? • Is there any research evidence available related to clinical safety? • Have any product-related adverse events been reported or identified? • What is the company's process to handle adverse events? • Has the product undergone a risk analysis? • Are there any undesirable effects associated with misuse of the product? • Are the error conditions of guidelines removed, or is their realization unlikely? • Is the company aware of the product register and Manufacturer Incident Report supervised by the National Supervisory Authority of Welfare and Health? • Who is the responsible person in the company for handling Manufacturer Incident Reports?
Data security and protection	• Data Security and Protection Preliminary Task • Information Security and Data Protection Requirements
Usability and accessibility	• Have all user groups been taken into account in product design, like people with visual or hearing impairments? • Has the product been tested with real user groups? • What kind of accessibility testing has been performed on the product?

	• Has the functionality of the product been tested with screen readers or other assistive technologies? • How have the product's users been taken into account in the product's text (clear, concrete language; the avoidance of professional language)? • How have the product's users been taken into account in the design of its textual content (headings, lists, and images)? • How does the company continue to collect feedback from users and make changes to the product based on this feedback? • What changes have been made to the product based on user feedback? • How is the company going to continue to evaluate and develop accessibility? • Is the product compatible with the following ty guidelines (if applicable)? WCAG 2.0/ WCAG 2.1 Papunet Design Guide for Websites EN 301 549 section 11- Software Design guidelines for native application Design guidelines for progressive web application • Does the application support OS accessibility features?
Interoperability	• Does the product have interfaces into the website or other software? • Does the product have interfaces into the following healthcare services? Electronic patient records (which ones?) Finnish Kanta PHR Other (what?) • Are proprietary formats used to store and transfer data? • Are the definitions of the original proprietary formats openly available? • Does the product have interfaces for other companies' services? • Can the data contained in the product be exported

Artificial intelligence

- in a commonly used or standard format?
 - Does the product use data from other systems via interfaces? If yes, can the data produced by others be separated in the system?
 - Does the product connect with health or wellness devices? If yes, is it compatible with ISO/IEEE 11073 Personal Health Data (PHD) Standards?
 - Exactly what defined problem is going to be solved by the AI?
 - What is the classification of AI? Visualization only, AI-assisted (e.g., diagnosis/classification/decision), or solely AI-controlled?
 - Could the problem be solved without the AI solution?
 - Is the solution based on machine learning or a neural network?
 - Do the staff have sufficient capacity to understand the operational logic of AI (e.g., do they need additional training)?
 - Are the conclusions and decisions of the AI solution transparent, i.e., can medical staff understand what the decisions are based on?
 - Is the AI solution validated in the environment in which it will be used?
 - What are the data sources for the AI solution?
 - Are the data sources used in the training of AI solutions relevant to a final use case (e.g. are the age and gender composition of training groups comparable to that of real user groups)?
 - Are the access rights required for the use of the data in order, and have data protection (e.g., GDPR) and security issues been taken into account?
 - When it comes to classifier teaching, are there enough data relative to the size of the smallest class?
 - Can the AI solution use incomplete data? Can the
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Robotics				AI solution use noisy data? • Is retraining possible for the AI solution? What are the data sources for retraining? • How is it ensured that the system is not taught with irrelevant data? • How many tests or results are needed for the AI model? • Is the algorithm purchased software as a service (SaaS) or its own design? What performance criteria are used? • Does the AI solution change care processes? How? • When does the AI solution propose an action? • How, and who will actually implement it? • Is staff's approval needed for action proposed by the AI?
				• Is there any possibility that using the robot could create safety risks for healthcare personnel or customers (e.g., forces that could be destructive or collision with people)? • How have those risks been avoided in the robot's design? • What kind of arrangements are needed to teach or program the robot to operate? • If the robot is battery-operated, what are the operating, idle, and charging times?
CISSM [10]	System Performance (SP)	•	Ease of Use	• The degree to which a person believes that using a particular system would be free of effort
		•	Accessibility	• The ease or difficulty with which the user may act to utilize the capability of the computer system
		•	Reliability	• The dependability and consistency of access and uptime of systems
	Information Quality (IQ)	•	Perceived Usefulness	• The degree to which a person believes that using a particular system would enhance his or her job performance
		•	Content Completeness	

