

Technology Evaluation & Its Application

- KTRS methodology & KSP project -

**February 18, 2020
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Who am I?



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- **Education**
 - Ph.D., Finance, February 2010, Korea University, Seoul, Korea
 - M.S., Economics, February 2001, Korea University, Seoul, Korea
 - B.S., Economics, February 1994, Korea University, Seoul, Korea

- **2001.1~2011.8: NICE Investors Service Co. (Korean Credit Rating Agency), Credit analyst**
 - Research on credit rating methodology
 - Evaluation of structured finance product and credit derivatives
 - Credit risk management consulting for financial institutions
 - Development of credit rating model for financial institutions

- **2011.9 ~ current: Associate Professor in Dong-Eui University (Dept. of Business, Finance)**
 - (Projects on technology evaluation system of KOTEC)**
 - 2011.12. Improvement of Technology Evaluation Infrastructure in KOTEC
 - 2012.11. Improvement of KTRS-Startup Technology Rating Model
 - 2013.12. Improvement of Technology Rating Model and Re-establishment of System
 - 2015.12. Development of Technology Rating Model for Investment
 - 2017.12. Development of Cultural Contents Valuation Model
 - 2017.12. Reestablishment of Cultural Contents Rating Model
 - 2019.10. Improvement of Technology Rating Model for Investment
 - 2019.12. Development of a New Technology Evaluation Model Based on Artificial Neural Networks
 - (KSP)**
 - 2016.11. Knowledge Sharing Program with Kingdom of Thailand
 - 2017.5. Knowledge Sharing Program with Kingdom of Thailand
 - 2018.4. Knowledge Sharing Program with Peru

What I found ...

Credit evaluations and technology evaluations are quite different from each other.

Credit-based

- **Long history**
 - Financial track records
- **Tangible assets**
 - property, plant and equipment
 - collateral
- **Large company**

Tech-based

- **Short history**
 - No financial track records
- **Intangible assets**
 - technology, patent ..
 - engine of future growth
- **Small business, Startups, tech-based**

The value of technology-based SMEs can be properly assessed by the technology evaluation methodology.

Why KTRS? : Key features of KTRS

■ Good Performance

- ✓ Good performance in identifying technology-based SMEs with high growth potential

■ Efficiency

- ✓ Tradeoff relationship between cost and quality in evaluation.
- ✓ But, KTRS shows “low cost-good quality” relationship

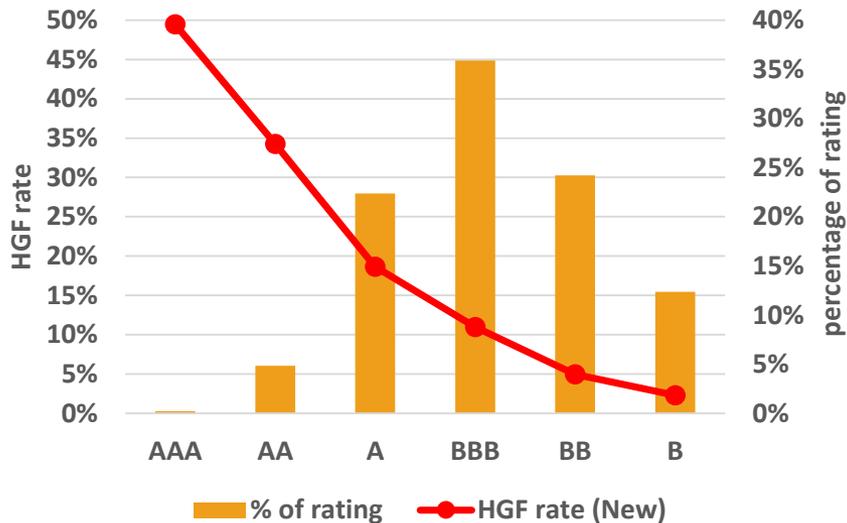
■ Flexible structure

- ✓ The structure of technology evaluation criteria is very flexible
- ✓ So, we can easily expand KTRS methodology into new area

Good performance

Why are other countries interested in KTRS?

