GENOMICS THAILAND STRATEGIC ROADMAP

DEVELOPING STRATEGIC ROADMAP

VISION OF THE FINAL DESTINATION (PRIORITIZED GOALS)

Vision for the final destination is the results of co-creation among >100 stakeholders through various exercises including one-on-one interview, two Focus-Groups with a Final Workshop to validate our vision. We applied IQVIA's "SMART" guiding principles (S - Specific, M - Measurable, A - Achievable, R - Relevant, T - Time-oriented) to ensure that the vision is appropriate and truly represent the direction of the Thai genomics industry. The defined vision will then be categorized according to the 4 major elements from the STEP framework (Social, Research and Technology, Economics and Political) to ensure the vision is well-balanced from all stakeholders' point of view. Genomics Thailand's Integrated Action Plan and Thailand's genomics 20-year roadmap* were also taken into consideration while forming the long-term goals. Full details on defining vision activities is in the appendix.

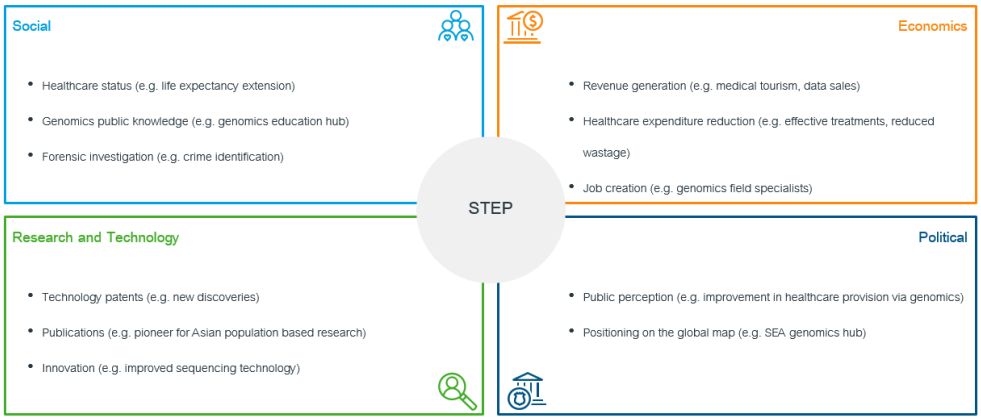

Figure 48 : IQVIA's STEP framework

As a result, five key visions/goals were defined as a guiding principles in developing strategic roadmap:

Element	Visions/Goals
Social	To improve healthcare outcome for Thai citizens by increasing accessibility to genomics diagnostics and treatments
Research and technology	To form a centralized deep clinical genomics data platform across healthcare providers and universities
Economic	To reduce cost of healthcare through improved prevention, diagnosis and treatment
Political	To build awareness of genomics and its advantages among all Thai citizens and healthcare professionals
	To form Thailand specific genomics regulations and legislations to ensure ethical usage of genomics

Table 28 : Prioritized goals

* *https://www.genomicsthailand.com/Genomic/strategy*

DEFINING AND PRIORITIZING GAPS

After defining goals & vision, key gaps were identified and categorized according to the applicability of the 4 As (availability, affordability, adoption and awareness) framework. Subsequently, the most critical gaps were prioritized using two metrics, impact on 4 As criticality and impact on goals achievement and plotted on a 2x2 matrix.

