

Green Industry Development and Investment Strategy

中華經濟研究院綠色經濟研究中心

THE CENTER FOR GREEN ECONOMY, CHUNG-HUA INSTITUTION FOR ECONOMIC RESEARCH

L ih-Chyi Wen Research Fellow/Director August, 2016



- 1. Background: what
- 2. Green Industry Development Strategy
- 3. Green Investment





簡報大綱

Outline

International policy signal for green growth is very clear

UNFCCC: COP 21 for Paris agreement and the implementation of INDCs WTO: negotiations on EGS APEC: Tariffs of 54 green EGS will be cut in 2015



Conférence sur les C

 Nations Unies

 Conférence sur les Changements Climatiques 2015

 COP21/CMP11

 Paris, France

"We want the low-carbon economy that continues to provide good jobs and great opportunities for all Canadians."

\$75 million to Canadian towns and cities to "respond to pressing climate challenges" and
50 million investment in improvince climate resilience in design guidelines and infrastructure codes.

Globe 2016 Leadership Summit 加拿大新任總理 Justin Trudeau

Fossil Fuel vs. Renewable Energy



Global Trend of Renewable Energy



6

Global Trend of Energy Storage



7

Global Trend of Smart Grid



Data source: Bloomberg New Energy Finance (2016)

1 Methodology



A Case Study in Finland

Objective Market-Driven Economic Development

To develop an efficient means for selecting companies and projects for investment in new green industries that can drive job creation and economic growth...

...at market returns, but with maximum

leverage opportunity for public funds.

Roadmap: 'Smart Industrial Farming' of the Economy

- 1. Economic developers optimize economic variables:
 - Macroeconomic trends
 - Core skills and competencies
 - Investment policies (loans, subsidies, trade)
 - Workforce development
 - Attract private and institutional investors (pension funds, investment banks, FDI)

- Companies respond to & influence industry and market variables:
 - Macroeconomic trends
 - Changing business models
 - Investor requirements
 - Supply chain shifts

- 1. Collect data from companies
- 2. Process them in the cloud
- 3. Contextualize ecosystems
- 4. Optimize growth and profits

KeyStone Compact Group:

Matrix-crunching software platforms for economic investment management



Why Industry Ecosystems? They are the Basis of Industrial Renewal

Shift from linear, rigid and cost-driven value chain models of economic development, towards adaptive, value capturing, and investable business







2 Module



Part I. Mapping Emerging Industry Ecosystems

Growth demands a temporary surrender of security. It may mean giving up familiar but limiting patterns, safe but unrewarding work, values no longer believed in, and relationships that have lost their meaning.

- John C. Maxwell, Author

Financial Network Mapping: How Does it Work?

1. Mine Bloomberg database to obtain raw supply-chain data

- Collect company names, industry codes, and corporate financial data
- Mine supplier, customer, and peer relationships to understand transactions

2. Re-assemble and digest mined data in a relational database

- Automated script, query-able framework, and statistical analytics
- Aggregate industry sector relationships using financial metrics of public companies

3. Graphically visualize the new relational database using nodal networks

- Quantitative analysis of ecosystem using network theory principles
- Relative positions determined through force-directed mapping algorithm



From: D. Assanis, S. Zielinki, and P. Adriaens. 2016. New Mobility Industry Analysis: A Value System Perspective. Progress Meeting Presentation to the Ford Motor Company, Dearborn MI.

Financial Network Mapping: Step 1. Bloomberg Supply Chain Data

- 1. Supply chain data focus on money flows between companies on both a customer (revenue) and supplier (cost) basis. They help to predict changes in a company's business based on events in its supply chain.
- 2. Bloomberg employs both human and computerized methods to aggregate publicly disclosed data. Because this data set is incomplete, Bloomberg also provides proprietarily quantified supply-chain data. This proprietary data consists of two types: 1) mathematically derived, and 2) algorithmically derived.

