



# **An integrated model for Technical Investment Decisions of Pharmacell Inc.**

***YHY***

***HD20233085***

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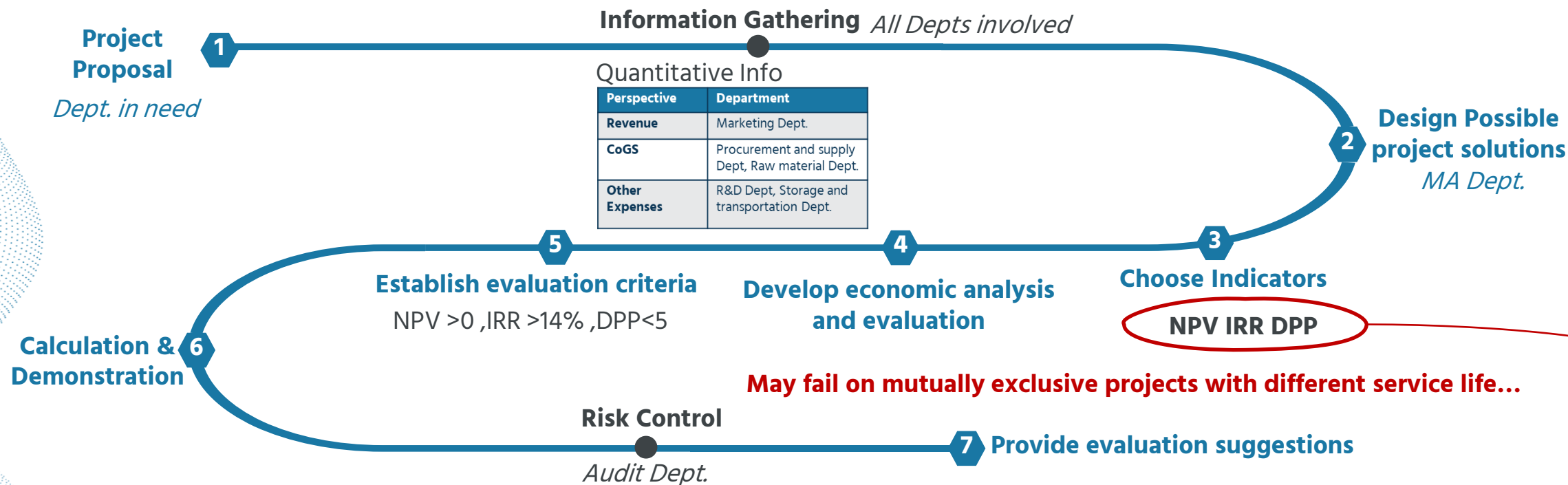
Model implementation on T1 product line intelligent renovation project