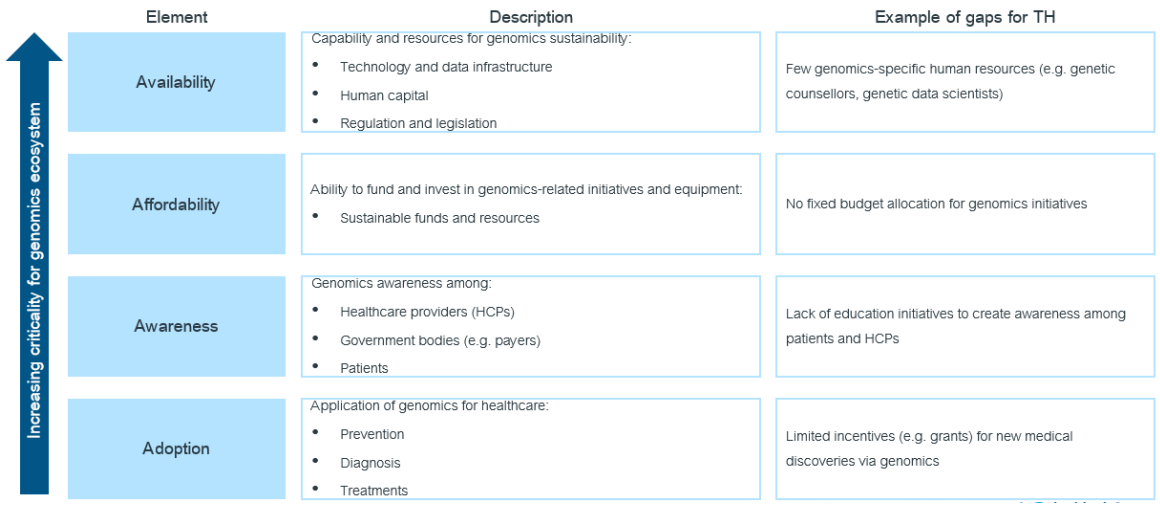

Figure 49 : 4 As framework employed to identify and assess key gaps

Measurements	Criteria	Rating allocation	Rating methodology
4As framework impact ability	Impact on 4 As criticality	Low to high	Low: Adoption Medium: Awareness or afford- High: Availability
Goals goals	Impact on goals achievement	Low to high	Low: No / indirect impact the Medium: 1 - 2 goals High: 3 or more goals

Table 29 : Gap prioritization criteria

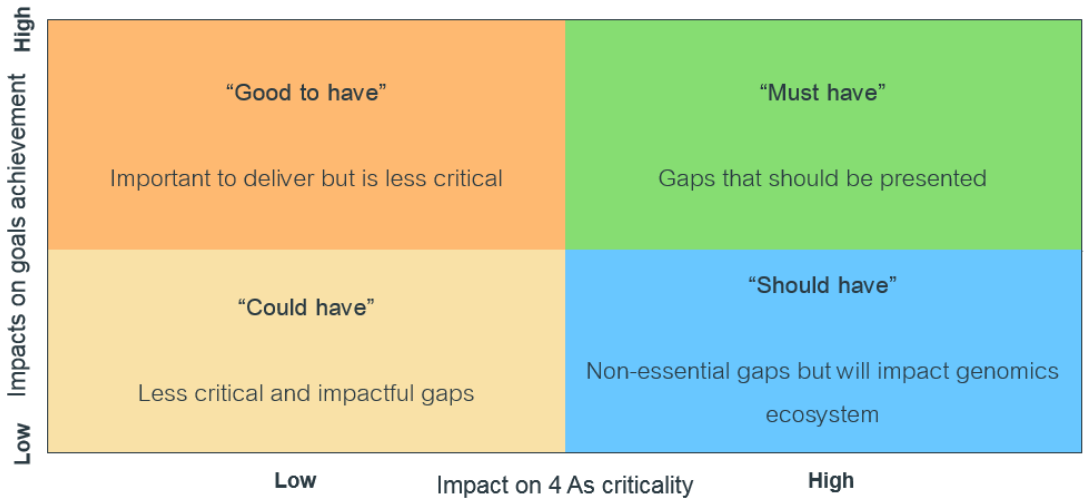

Figure 50 : Prioritization matrix of gaps

The top gaps identified falls into either Availability or Awareness elements, which is reflective of the current early stage of the industry, which is not yet ready for commercialization (where the elements of affordability and adoption will be more prevalence).

Element	Prioritized Gap #	Gap
Availability	PG1	Genomics specific human capital availability (e.g. bioinformaticians, genetic counsellors, genetic clinical specialist)
	PG2	Genomics specific regulations and legislations (i.e. ELSI)
	PG3	Genomics data usage and access guidelines
	PG4	Fragmented database platforms and ownership
	PG5	Genomics data security measures
	PG6	Under-developed national biobank (e.g. limited data stored)
	PG7	Limited local genomic laboratories and sequencing centers
	PG8	Absence of centralized genomics organization leading national initiatives
	PG9	Limited genomics specific associations and organizations in Thailand
	PG10	Absence of centralized data platform to ensure ease of accessibility
Awareness	PG11	Low genomics awareness among healthcare providers (HCPs) and Thai citizens to encourage genomics uptake

Table 30 : Prioritized gaps

PRIORITIZED ACTIONS TO ADDRESS GAPS

For each prioritized gap, potential actions were formed to bridge the gaps using the 6 IQVIA genomics benchmarking levers (business model and financing, human capital, ownership and governance, physical and data infrastructure, research and technology, public education and awareness). Participants also assigned potential responsible sectors for each proposed action. The long list of actions was prioritized after the workshop based on rank of importance within the individual group and consensus across groups and mapped to the prioritized gaps addressed respectively.