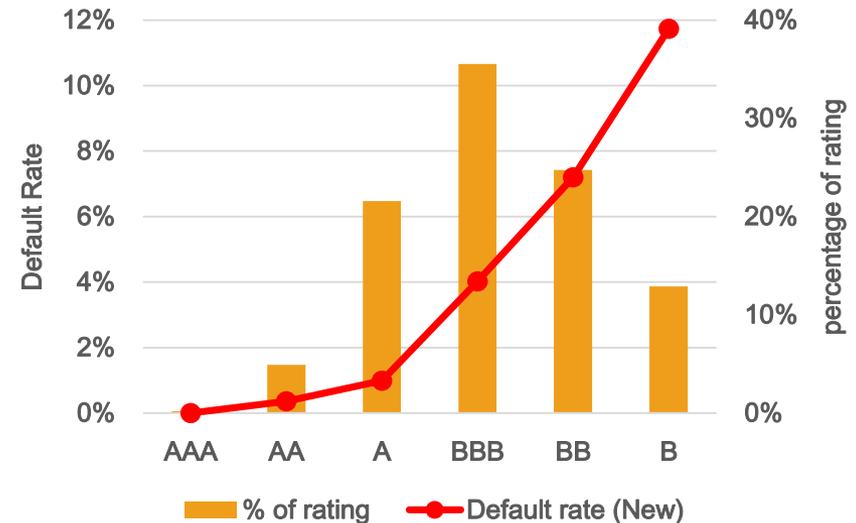
Measurement of growth potential



ROC 71.5%

- HGF: High Growth Firm
 - ✓ Companies with an average annual sales growth rate of 20% or more over the past three years

Measurement of risk



ROC 71.2%

- ROC: Receiver Operating Characteristic
 - ✓ Statistical indicator to measure model accuracy
 - ✓ The higher the accuracy of the model, the closer to 1

- KTRS has excellent ability to select technology-based SMEs with high growth potential as well as low credit risk.

Good performance ... in more detail

- **The results of numerous studies on corporate growth show that corporate growth is inversely related to firm size and age.**
- **In other words, companies with high growth potential are likely to be small and young.**
- **As we saw earlier, however, small and young companies are generally high credit risk entities.**
- **In other words, companies with high growth potential are generally more likely to have higher credit risk.**
- **Therefore, KTRS's ability to select companies with high growth potential and low credit risk is a very special one.**

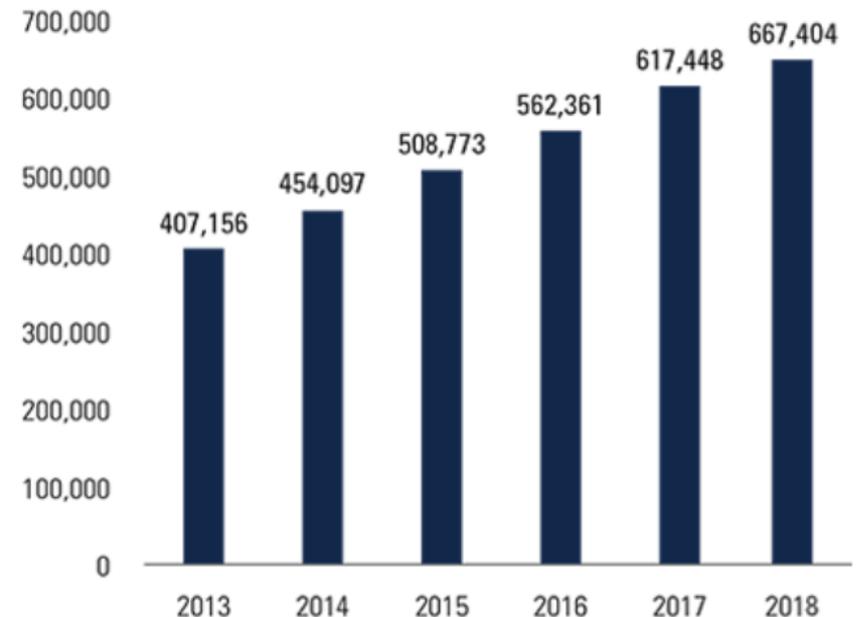
Efficiency

Why are other countries interested in KTRS?

- **Low evaluation cost and good evaluation quality**
→ **cost-quality efficiency**
- **For this reason, more than 50,000 evaluations can be performed annually**
- **Accumulated data contributes to performance improvement of KTRS through feedback**

Technology Appraisal Cases
(Cumulative)