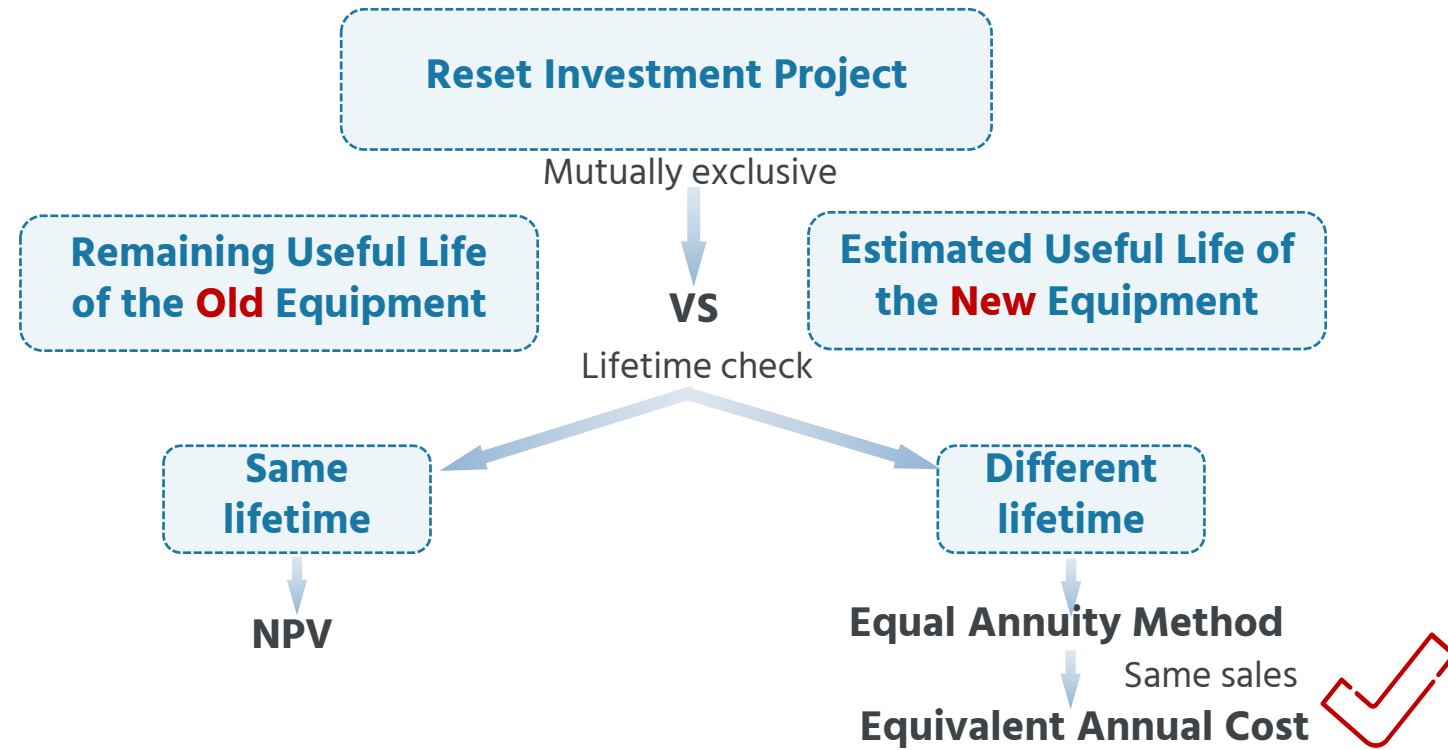


01.

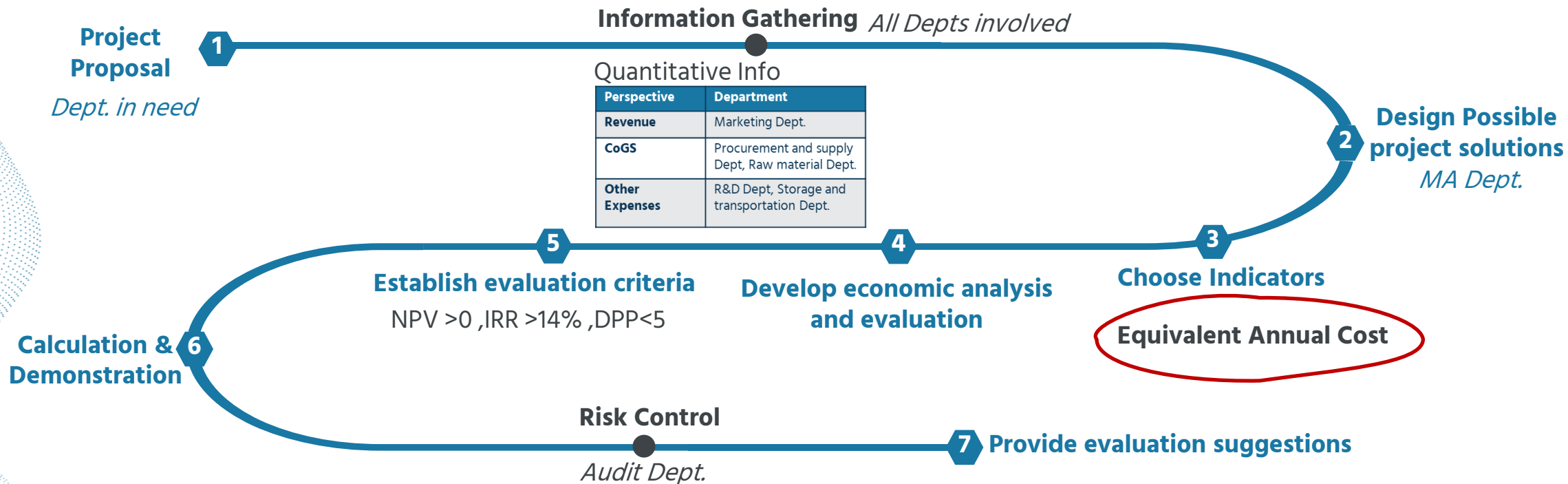
**Revised Financial evaluation model  
for reset investment projects with  
different service life**

## Current Evaluation Mechanism for Internal Technology Investment projects





## Revised Evaluation Mechanism for Internal Technology Investment projects



## Equivalent annual cost (EAC)

$$= \frac{PV \text{ of total cash outflow}}{(P/A, i, n)}$$

Net investment

$$= \frac{\text{Original value} - \text{residual value} \times (P/F, i, n) + \sum PV \text{ of Running costs}}{(P/A, i, n)}$$



Running costs = Cash Operating expense  $\times (1 - T)$  - Dep'n  $\times T$

Cash Operating expense = Total COGS + Maintenance costs

Direct material

Other material

Labor

Energy consumption



## Traditional production line

Updated useful life	Original value	Salvage value	Discount factor	PV of Salvage value	Operating cost	PV of Operating cost	PV of Operating cost when update	PV of total cash outflows	Annuity Present Value Factor	EAC
1	9,708,738	8,027,322	0.88	7,041,510	74,601,096	65,439,558	65,439,558	68,106,785	0.877	<b>77,658,820</b>
2	9,708,738	6,345,906	0.77	4,882,969	74,803,573	57,558,921	122,998,479	127,824,248	1.646	<b>77,657,502</b>
3	9,708,738	4,664,490	0.67	3,148,398	75,015,349	50,633,224	173,631,702	180,192,042	2.321	<b>77,635,520</b>
4	9,708,738	2,983,074	0.59	1,766,219	75,245,141	44,551,164	218,182,867	226,125,385	2.913	<b>77,626,291</b>
5	9,708,738	1,301,658	0.52	676,040	75,485,185	39,204,640	257,387,506	266,420,203	3.433	<b>77,605,652</b>
6	9,708,738	500,000	0.46	227,793	75,727,740	34,500,540	291,888,046	301,368,990	3.888	<b>77,512,600</b>