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									F.
Start with a dozen companies -	uncover 1	nos of a	sunnl	v cha	ain c	omn	anies an	d indust	n

Start with a dozen companies -> uncover 100s of supply chain companies and industry sectors -> 1000's of financial relationships

Financial Network Mapping: Step 2. Sorting Bloomberg Financial Data in Query-able Database Structure

- 1. Aggregate industry sector relationships (based on existing individual corporate relationships): Software companies, telecoms, IT, consumer electronics, car manufacturers
- 2. Aggregate financial exposure metrics (% COGS; % SG&A; % revenue, % EBITDA) by industry sector



+ Figure 3

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Financial Network Map: Step 3. Visualize Dataset – Example Smart Mobility



Financial Network Map: Step 4. Interpreting Maps Using Network Theory

- Node: A single GICS (Global Industry Classification System) industry sector
- Node Size & Label: Indicator of the node' s centrality in the network (betweeness centrality metric)
- Node Color: Industry sector average EBITDA margin a measure of core operating profitability
- Edge: Directed transactional relationship between two industry sectors
- Edge Thickness: averaged relative magnitude of financial exposure of the companies in these relationships (one company's revenue is the other's direct or indirect cost)
- Distance between the nodes indicates the relative centrality of the industry segment relative to all other segments

From: D. Assanis, S. Zielinki, and P. Adriaens. 2016. New Mobility Industry Analysis: A Value System Perspective. Progress Meeting Presentation to the Ford Motor Company, Dearborn MI.

Note: Anchor and Catalyst Industries were defined as part of the Tekes FiDiPro project awarded to ETLA, The Research Institute of the Finnish Economy, and Peter Adriaens, Ross School of Business. This was published as an ETLA brief.

Financial Network Map: Step 5. Smart Mobility Industry Sectors (GICS)

Types of Nodes in the Industry structure (based on network centrality):

> Anchor industries Closely integrated supply/value chains

> Catalyst industries Crossindustry supply/value chains



Data: Bloomberg

Financial Network Map: Step 6. Select SMEs (NACE) from Country Databases

Automobile

Valmet Veho Group Oy Ab Atoy Oy BRP Finland Oy Pegasor Oy Kabus Oy

Logistics

Finavia Oyj Meriaura Oy SE Mäkinen Logistics Oy Weegos Oy HUB Logistics Finland Oy Ahola Transport AB Oy Helsingin Taksi-Data Oy Taksiliiton Yrityspalvelu Oy Transdev Finland Oy Logistikas Oy ALD Automotive Oy

Application Software

Bravioz Oy Ecomond Oy Space Systems Finland Oy EC-Tools Oy Sunit Oy & Mobisoft Oy PIEneering Oy Infotripla Oy E-Bros Oy Componentality Oy Western Systems Oy Ajelo Oy CGI Suomi Oy Ixonos Oyj Eficode Oy Ajeco Oy

Wireless Telco

Helpten Oy M-Motion Ltd Oy IT/Management Consulting & Design

Teconer Oy Taipale Telematics Oy Mobinet Oy ILS Oy Confidex Valpastin Oy EXP Analytics Oy Sito Oy Eniram Oy MediaMobile Nordic Oy Conexbird Oy Picodeon Ltd Oy MovekoTech Oy Coreorient Oy Anadium Group Oy

ADA Drive Oy Cadring Oy DA-Design Creanex Certeum Oy

Technology HW & Storage

Teknoware Oy EKE-Elektroniikka Oy TechnoSmart Oy Selmic Oy Teiskonen Ltd., Oy Sabik Oy Ab SATEL Oy U-Blox Espoo Oy Oceanvolt Oy Nokian Renkaat Oyj Lumikko Oy Siemens Osakeyhtiö Murata Electronics Oy Aplicom Oy EKE Group

Data Processing

iQ Payments

Data: Statistics Finland

Financial Network Map: Step 7. KeyStone Compact® Analytics – Smart Mobility



Financial Network Map: Similar Analysis for Smart Grid



Data: Bloomberg & Statistics Finlar

Financial Network Map: Similar Analysis for Green Chemistry



Data: Bloomberg & Statistics Finland

Take Home Message: How Strong are Your Economic Assets in Different Industry Sectors?