Unit: Cases, KRW 100 million



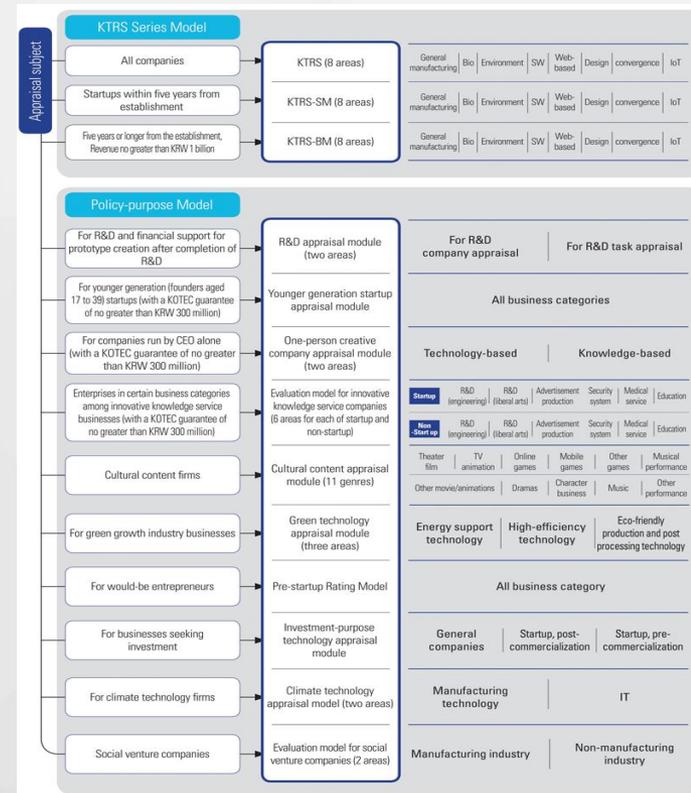
Flexible structure Why are other countries interested in KTRS?

Tech. appraisal criteria of KTRS

Module	Pillar 2	Classification 3 (Evaluation Criterion)
1. Management	1.1 Status of technology	1.1.1 Experience of the same industry
		1.1.2 Technology education level
		1.1.3 Degree of understanding in technology business
	1.2 Management capacity	1.2.1 Technology personnel management
		1.2.2 Management skill
		1.2.3 Technology business strategy
	1.3 Quality of executives/teamwork	1.3.1 Knowledge level of executives
		1.3.2 Capital Investment from Executives
		1.3.3 Relationship with the Owner (CEO) & Management Teamwork
2. Technology	2.1 R&D capability	2.1.1 R&D Organization Structure
		2.1.2 R&D (design) personnel
	2.2 Status of technology development	2.2.1 Track-records, awards and certification regarding technology development
		2.2.2 IP holding status
		2.2.3 R&D expenditure
	2.3 Innovation level of technology	2.3.1 Distinctiveness of Technology
		2.3.2 Inimitability
		2.3.3 Position on Technology Life-cycle
	2.4 Completeness and expandability of technology	2.4.1 Completeness of Technology
		2.4.2 Independency of Technology
		2.4.3 Ripple effect of Technology
	3. Marketability	3.1 Market landscape
3.1.2 Growth prospect of target market		
3.2 Competition factors		3.2.1 Status of Market Competition
		3.2.2 Legal/political constraints (or promotion)
3.3 Competitiveness		3.3.1 Customer Recognition
		3.3.3 Comparative advantage
4. Business prospect/profit	4.1 Production capability	4.1.1 Production Capacity
		4.1.2 Adequacy in Investment Scale
		4.1.3 Financing accessibility
	4.2 Profit prospect	4.2.1 Marketing Competency
		4.2.2 Sales channel diversity and stability
		4.2.3 Return on investment Prospect



Lineup of KTRS



- The flexible structure and high expandability of KTRS will increase its applicability to other countries.

What did we do?

Project on KOTEC Technology Rating System

■ Thailand

- * 1st KSP: 17. Jul. 2015~31 Mar. 2016 (259 days)
- * 2nd KSP: 12. Sep. 2016~16 May 2017 (247 days)
- * NSTDA/TCG: combination of technology and finance point of view
- * 32 official expert members and many others participated in the project
- * Set up TTRS Center and issued TTRS portfolio Guarantees (Financial Support)