**The reset investment project does not have economic viability!**

Smaller than

## Intelligent production line

Updated useful life	Original value	Salvage value	Discount factor	PV of Salvage value	Operating cost	PV of Operating cost	PV of Operating cost when update	PV of total cash outflows	Annuity Present Value Factor	EAC
1	22,123,894	20,022,124	0.88	17,563,267	75,937,574	66,611,907	66,611,907	71,172,535	0.877	<b>81,154,543</b>
2	22,123,894	17,920,354	0.77	13,789,130	75,988,574	58,470,740	125,082,648	133,417,411	1.646	<b>81,055,535</b>
3	22,123,894	15,818,584	0.67	10,677,094	76,042,124	51,326,268	176,408,916	187,855,716	2.321	<b>80,937,405</b>
4	22,123,894	13,716,814	0.59	8,121,455	76,180,876	45,105,194	221,514,110	235,516,549	2.913	<b>80,850,171</b>
5	22,123,894	11,615,044	0.52	6,032,490	76,256,420	39,605,195	261,119,305	277,210,709	3.433	<b>80,748,823</b>
6	22,123,894	9,513,274	0.46	4,334,120	76,343,168	34,780,920	295,900,225	313,689,999	3.888	<b>80,681,584</b>
7	22,123,894	7,411,504	0.40	2,961,914	76,408,258	30,535,592	326,435,817	345,597,797	4.288	<b>80,596,501</b>
8	22,123,894	5,309,735	0.35	1,861,376	76,501,360	26,818,245	353,254,062	373,516,580	4.638	<b>80,533,976</b>
9	22,123,894	3,207,965	0.31	986,475	76,573,123	23,546,843	376,800,905	397,938,324	4.946	<b>80,456,596</b>
10	22,123,894	800,000	0.27	215,795	76,664,978	20,679,903	397,480,808	419,388,907	5.216	<b>80,404,315</b>