Comprehensive evaluation framework for telemedicine implementation [11]	Human	• Format • Accuracy • Service Support • Social Support • Perceived Behavioral Control • Work Processes	• The completeness and precision of the output information • The material design of the layout and display of the output contents • The correctness of the output information
			• The degree to which clinicians perceive a helpful network of co-workers
			• User's expectations and perceptions of service performance levels provided by CIS staff
			• Perceptions of internal and external constraints on behavior
			• The clinician's perceptions of clinical activities as they relate to specific CIS applications
			• The extent to which the CIS is integrated into the clinician's work routine
			• The level of overall clinician satisfaction with CIS
			• The degree to which a clinician believes that using a particular CIS impacts job performance
			• Comfort with Work flow • Expertise on ICT • Education & Training • Comfort with Patient communication • Comfort with Provider interaction • Resistance to Change
			• Location/ travel time • Disease characteristics • ICT skills & knowledge • Patient awareness • ICT equipment • User habit • Medical cost (out-of-pocket)
	System	• Organisation	• Leadership • Organizational culture • Change management • Hospital information systems • Budget

		Environment		• Training & support • Work flow reengineering
			• Technology	• Reliability of technology • Storage • System speed • User interface • Data quality • Transmission • Interoperability • Information security • Reimbursement • 3rd party payer • Insurance fee schedule • ICT infrastructure • Social norms & values
			• Society	
			• Rules/policy	• Governmental authority • Interface standards • Privacy certification & license • Privacy & security rule • Practice Medical liability
		Outcomes	• Cost effectiveness • Quality of care • Patient satisfaction	
Digital Health Score Card [12]	Technical		• Performance	• Assessment of performance when compared to technical gold standard
	Clinical		• Security	• Testing of security
			• Interoperability	• Testing of interoperability
			• Evidence	• Critical appraisal of evidence supporting whether solution has impact on defined clinical outcome • Comparison to existing clinical gold standard • Real world testing or simulation performance intarget population
	Usability		• Usability (helpful, learnable, likable)	• Assessment using standardized usability framework that evaluates Performance across basic Characteristics (e.g. helpful; effective; learnable; likeable)
	Cost		• Purchasing price • Resources	• Purchase price • Resources including time required for training, set-up, implementation, and management of solution
			• Anticipated costs	• Anticipated cost impact on clinical outcome of interest
DIPSA Framework [13]	Technology		• System quality • Safety	

Health Technology Adoption Framework [14]	Human Factor	• Collaboration • Satisfaction	
	Organization	• Procedures	
	Health gain	• Efficacy (evidence based medicine, clinical outcomes and quality of life) • Population health (burden of disease) • Standard of care	• Is there evidence that the technology will improve individual patient short-term (, 5 years) gain in health (clinical outcomes and/or quality of life) as compared with the current practice? • Is there evidence that the technology will improve individual patient long-term (5 years) gain in health or reduce the likelihood of further disease or complications as compared with the current practice? • Can the technology, including risk of adverse events, benefit cases with few alternatives? • Does the technology address a condition with significant incidence and/or prevalence (burden of disease)? • Is the incidence or prevalence projected to increase or decrease over the next 5 years? • Has the technology become the Standard of Care in other health regions? • Will the technology establish a new Standard of Care?
	Service delivery	• Safety • Training • Access	• Is the technology at least as safe as current practice for the patients? • Is the technology at least as safe as current practice for the health care providers? • Will the technology require health care provider training? • What is the expected time frame for more health care providers to acquire the expertise to use the technology? • Will the technology improve accessibility (i.e. shift services closer to where patients reside; geographic equity)? • Will the technology provide services to under-served population(s)?