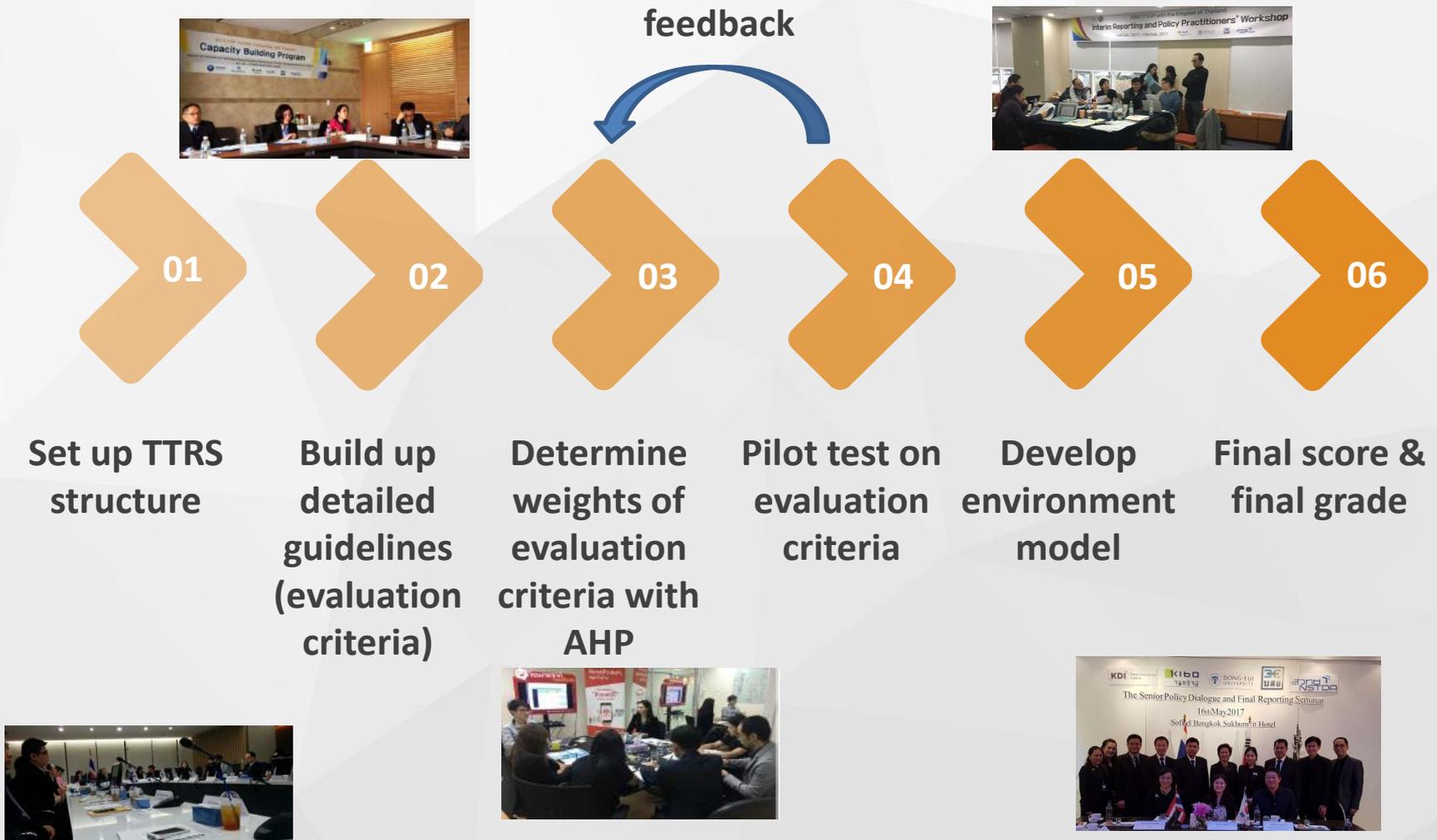
■ Peru

- * KSP: 10. Jul. 2017~30. April. 2018 (386 days)
- * MOP/FOGAPI : combination of technology and Policy point of view