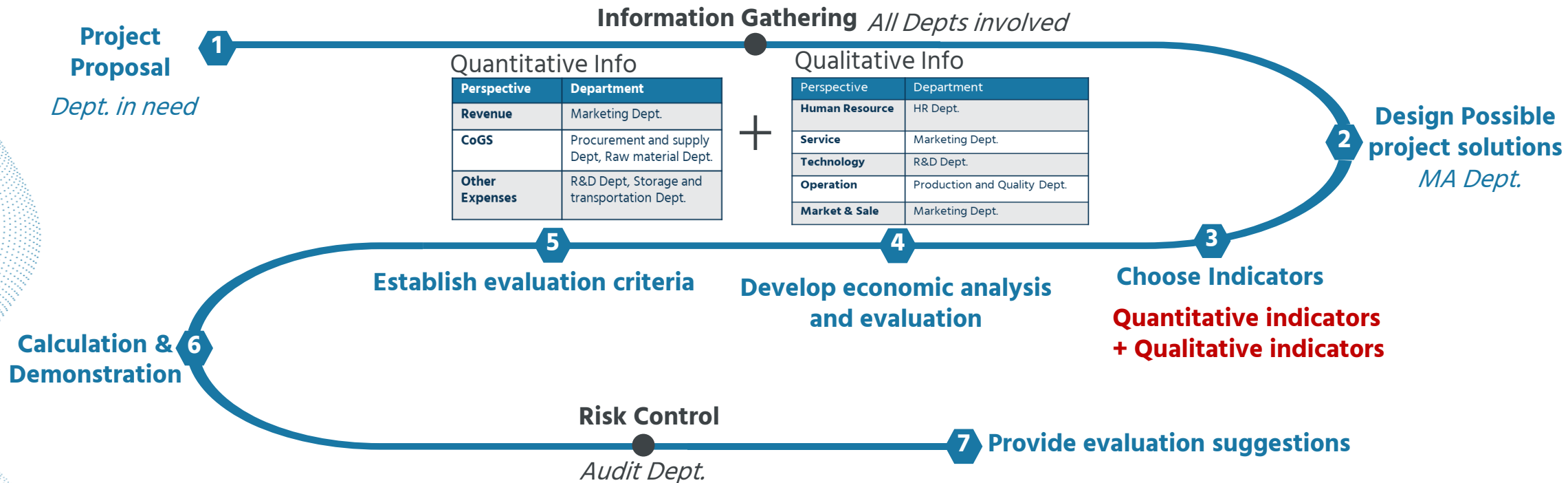




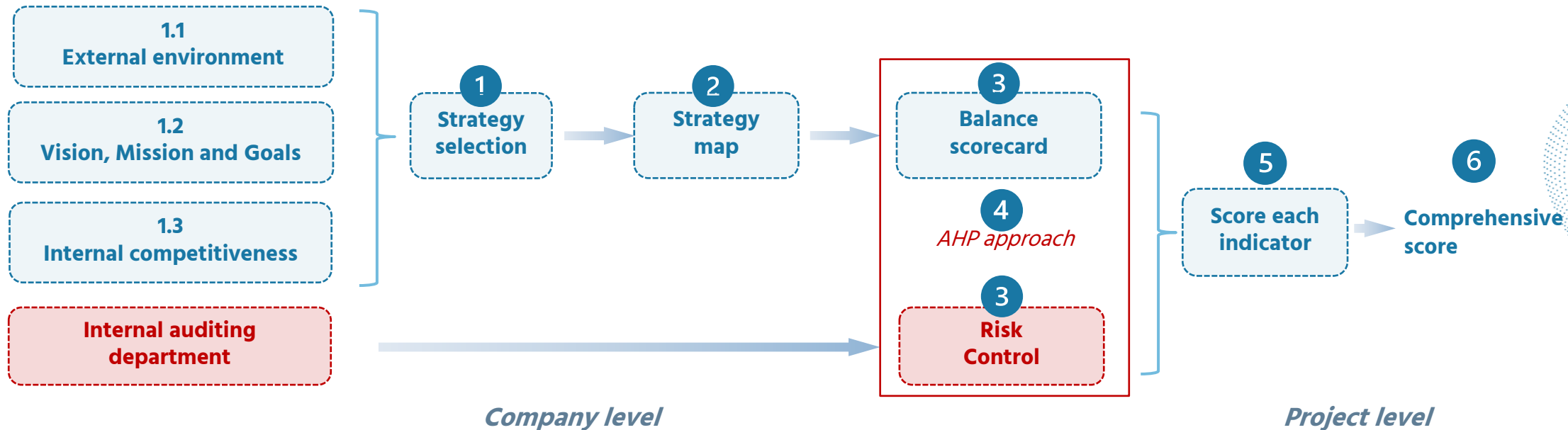
02.

## **An integrated model for Technical Investment Decisions**

## The choice of technology investment projects is not simple math!



## Modeling process: Comprehensive evaluation system



# Our new model for Internal Technology Investment projects

Information Gathering *All Depts involved*

**Project Proposal**  
*Dept. in need*

1

Quantitative Info

Perspective	Department
Revenue	Marketing Dept.
CoGS	Procurement and supply Dept, Raw material Dept.
Other Expenses	R&D Dept, Storage and transportation Dept.

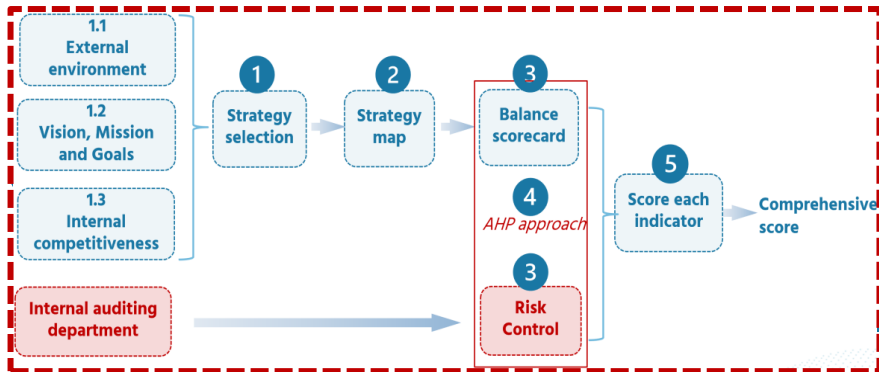
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Qualitative Info

Perspective	Department
Human Resource	HR Dept.
Service	Marketing Dept.
Technology	R&D Dept.
Operation	Production and Quality Dept.
Market & Sale	Marketing Dept.

2

**Design Possible project solutions**  
*MA Dept.*



7

**Provide evaluation suggestions**

## PEST analysis



High entry barrier



Low entry threat



Fiercer competition

"Specialized, sophisticated,  
distinctive, and innovative"

Gain competitive advantage

## STEP 1.1 External Environment Analysis

Policy	Year	Content
China's Action Plan for the Containment and Prevention of AIDS	2001	The State shall <b>not approve</b> the establishment of <b>new</b> blood products enterprises
Enterprise Income Tax Law of the People's Republic of China	2018	Reduced enterprise income tax rate of <b>15%</b> for high-tech enterprises
The "14th Five-Year Plan" for the Development of pharmaceutical Industry	2021	Promote <b>systematic upgrading</b> of medical manufacturing capabilities as a major task
Basic standard of plasma collection station	2022	Improve the quality standards and requirements of plasma stations <b>to ensure plasma quality and blood donor safety</b>
Interim Measures for the Management of Gradient Cultivation of High-quality SMEs	2022	TOI > 100 million yuan in the previous year, <b>R&amp;D expenses <math>\geq</math> 3% of TOI in past 2 years</b> Have Self-established research and development institutions
List of practical things to do for "specialized and special new" SMEs	2022	By the end of 2021, the central government will allocate over <b>3 billion RMB</b>
Ministry of Finance General Administration of Taxation Announcement No. 7 of 2023	2023	<b>R&amp;D expenses</b> deduction rate will increase to <b>100%</b>