Lever	Action Description	Responsible sector	Gaps addressed
Human capital	Form genomics specific (e.g. analytics and interpretation) academic and curriculum programs to train local talents	Government	PG1, PG7
	Provide attractive incentives to attract foreign talent (e.g. tax incentives)	Government	PG1
Ownership and governance	Establish genomics specific regulation and legislations to protect data privacy	Government	PG2, PG3, PG5
	Integrate genomics as part of the social insurance coverage to encourage adoption	Government	PG2
	Form an integrated central governing body supported by a collaboration with private sector	Government	PG1, PG2, PG4, PG5, PG6, PG8, PG9
Physical and data infrastructure	Build a centralized genomics data platform by integrating current platforms and standardizing data format (e.g. medical school and teach hospitals database) to increase ease of accessibility	Government	PG4, PG6, PG10
	Government and private sector to work together to build infrastructure, e.g. data center, central lab and regional private labs	Government / Private	PG7
Research and technology	Increase grants / scholarships for genomics specific researches and discoveries and form grants and incentive approval guidelines for genomics specific initiatives and programs	Government	PG1
	Encourage genomics data and research sharing across healthcare providers (e.g. medical schools and hospitals)	Government	PG3
Public awareness	Form annual public conferences and forums to educate and encourage adoption of genomics among Thai citizens	Government	PG11
	Educate patients through trained genetics counsellors to build awareness of genomics	Private	PG11

Table 31 : Prioritized actions

STRATEGIC ROADMAP RECOMMENDATION

We propose that Thailand should take a 2-step approach to build upon its genomics industry foundation, which has been initiated by various agencies, public and private. Phases can overlap, but commercialization will rely upon the increased capabilities developed over the next 5-10 years. IN this section, we focus on the initiatives required in the mid-term to build upon the current foundation, and further develop capabilities.

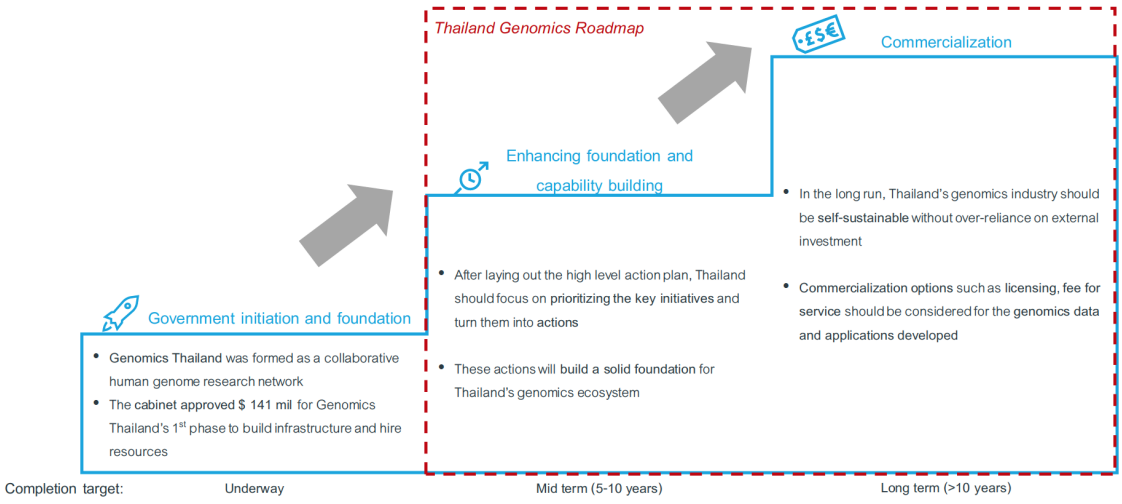

Figure 51 : Proposed approach for Thailand

ENHANCING FOUNDATION AND CAPABILITY BUILDING

This is the critical next phase in the industry development, as we should aim to systematically lay solid ground works in the forms of infrastructure, resources and governance in preparation for future operation and commercialization opportunities. We synthesized the outputs & alignments from focus groups & workshop to form 5 prioritized initiatives for the mid-term stage:

Recommended Initiatives	Prioritized actions from focus group
Form central governing body and define ownership	Form an integrated central governing body supported by a collaboration with private sector
	Establish genomics specific regulation and legislations to protect data privacy
	Integrate genomics as part of the social insurance coverage to encourage adoption
	Encourage genomics data and research sharing across healthcare providers (e.g. medical schools and hospitals)