- 1. Financial network maps using financial metrics and value chain information allow for understanding of global and regional thematic industry structure
- 2. Network theory provides insights in how industry sectors are positioned in emerging industries (anchor vs catalyst)
- Industry classification codes allow us to test how your companies are positioned in thematic industry structures
- 4. Multi-asset renewal funds are focused on investing in industry ecosystems/clusters, instead of in individual companies only
- 5. The view has to be export-oriented, market driven, and aimed at attracting foreign direct investment (FDI)

Part II. Company Assessment Value Capture and Investment Grade

We are in danger of valuing most highly those things we can measure most accurately, which means that we are often precisely wrong rather than approximately right.

- Sir John Banham, Director General of the Confederation of British Industry

Business Model Investment Risk : KeyStone Compact®



Business Model

Debt Risk debt Illiquid credit Supplier/buyer credit



Equity – traditional Equity – cash flows Corporate investment Project finance



Return on Investment (ROI) expectations

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Non-Financial Risk: Difficult to Quantify – Important Risk Factor

KeyStone Compact® addresses non-financial risk



The remainder (25%) is financials.

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Basic Tenets of Methodology: Empirical Research from 600 Businesses

- 1. The strength and investment grade of a company in a particular industry value system depends on the type of activity the company is engaged in.
- 2. The value capture (retention of value) position depends on how the company's capabilities (IP, team, skills) can be leveraged in the value chain, relative to competition, partners, and buyer/supplier networks.
- The investment grade of the company depends on the upside potential to the investor, and the speed/capital efficiency at which the company can be scaled.



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Stress-Testing the Business Model: KeyStone Compact[®] Emerging Business[®]



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Stress-Testing the Line of Business: KeyStone Compact[®] Enterprise®



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Algorithmic Risk Analysis: Data Capture, Curation, Allocation



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Dependency Leveragability Replicability Connectivity

- Industry View: Value Capture Potential
- 1. Weak business potential: The capabilities under control of the firm are far outweighed by what you need from others in the value chain; low differentiation
- 2. Niche business potential: The company can easily acquire what it needs to service market (e.g. licenses, catalog goods, data); poor differentiation
- 3. Unclear value capture: High dependency on others, but the firm has leverage because of high differentiation ('you need your partner as much as they need you')
- High growth potential: The capabilities to grow your business depend mainly on generic supply chain needs to service your market; highly differentiated

Typical High Value Capture

0% Dependency 70.6% Leveragability 89.5% Replicability 88.9% Connectivity



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Diversification Profitability Scalability Capital Efficiency

- 1. Traditionally equity-investable: majority ownership by investors; driven by capital efficiency, rapid scalability and significant upside potential
- Creative equity financing ('patient capital'): minority ownership by investors; often tied to future cash flows (instead of exits) – driven mainly by value, not speed
- 3. Non-equity financing: no investor ownership; includes project finance, convertible or structured debt; tied to annual/monthly cash flows; often involves PPP (public-private partnerships)
- Bootstrapping/Non-Dilutive Financing: no external investor; often includes founder's capital, low cost business
 loans, government grants, or buyer/supplier financing

Investor View: Investment Grade

Typical Equity Investment

80.0% Diversification 84.6% Profitability 80.0% Scalability 81.8% Capital Efficiency

VALUE CAPTURE RATE / CAPITAL INVESTMENT



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KeyStone Compact[®] **Assessment Process**

1. Public Data Inputs/Sources:

- Company websites \checkmark
- ✓ LinkedIn profiles
- News releases \checkmark
- ✓ Crunchbase
- Financial database
- ✓ CB Insights

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2. KeyStone Compact Assessment