		Will the technology improve the provision of services at the most appropriate time or decrease wait times? (Timeliness; service efficiency)?
	Service coordination	- Will the technology improve coordination and collaboration with other clinical services or reduce or increase impact on other services (service coordination)? - Will the technology reduce load or positively impact other services?
	Sustainability	- How many health care providers are demanding this technology? - Will the technology be well utilized? - How many health care providers have the expertise to use the technology upon acquisition? - Will additional human resources be required?
Strategic fit	Strategic fit	Is the technology aligned with internal (Department/Division) strategic goals?
Innovation	Knowledge and research	Will the technology improve the generation, transfer, and/or application of new knowledge to patient care services? (innovation characteristics)
Financial	Cost (resources, infrastructure)	- Will the technology have Direct costs (purchase of technology)? - Will the technology have One Time and Start Up Costs? - Will the technology have Ongoing costs? - Will the technology impact Other Services Areas? - Will the technology have Alternative or Partial Funding Sources? - Will the technology have Environmental costs?
	Economic analysis (cost-effectiveness, cost-benefit)	- Is there evidence to support the cost-effectiveness of the technology? - Is the cost-effectiveness threshold the same for all (e.g. children vs adults)? - Is there evidence to support the cost-benefit

			- ratio of the technology? - Are any potential cost increases associated with the technology offset by significant improvements in quality of life or other patient outcomes?
HIS Success Framework [15]	Functional	- Preparation of the user requirements - Alignment of the role and design of the HIS (Task-technology adaption) - Flexibility towards dynamic changes and changes in the organizational context - Added functionality are provided by the HIS, enabling users to provide new or better services - Improve clinical performance and outcomes - In general	
	Organizational	- Collaboration and cooperation - Participation in decision-making - Work from the workflow - Support from higher level organizations - Make implementation a transparent process within the organization - Organizational stability - Rate of hospital independence and authority - Organizational capacity for changes - In general	
	Behavioral	- User involvement - User engagement and commitment - Resistance to changes - User knowledge and skills - Stakeholder, user and patient satisfaction - Motivational activities - User acceptance (perceived system ease of use, perceived system usefulness) - In general	
	Cultural	- Understand health care as a specific culture - Understand the local culture (such as attention to cultural differences between public and private hospitals as well as developing and developed countries) - Preparedness and willingness towards cultural change (professional culture) - Expectations of users - In general	
	Management	Managers commitment	

	• Formulation and expression of a clear vision for the enterprise showing the HIS as part of it • Setting clear goals and instructions • Flexible planning • Prospective and proactive control • Coping with the impact of change • Internal communication and clear feedback • Having a strategy • Handling the diversity within stakeholder goals • Using formal project management methodology • Dedicate, availability and prioritize of competitive hospital resources (human, financial and physical resources and time) • Identify and mitigate risk (risk management) • Consider IT implementation as a change process 1 • Understanding socio-technical nature of HIS • Regular evaluations and using their results at different stages of HIS life cycle • In general
Technical (system quality, information quality and service quality)	• Integration with Legacy system • Interoperability and Interconnectivity • Usability • Balance between flexibility and stability of IT • Reliable technical infrastructure or network • Complexity of the system • Information quality (relevancy, usefulness, completeness, etc.) • Response time (system speed) • System security • Service quality (the support provided by the information department, the support provided by the maintenance company) • Quality of user documentation • Flexibility and adoptability, enabling future functional and technical changes • Using proper standards, coding and nomenclature • In general

	Strategy	• National, regional, organizational • Accepted also at lower levels • Alignment between system strategies and hospital strategies • In general	
	Economy	• Return on investment (material or immaterial) • Justification of increase of costs • Sufficient funding • In general	
	Education	• Sufficient training to make the best out of the daily operation • Sufficient training to provide an understanding of its limitations and future potentials • In general	
	Legal	• Compliance with legal requirements • Know what the legal constraints/opportunities • In general	
	Ethical	• Compliance with existing ethical rules in affairs management • Privacy and confidentiality • In general	
	Political	• Political games/conflicts • Willingness towards investment on IT systems • Reliable external partners • In general	
HOPT-FIT [16]	Human	• System Design • System Implementation • System Use	
	Organisation	• Structure • Environment	
	Process	• Clinical Flow/Standard • Business Process Management • Lean Method	
	Technology	• System Quality • Information Quality • Service Quality	
Khoja–Durrani–Scott Evaluation Framework [17]	Health services outcomes	• Development	• Ongoing and periodic assessment of health status, existing services, needs, and opportunities
		• Implementation	• Improved diagnosis and treatment of disease conditions • Improved decision support and clinical care and health management • Improved access to care • Barriers and facilitators • Acceptability of e-health • Better clinical safety • Improved quality of care