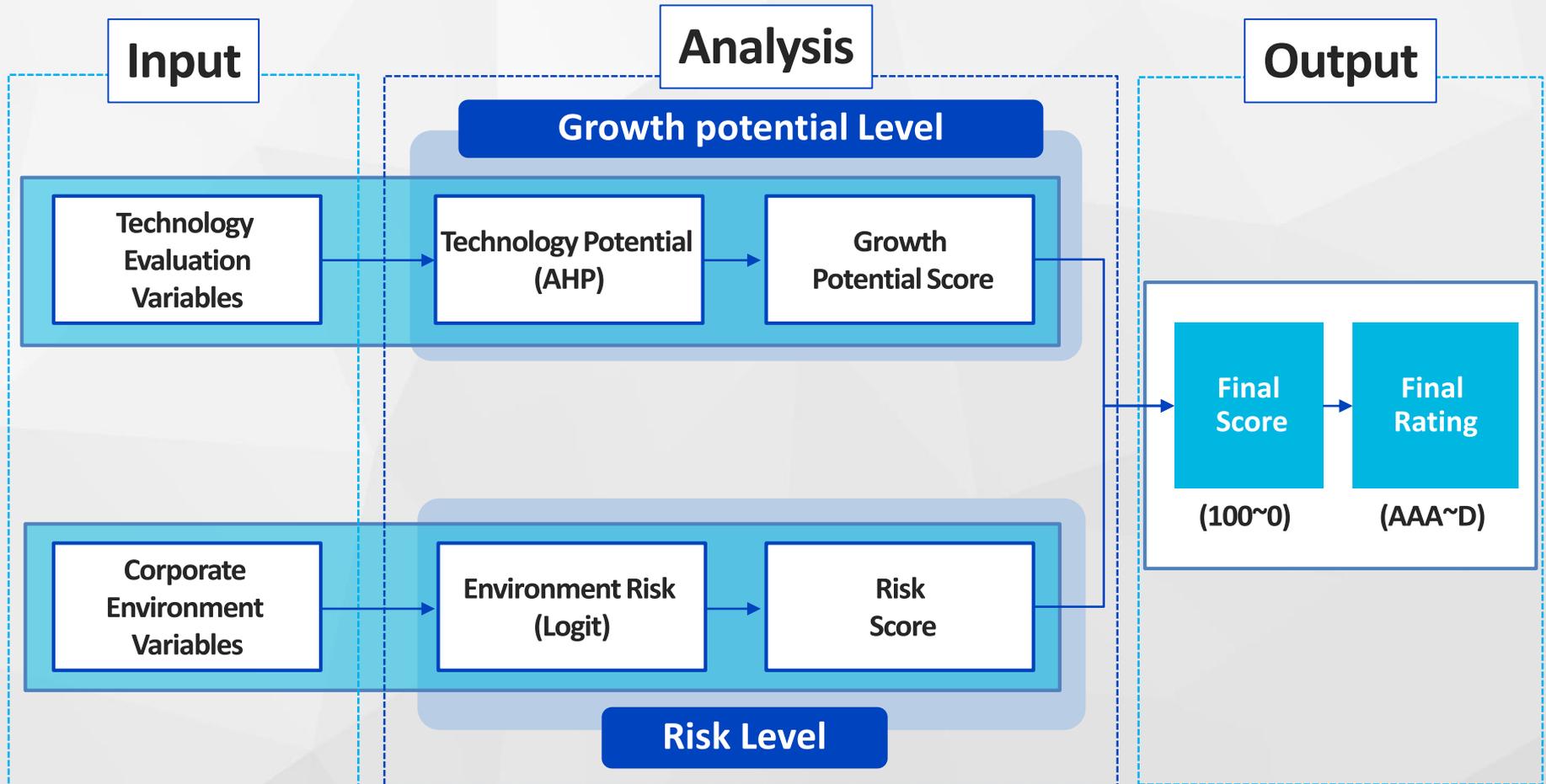
KSP: Knowledge Sharing Program

- Knowledge-intensive development and economic cooperation program
- Designed to share Korea's development experiences with partner countries
- begun in 2004 and administrated by the Korean Ministry of Strategy and Finance

Development process of TTRS



Overall structure of TTRS



Tech. appraisal criteria of TTRS (1 of 2)