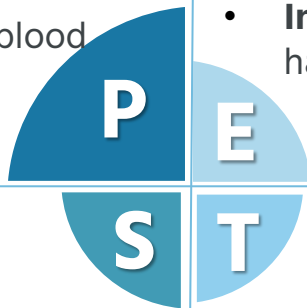


## Objective Recognition

Protection  
of donor's  
securityMeet Policy  
Requirement

## STEP 1.1 External Environment Analysis

- **Entry threat:** low
- **Selection of “Specialized, sophisticated, distinctive, and innovative” enterprises:** R&D costs requirement, tax and finance incentives
- **Systematic Upgrading:** a major task
- **Quality control:** to ensure plasma quality and blood donor safety



- **Population aging**
- **Public awareness:** Blood products play an important role in the treatment of COVID-19

- **Demand excess supply:** domestic demand for raw plasma: over 16,000 tons VS 10,181 tons plasma collected in 2022
- **Affordability:** Consumption of blood products under health insurance coverage is increasing
- **Industry concentration:** the speed of industry consolidation has accelerated significantly

**International:** A wave of automation and Intelligence. E.g. Competitor A&T company gain competitiveness through intelligent transformation.

- **Domestic:** in its starting stage

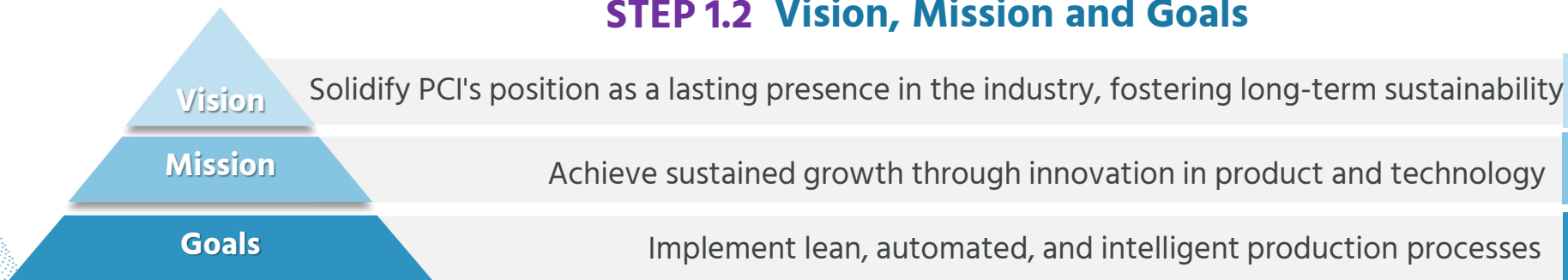


### Objective Recognition

Increase Productivity

Market Expansion

### STEP 1.2 Vision, Mission and Goals



Protect customer interests  
 Protect employee Interests  
 Protect of donor's security  
 ...

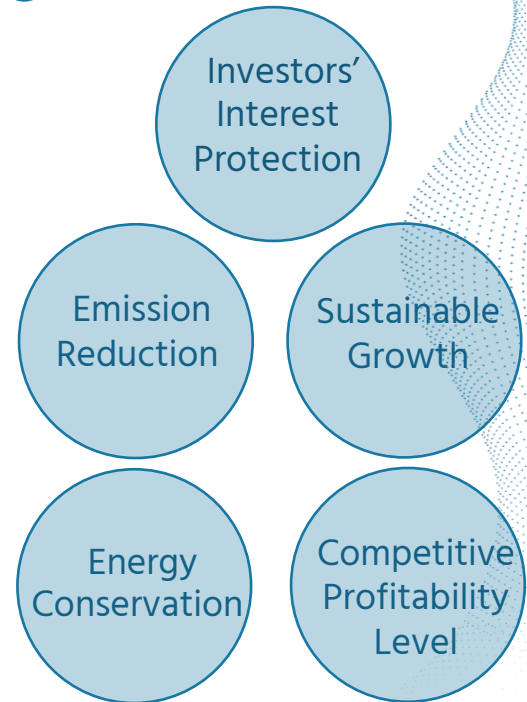


Protect investor's interests  
 Strengthening the foundations of governance  
 ...

Energy conservation  
 Emission reduction  
 ...