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KeyStone Compact® Step 1. Financial Network Company Demographics



KeyStone Compact® Emerging Business® Step 2. Position for Value Capture Questions

KEY STONE COMPACT GROUP	Take Assessment Show Assessments Peter Adriaens -
Demographics	Assets
Assets	1. The Company owns or leases physical/tangible assets.
Vanagement	$Y \bigcirc N \bigcirc$
Structure and Partnerships	2. The Company's physical/tangible assets are core to business operations. Y \bigcirc N \bigcirc
Type and External Drivers	3. The Company's physical/tangible assets are contextual (supportive, not core) to business operations. □ Y ◯ N ◯
Product	4. The Company owns intellectual property (IP: trademarks, copyright, patents, industrial design rights, or trade secrets)
Sources of Junding	YONO
	5. This IP is core to the business activities of the Company.
Industry Segment	6. The Companu's success is specifically dependent on patent protection.
Marketing and Sales	YONO
	7. The Company is the owner of the patent or trademark. \Box
	YONO
\checkmark	8. The Company has the right to practice the invention (patent).
	YONO
3/	9. The physical (tangible) assets are based on the intellectual property of the Company. \Box
	YONO

KeyStone Compact® Emerging Business® Step 3. Investment Grade Questions

KEY STONE COMPACT GROUP	Take Assessment Show Assessments Peter Adriaens -
Demographics	2
Assets	
Management	Marketing and Sales 13
Structure and Partnerships	1. Most of the company's sales occur through on-line platforms or API (Application Programming Interface) models. Y 🔿 N 🔿
Type and External Drivers	2. Most of the Company's sales require face-to-face contact to influence the buyer ("missionary sales", usually one sale at a time, e.g. power purchase agreement).
Product	YONO
Sources of Funding	3. The Company has a recurring sales model (e.g. monthly charges, commissions) to generate revenue (i.e. that require no extra work). Y N
Lidustry Segment	 4. The Company has identified multiple/diversified revenue streams (e.g. software and services, hardware and maintenance, service and data, sales and advertising). Y \cap N \cap
Marketing and Sales	5. The Company's sales and marketing channels are very influential in making the sale.
	 Y N 6. The Company's sales and marketing channels are not specific to your product or service (e.g. on-line, web-based, sales booths at meetings, etc.). Y N 7. The sales cycle (conversion from lead to sales) of the Company's product or service is months. (If less than one month, please use decimal)
	 8. The Company's offering is "plug-and-play" and can be integrated in your buyer's process or system. Y \(\n) N \(\n)

Keystone Compact® Emerging Business® Step 4. Algorithmic Training of Company Risk Factors



Dependency Leveragability Replicability Connectivity



Diversification Profitability Scalability Capital Efficiency

Value Capture

- 1. Value chain dependency
- 2. Leverage in value chain
- 3. Competitive differentiation
- 4. Industry connectivity

Investment Grade

- 1. Scalability & recurring revenue
- 2. Upside potential/profitability
- 3. Market diversification
- 4. Capital efficiency

Risk Adjustment

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KeyStone Compact® Emerging Business® Step 5. Mathematic Risk Mapping Model



Typical High Value Capture

0% Dependency 70.6% Leveragability 89.5% Replicability 88.9% Connectivity

VALUE CAPTURE RATE / CAPITAL INVESTMENT INCREASINGLY RAPIDLY-SCALABLE VENTURE INCREASINGLY CAPITAL-EFFICIENT VENTURE LOW HIGH **MAGNITUDE OF CAPTURABLE VALUE** PATIENT CAPITAL TRADITIONAL **INVESTABLE** EOUITY VENTURE **INVESTABLE** Creative / VENTURE HIGH non-traditional NCREASING UPSIDE POTENTIAL financing. NON-EQUITY BOOTSTRAPPING INVESTABLE AND **NON-DILUTIVE** VENTURE Bond-like annuity **FINANCING** NO returns potential **Typical Equity Investment**