Manufacturing			Services (Focus: ICT)			
Module (Pillar 1)	Classification2 (Pillar 2)	Classification3 (Pillar 3)	Classification2 (Pillar 2)	Classification3 (Pillar 3)		
1. Management	1.1 Status of Technology)	1.1.1 Experience of the Same Industry	1.1 Status of Technology)	1.1.1 Experience in the Same Industry		
		1.1.2 Technology Education Level		1.1.2 Education Level Pertaining to Technology		
		1.1.3 Degree of Understanding in Technology Biz		1.1.3 Degree of Understanding in Technology Biz		
		1.1.4 Creativity & Fusion Capability		1.1.4 Creativeness & Fusion Capability		
	1.2 Management Capability	1.2.1 Technology Personnel Management	1.2.1 Technology Personnel Management	1.2 Management Capability	1.2.1 Technology Personnel Management	
		1.2.2 Entrepreneurship-Including Leadership	1.2.2 Entrepreneurship			
		1.2.3 Management Skill	1.2.3 Management Skill			
		1.2.4 Technology-Biz Strategy	1.2.4 Technology-Biz Strategy			
	1.3 Quality of Executives/Teamwork	1.3.1 Knowledge Level of Executives	1.3.1 Knowledge Level of Executives	1.3 Quality of Executives/Teamwork	1.3.1 Knowledge level of Executives	
1.3.2 Capital Investment from Executives		1.3.2 Capital Investment from Executives	1.3.2 Capital Investment from Executives			
1.3.3 Relationship with the Owner (ceo) & Management Teamwork		1.3.3 Relationship with the Owner (ceo) & Management Teamwork	1.3.3 Relationship with the Owner (ceo) & Management Teamwork			
1.3.4 Creativity Skills: INNOBIZ		1.3.4 Creativity Skills: (INNOBIZ)				
2. Technology	2.1 R&D Capability	2.1.1 R&D Organization Structure	2.1 R&D Capability	2.1.1 R&D Organization Structure		
		2.1.2 Quality and Quantity of Technology Staffs		2.1.2 Quality and Quantity of Technology Staffs		
		2.1.3 Tech Innovation Execution Capacity: INNOBIZ		2.1.3 Tech Innovation Execution Capacity: INNOBIZ)		
		2.1.4 R&D Equipments (INNOBIZ)*		2.1.4 ICT Development Infrastructure (Including key employee turnover)*		
	2.2 Status of Technology Development	2.2.1 Track-records, Awards and Certification Regarding Technology Development	2.2.1 Track-records, Awards and Certification Regarding Technology Development	2.2 Status of Technology Development	2.2.1 Track-records, Awards and Certification Regarding Technology Development	
		2.2.2 IP Holding Status	2.2.2 IP Holding Status		2.2.2 IP holding Status	
		2.2.3 R&D Expenditure (Financial)	2.2.3 R&D Expenditure (Financial)		2.2.3 Intensity of R&D Expenditure (Financial)	
	2.3 Innovation Level of Technology	2.3.1 Differentiation of Tech	2.3.1 Differentiation of Tech	2.3 Innovation Level of Technology	2.3.1 Degree of Differentiation of Technology* (Detailed Guideline will be changed)	
		2.3.2 Inimitability	2.3.2 Inimitability		2.3.2 Inimitability	
		2.3.3 Position on Technology Life-cycle	2.3.3 Position on Technology Life-cycle		2.3.3 Position on Technology Lifecycle	
		2.3.4 Degree of Green Technology*	2.3.4 Capability to Lead into Digital Transformation			
	2.4 Completeness & Expandability of Technology	2.4.1 Completeness of Tech *	2.4.1 Completeness of Tech *	2.4 Completeness & Expandability of Technology	2.4.1 Degree of Completeness in ICT Service*	
2.4.2 Independency of Tech*		2.4.2 Independency of Tech*	2.4.2 Excellence of ICT Service* (Intelligent Service Indicator)			
2.4.3 Ripple effect of Tech (HL Indicator)		2.4.3 Ripple effect of Tech (HL Indicator)	2.4.3 Expandability of ICT Service* (Intelligent Service Indicator)			

Tech. appraisal criteria of TTRS (2 of 2)

Manufacturing			Services (Focus: ICT)	
Module (Pillar 1)	Classification2 (Pillar 2)	Classification3 (Pillar 3)	Classification2 (Pillar 2)	Classification3 (Pillar 3)
3. Marketability	3.1 Market Landscape	3.1.1 Size of Target Market	3.1 Market Landscape	3.1.1 Size of Target Market
		3.1.2 Growth prospect of target market)		3.1.2 Growth Prospect of Target Market
	3.2 Competition Factors	3.2.1 Status of Market Competition	3.2 Competition Factors	3.2.1 Status of Market Competition
		3.2.2 Market Entry Barrier		3.2.2 Market Entry Barrier (Detail guideline will be changed)*
		3.2.3 Legal/political constraints (or promotion)		3.2.3 Legal/Policy Constraint/Promotion
	3.2 Competitiveness	3.3.1 Customer Recognition	3.2 Competitiveness	3.3.1 Customer Recognition
		3.3.2 Market Share		3.3.2 Market Share
		3.3.3 Comparative advantage* (Innovative products, NSTDA support or not)		3.3.3 Comparative Advantage among Competing Services* (Innovative products, NSTDA support or not, Knowledge Service Detailed Guideline) (Guideline will be different)
	4. Business Prospect /Profit	4.1 Production Capability	4.1.1 Production Capacity (Turnover Rate in IT Service)*	4.1 Commercialization Capability
4.1.2 Adequacy in Investment Scale			4.1.2 Adequacy in Investment Scale	
4.1.3 Financing accessibility			4.1.3 Financing accessibility	
4.2 Profit Prospect		4.2.1 Marketing Competency* (To 4.2.2 Dealer Diversity and Stability)	4.2 Profit Prospect	4.2.1 Relevance of Business Plan & Strategy (Knowledge Service 2.3.2 + Significance of Marketing Organization)*
		4.2.2 Net Sales Growth Rate (Finance)		4.2.2 Net Sales Growth Rate (Finance, Establishment, Growth Prospect)
		4.2.3 Operating Profit Ratio (Finance)		4.2.3 Operating Profit Ratio (Establishment, Profit Prospect)

Implementation of TTRS

March 18, 2018

Wednesday, February 12, 2020

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ITU SCHOLARSHIPS FOR SUCCESSFUL CANDIDATES RETHINK THE WAY YOU LEAD ROLD

Raving over rating system

Mar 18, 2018

Narong Siירתworakul, president of the National Science and Technology Development Agency (NSTDA)

By Aaina Pomsaen The Nation

Four-pillar tech evaluation adapts successful model from Korea to boost funding access

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Why this ad? 0

Small and medium enterprises (SMEs) and tech start-ups could more easily access funding sources thanks to a rating system developed by the Thailand Technology Rating System (TTRS) and initiated by the National Science and Technology Development Agency (NSTDA).