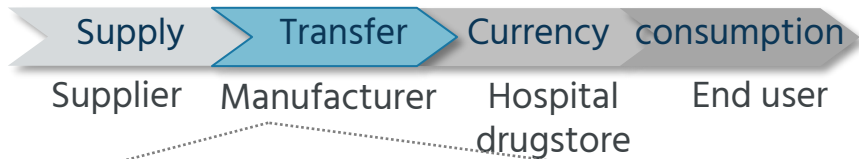


### Objective Recognition



### STEP 1.3 Internal competitiveness recognition

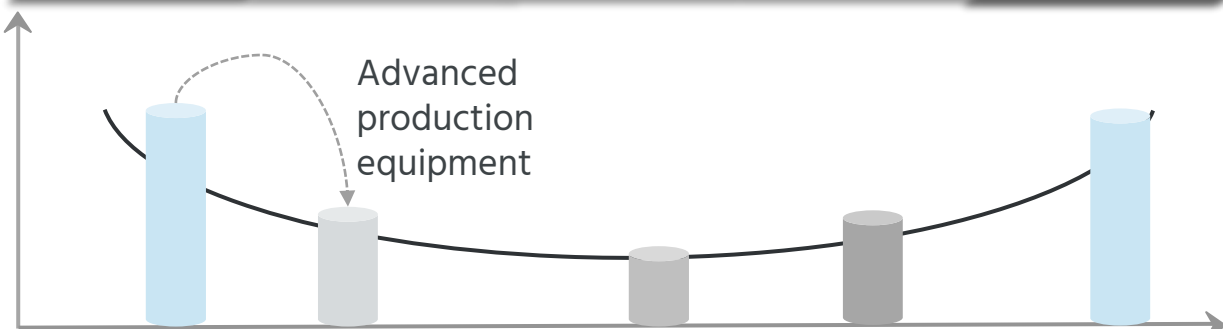
Industry level



Corporate level



Value added



Smile curve

Comparative advantage

Brand image

+

Intelligent manufacturing

increase productivity

stabilize product quality



Objective Recognition

Improve Brand Image

Increase Productivity

Stabilize Product Quality



## STEP 1 Strategy selection

### SWOT analysis

	Strength	Weakness
	<ol style="list-style-type: none"> <li>1. Among the <b>Top</b> in the industry</li> <li>2. Unique <b>technological</b> competitive advantage</li> <li>3. Technological Accumulation: <b>R&amp;D dep.</b></li> <li>4. <b>Policy</b> support</li> </ol>	<ol style="list-style-type: none"> <li>1. Relatively <b>low number of plasma station</b> compared with other firms</li> <li>2. Potential resource constraints: E.g. <b>talents</b></li> </ol>
Opportunity	S+O (Grab)	W+O (Improve)
<ol style="list-style-type: none"> <li>1. Domestic Market vacancy: <b>In its early stages</b></li> <li>2. the number of approved stations is expected to increase (14<sup>th</sup> five years)</li> <li>3. Blood production are in short supply</li> </ol>	<b>Differentiation Strategy:</b> <ul style="list-style-type: none"> <li>• Vigorously develop intelligent production</li> <li>• Increase the proportion of experts</li> <li>• Gain sustainable competitiveness by leading the domestic wave of intelligent transformation</li> </ul>	<ul style="list-style-type: none"> <li>• Expand the scale of plasma collection station</li> <li>• Conduct company training for existing employees or hire talent</li> </ul>
Threat	S+T (Monitor)	W+T (Avoid)
<ul style="list-style-type: none"> <li>• <b>Competitive pressure</b> from international competitors, E.g. A&amp;T</li> <li>• The rise of intelligence brings <b>layoffs</b></li> <li>• Possible economic inefficiency of deploying intelligent transformation</li> </ul>	<ul style="list-style-type: none"> <li>• Pay close attention to domestic and foreign competitors' movements</li> </ul>	<ul style="list-style-type: none"> <li>• Try best to avoid the side effects brought by intelligent transformation: E.g. Employee layoff</li> </ul>