80.0% Diversification84.6% Profitability80.0% Scalability81.8% Capital Efficiency

GCCA 2015 Companies: Value Capture and Investment Grade



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Taiwan GCCA 2015 Companies: Value Capture and Growth Position

COMPLEMENTARY CAPABILITIES INCREASINGLY EASY TO APPROPRIATE SPECIALIZED GENERIC CAPABILITIES UNCLEAR STRONG VALUE CAPTURE SPECIALIZED **HIGH-GROWTH** STRUCTURE: NCREASINGLY DIFFICULT TO REPLICATE Narrow Business **NEW BUSINESS** or Partner with OTENTIAL and / or Licence to C.A holder **YOUR CURRENT WEAK** NICHE BUSINESS BUSINESS POTENTIAL GENERIC POTENTIAL Margin Market Access



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Venture Grade 2015 GCCA Companies: Traditional Equity



KeyStone Compact® Validation: GCCA Top 30 vs TechStars



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Part III. Interpreting KeyStone Analytics Example: Finnish Smart Grid Companies

However good our futures research may be, we shall never be able to escape from the ultimate dilemma that all our knowledge is about the past, and all our decisions are about the future.

- Ian Wilson, Scenario planning expert



3

Developing Business Model Green Solutions Deployment



Preliminary Results of The

Survey

Type of Company



Financial Security



Nearly half of the non-spot transactions



- Mostly cash transactions
- Mainly based on the non-spot transactions (check, credit card, etc.)
 49
- No specific pattern

Business Overview



Products Patterns



Market Competition

Most market competition is moving toward relaxation



- There are distinct market competitors
- Market competition is moving toward relaxation



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Sales





2013 2014 2015

The self-assessment of marketing results

14%

43%

14%

- Ineffective marketing
- Normal marketing effect
- Marketing effect is significant, but still below expectations
- Marketing effect is significant, even beyond expectations

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Business Partnerships

The situation of business partnerships

Business impact of the strategic partnerships





- No business partnerships
- Operating business partnerships
- Cooperation with upstream and downstream third-party (suppliers, service providers, etc.)
- To become collaboration party of large enterprises

- The company's strategic partnerships are very important in technology licensing / R & D
- The company's strategic partnerships are very important in products / services sales

Intangible Assets (1)



Intangible Assets (2)

Commercial feasibility of Intangible assets for sale or use



A: percentage of R&D expenditure



Human Resources (1)



Human Resources (2)

44% Surveyed enterprises have permanent boards of advisors. 78% Surveyed enterprises' management include experts in the same industry.



Human Resources (3)

Staff's Competence



22% Most employees can start work without training
 22% Some employees need pre-employment training

56% Most employees need pre-employment training

Staff educational training



Staff's main educational backgrounds



Strength And Challenges

The biggest ADVANTAGE The biggest CHALLENGE Company Lack of scale is talents growing 11% 11% Market has Lack of industry not yet infrastructure formed 22% 11% Company Company has high Lack of has strong competitive parts intangible products or supplier **Government policy** assets. service. 11% as impediments 33% 56% 45%

policy advices (1)

All (100%) Surveyed enterprises suggest add or amend policy infrastructure





Policy Suggestions

policy advices (2)

78% Surveyed enterprises hope to increase renewable energy options in the energy market to help their business



Conclusions

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- 1. Most surveyed Taiwan green energy enterprises are young, small and totally domestic capital with delicate financial security.
- Most surveyed enterprises export their products and gain revenue, but gross margin(毛利率) is generally lower than 20%.
- 3. Most surveyed enterprises need business partnership, mainly in cooperation with upstream and downstream third parties.
- 4. Most surveyed enterprises face mild competition in the market because of their relative high competitiveness, but lack of policy legislation, incentives and industry infrastructure are their biggest challenges.
- Most surveyed enterprises hope to increase renewable energy options in the Taiwan energy market to help their business expansion.