A successful business-rating system from Korea's Technology Finance Corporation (KOTEC) has been tailored for Thailand, thanks to the NSTDA joining forces with the Thai Credit Guarantee Corporation (TCG). The Thailand Technology Rating System (TTRS) will aim to help SMEs and start-ups to more easily get funding.

KOTEC is a quasi-governmental institution providing guarantees, based on technology appraisal, to SMEs that are technologically competent but lack collateral.

Narong Siירתworakul, president of the National Science and Technology Development Agency (NSTDA) said that the organisation on March 1 launched the Thai technology rating system after a successful trial period in which they evaluated some companies.

With the launch of TTRS, which incorporates the KOTEC rating system, tech start-ups and SMEs will be evaluated for their suitability for funding.

TTRS will consider four pillars – founders, technology, market opportunity, and company finances. Some 40 factors are evaluated under the four pillars. Those that excel in the evaluation

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A successful business-rating system from Korea's Technology Finance Corporation (KOTEC) has been tailored for Thailand, thanks to the NSTDA joining forces with the Thai Credit Guarantee Corporation (TCG). The Thailand Technology Rating System (TTRS) will aim to help SMEs and start-ups to more easily get funding.

~ the organisation on March 1 launched the Thai technology rating system after a successful trial period in which they evaluated some companies.

"KOTEC spend only one week for the whole evaluation," said Narong. "For TTRS, we will spend two weeks to get SMEs and start-ups certified. With our strength, we have multidisciplinary technology knowledge with over 600 PhDs. We really hope to be a key driver for Thailand's technology industry moving forwards and become the key industry driving the country's economy."

Source: <https://www.nationthailand.com/noname/30341179>

Implementation of TTRS

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TTRS Team

- ❖ 4 Ph.D. [Technopreneurship & Innovation Mgt., IE., Business]
- ❖ 5 M.Sc.,MBA [Data Analysis, Marketing, Mgt, Finance, Biotechnology, Biomedical&Health, Engineering, and IOT]

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implementation of TTRS



“TTRS: TECH FUNDING EVALUATION MODEL”

THAILAND TECH SHOW 2019 | NSTDA | M I E S T

Date: 6 SEP 2019
Time: 9:30 AM - 4:00 PM
@ LOTUS SUITE 3-4 FL.22
 Centara Grand & Bangkok Convention Centre At Central World

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Time: 6:00-8:00 PM
 @ Delegation Cafe & Bar FL22
 Centara Grand & Bangkok Convention Centre
 CentralWorld Bangkok