### Objective Recognition

Improve Employee Satisfaction

Expertise Density

Improve Employee Expertise

Realize vision and mission

**Finance**

Drive financial results

**Customer/Stakeholders**

Unique benefits to customers/Stakeholders

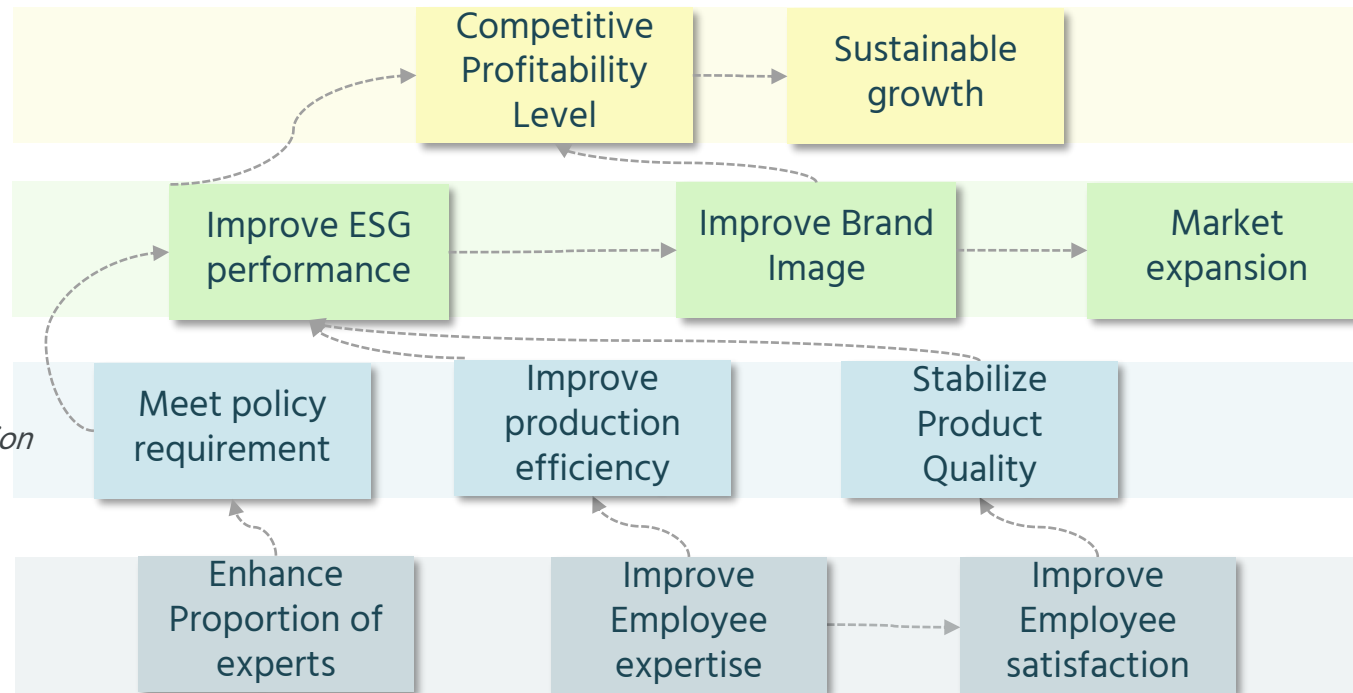
**Internal Process**

Build strategic capacity by intelligent transformation





**Learning & Growth**

Employees are well equipped and motivated

**STEP 2 Strategy Map**



## STEP 3.1 The Balanced Scorecard

Perspectives	Objectives	Indicators
<b>Financial</b> 	Sustainable Growth	Revenue growth rate
	Competitive Profitability Level	Operating margin
	<div style="border: 2px dashed red; padding: 5px; display: inline-block;">           Evaluation criteria for internal investment project (same lifetime)  <b>Selection function</b>            Evaluation criteria for internal investment project (Different lifetime)         </div>	NPV
		IRR
	DPP	
	Equivalent annual cost	
Assessment by profit center	Asset turnover rate	
<b>Customer/ Stakeholder</b> 	Improve Brand Image	Customer satisfaction index
	Market expansion	Market share growth rate
	Energy conservation	Energy consumption
	Emission reduction	Carbon emission
	Protection of donor's security	Safety and interests of blood donors
	Protection of investors' interest	Transparency of information disclosure
<b>Internal Process</b> 	Requirement for selection of "Specialized, sophisticated, distinctive, and innovative" enterprises	R&D spending percentage
	Improve production efficiency	Production capability
	Stabilize Product Quality	Product recall frequency
<b>Learning &amp; Growth</b> 	Improve Employee expertise	Number of training hours per employee
	Improve Employee satisfaction	Employee satisfaction index
		Employee layoff rate
Expertise density	Proportion of expert talent	

**In line with the concept of agile management!**

## STEP 3.2 How does BSC work together with risk management?



Perspectives	Objectives	Events	Indicators
<b>Financial</b> 	Sustainable Growth	Increasing competition	Increase in percentage of market saturation
	Competitive Profitability Level	Increasing operational costs	Rise in COGS
	Evaluation criteria for internal investment project	Unexpected market volatility	Variance between forecasted and actual figures
	Assessment by profit center	Technological obsolescence	Increase in maintenance costs
<b>Customer/ Stakeholder</b> 	Improve Brand Image	Negative publicity	Increase in customer complaints
	Market expansion	Regulatory barriers	Delay in obtaining regulatory approvals
	Energy conservation	Employee non-compliance to policies	Low participation rates in energy-saving program
	Emission reduction	Lack of proper monitoring	Variability in emission levels
	Protection of donor's security	The plasma collection station is not compliant	Frequency of being fined
	Protection of investors' interest	Lack of transparency in financial reporting or disclosures	Low quality of financial reporting
<b>Internal Process</b> 	Requirement for selection of "Specialized, sophisticated, distinctive, and innovative" enterprises	Rapid change in the requirement	Frequency of change in requirement
	Improve production efficiency	Low Input efficiency: production cost increase	Increase percentage of annual average cost
		Low Output efficiency: Unsteady plasma supply	Low rate of capacity utilization
	Stabilize Product Quality	Insufficient Production technology level	Increase in produce recalls
<b>Learning &amp; Growth</b> 	Improve Employee expertise	Ineffective training programs	Low completion rates for training programs
		Employees being not skilled in operation	Low training hours per employee
	Improve Employee satisfaction	Unsatisfactory employee welfare	Voluntary turnover of employee
	Expertise density	High Turnover of Expertise	Turnover of expertise