		• Functional independence among staff • Equity of care • Stability of services • Effects on the delivery of medical care
	• Integration	• Health impact leading to change in disease status • Social impact due to improved access and quality of services • Stability of services • Improvement in quality of life
	• Sustained Operation	• Health impact showing change via indicators • Stability of services • Wide reach
Technology outcomes	• Development	• Development cost, availability, affordability • Interoperability and standardization • Well-designed software • Reliable hardware • Technical efficiency or fix • Timeliness • Cost • Robust and reliable networking • Easily adaptable to different settings (patenting) • Cultural acceptability • Environmental viability
	• Implementation	• Interoperability • User-friendliness/usability • Appropriate in a variety of conditions • Relevance to existing and growing needs • Flexible (can be modified to suit local cultural/social needs) • Efficiency/error rates • Accuracy • User acceptance
	• Integration	• Appropriate in a variety of conditions • Relevant to existing and growing needs • Broader interoperability
	• Sustained Operation	• Scalability • Cost benefit • Ability to be incorporated into policy
Economic outcomes	• Development	• Affordability • Cost minimization

	• Implementation • Integration • Sustained Operation	• Cost-utility • Cost-benefit • Improved DALYs • Improved QALYs
Behavioral and sociotechnical outcomes	• Development • Implementation • Integration • Sustained Operation	• Human resource factors (management style, working relationship, communications flow, staff motivation) • Strategy for e-health implementation • User-friendliness • Human-computer interaction • Direct benefits to users in routine work • Benefits in learning • Penetration/diffusion of innovation (addressing the digital divide) • Trust • Beneficence/nonmaleficence (client, provider, organization) • Problem handling • Gender issue/gender divide • Penetration/diffusion of innovation (addressing the digital divide) • Strategy for broader e-health adoption • Adoption/adaptation of technology on a wider Scale
• Ethical outcomes	• Development • Implementation • Integration	• Prioritizing e-health over other issues • Moral consideration • Autonomy (client based) • Justice and equity • Selection of study subjects/patients and population • Securing identity and maintaining confidentiality of patient information • Sensitive to sociocultural issues • Security • Liability • Licensure • Reimbursement • All of the following in a broader perspective: • Sensitive to sociocultural issues • Security

			• Liability • Licensure • Reimbursement
		• Sustained Operation	• Security
	Readiness and change outcomes	• Development	• Plan for change management • Individual, organizational, and societal readiness to technology change • "Involvement" of end user in requirements elicitation phase, selection of vendor, solution, evaluation, features, etc.
		• Implementation	• Effective change management (preparation and action) • Training of all staff, including clinical and management staff
		• Integration	• Effective change management (maintenance)
		• Sustained Operation	• Modification • Improvement • Customization
	Policy outcomes	• Development	• Policies for change management • Scope for innovations • Funding support for research
		• Implementation	• Limited changes in organizational and national policies to facilitate e-health implementation
		• Integration	• Policy changes to facilitate broader adoption, implementation, and innovation in e-health
		• Sustained Operation	• Healthy public policy and organizational practice • Knowledge sharing with other organizations and countries
The layered telemedicine implementation model [18]	Technical	• Technology	• Support • Training • Usability • Quality
	Behavioural	• Acceptance	• Attitude and usability • Evidence based medicine • Diffusion and dissemination
	Economical	• Financial	• Provider and structure

Organizational

- Organization
 - Intramural and extramural work practices
 - Policy and Legislation
 - Legislation and policy
 - Standardization
 - Security
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