Dr. Thitapa Smitinont,
Executive Director
TMC, NSTDA

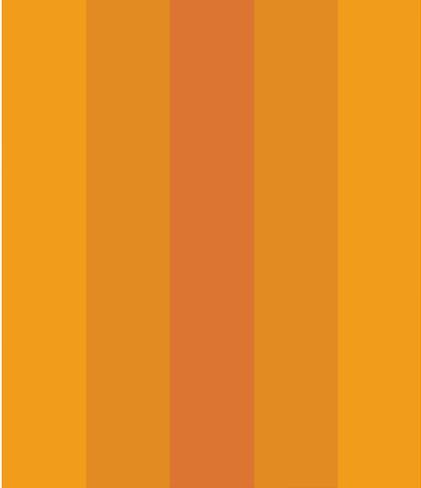


Mr. Yang, Jeog-Joo,
Director General, Public Relations
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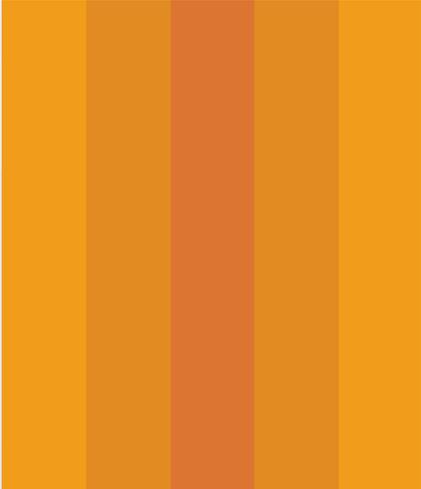
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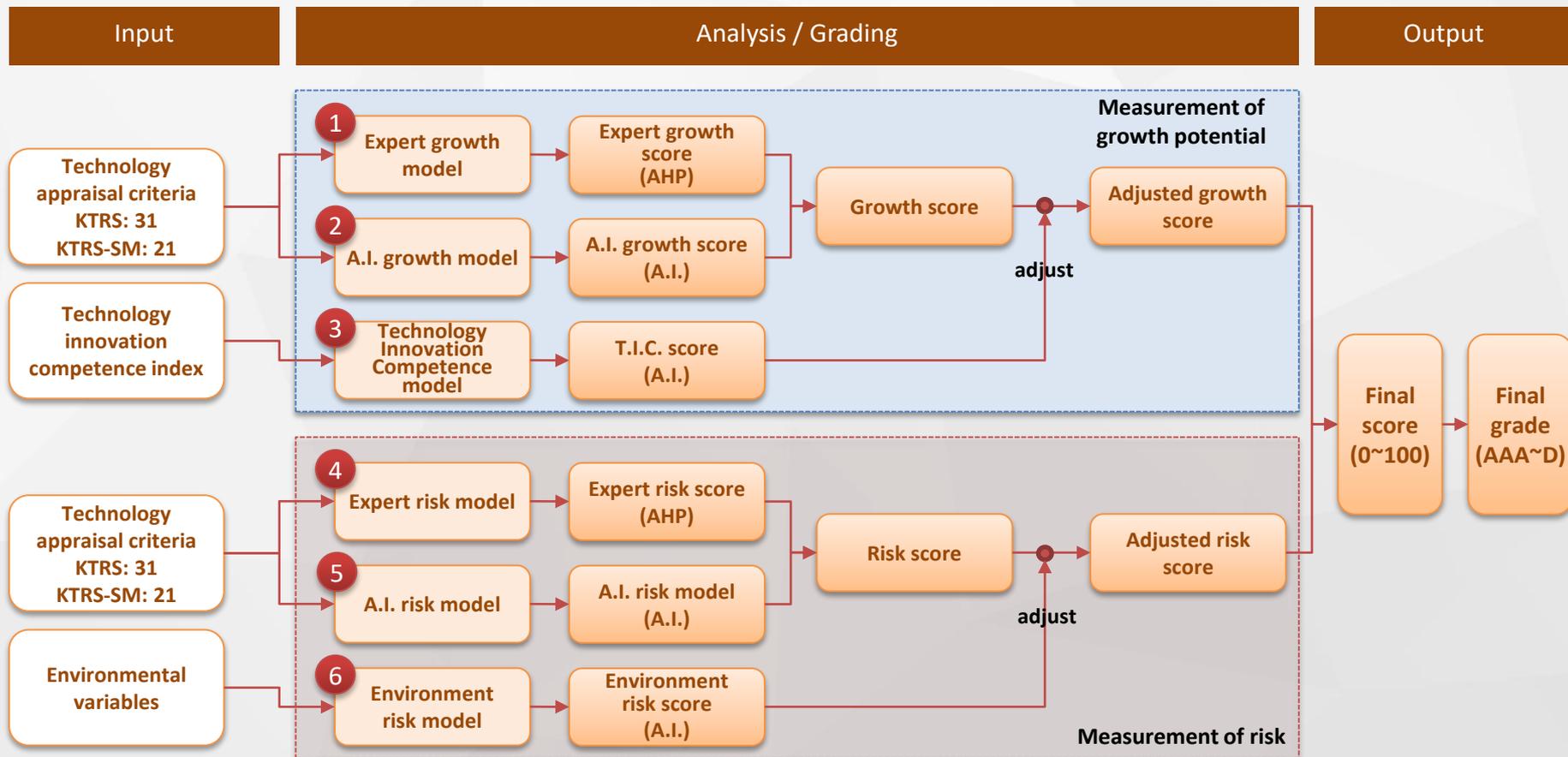
Thank you

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Overview of KTRS (the latest version)



• **Main feature of new KTRS methodology**

1) **Application of A.I. Technique**

- ✓ Applies to model ②,③,⑤,⑥

2) **Clarifying the concept of growth**

- ✓ Applying corporate growth concepts to KTRS by more systematizing them

3) **New development of technology innovation competence model**

- ✓ Measure the technology and innovation capabilities of a company
- ✓ Select six variables from three areas of infrastructure, activity, and performance