## STEP 4 Determining weights : AHP method

Pairwise comparison matrix—A scoring example

1<sup>st</sup> layer

Total	Financial	Customer	Internal Process	Learning & growth
Financial	1.00	0.77	1.29	4.58
Customer	1.29	1.00	3.00	6.48
Internal Process	0.77	0.77	1.00	3.46
Learning & growth	0.22	0.15	0.29	1.00

\*Geometrically average the scores of the three experts



Consistency check result

CR < **0.1**

**PASS!**

## STEP 4 Determining weights : AHP method

### 2<sup>nd</sup> layer of BSC indicators

Financial	Revenue growth rate	Operating margin	NPV	IRR	DPP	AAC	Asset turnover rate
Revenue growth rate	1	1.78	1.54	1.14	1.54	0.90	1.33
Operating margin	0.56	1	0.86	0.64	0.87	0.51	0.74
NPV	0.65	1.16	1	0.74	1.00	0.60	0.87
IRR	0.88	1.57	1.35	1	1.35	0.80	1.17
DPP	0.65	1.15	1.00	0.74	1	0.59	0.86
EAC	1.10	1.96	1.70	1.26	1.70	1	1.47
Asset turnover rate	0.75	1.34	1.15	0.86	1.16	0.68	1

Customer	CSI	MSGR	EC	CE	SEBD	TID
CSI	1	1.87	3.46	3.87	1.41	5.92
MSGR	0.53	1	0.89	1.00	0.58	1.41
EC	0.29	1.12	1	1.41	0.20	4.47
CE	0.26	1.00	0.71	1	0.18	3.16
SEBD	0.71	1.73	5.00	5.48	1	6.71
TID	0.17	0.71	0.22	0.32	0.15	1

Internal Process	RDSP	PC	PCF
RDSP	1	2.34	1.77
PC	0.42	1	0.76
PCF	0.56	1.32	1

Learning & Growth	NTHPE	ESI	PLR	PET
NTHPE	1	0.33	0.15	0.22
ESI	3.00	1	0.29	0.20
PLR	6.48	3.46	1	0.82
PET	4.58	5.00	1.22	1



Consistency check result

CR < 0.1

**PASS!**

## STEP 4 Determining weights : AHP method

### 2<sup>nd</sup> layer of risk indicators

Financial	IPMS	RIC	VBFA	IMC	IPAAC
IPMS	1	1.94	0.63	0.41	0.45
RIC	0.51	1	0.33	0.21	0.23
VBFA	1.59	3.07	1	0.65	0.72
IMC	2.45	4.75	1.54	1	1.11
IPAAC	2.2	4.28	1.4	0.9	1

Customer	ICC	DORA	LPRESP	VEL	FBF	LQFR
ICC	1	1.50	0.72	0.54	0.86	2.20
DORA	0.70	1	0.48	0.36	0.58	1.47
LPRESP	1.38	2.06	1	0.74	1.19	3.05
VEL	1.86	2.78	1.35	1		4.09
FBF	1.16	1.72	0.84	0.62	1	2.55
LQFR	0.45	0.68	0.33	0.24	0.39	1

Internal process	FCR	IPAAC	IPR
FCR	1	2.21	1.17
IPAAC	0.45	1	0.53
IPR	0.86	1.89	1

Learning & growth	LCRTP	LTHPE	VTE	TE
LCRTP	1	0.33	0.28	0.26
LTHPE	3.04	1	0.85	0.80
VTE	3.59	1.18	1	0.94
TEP	3.81	1.25	1.06	1



Consistency check result

CR < 0.1

**PASS!**

## STEP 4 The weights of BSC indicators

First Level Index	Weight	Second Level Index	Weight	Comprehensive Weight
Financial	30%	Revenue growth rate	18%	5.4%
		Operating margin	10%	3.0%
		NPV	12%	3.6%
		IRR	16%	4.8%
		DPP	12%	3.6%
		Equivalent annual cost	20%	6.0%
		Asset turnover rate	12%	3.6%
Customer/ Stakeholder	34%	Customer satisfaction index	32%	10.9%
		Market share growth rate	12%	4.1%
		Energy consumption	12%	4.1%
		Carbon emission	13%	4.4%
		Safety and security of blood donors	26%	8.8%
		Transparency of information disclosure	5%	1.7%
Internal Process	30%	R&D spending percentage	50%	15.0%
		Production capability	21%	6.3%
		Product recall frequency	29%	8.7%
Learning & Growth	6%	Number of training hours per employee	6%	0.4%
		Employee satisfaction index	12%	0.7%
		Employee layoff rate	38%	2.3%
		Proportion of expert talent	43%	2.6%



## STEP 4 The weights of risk indicators

First Level Index	Weight	Second Level index	Weight	Comprehensive Weight
Financial	30%	Increase in percentage of market saturation	13%	3.9%
		Rise in COGS	7%	2.0%
		Variance between forecasted and actual figures	20%	6.1%
		Increase in maintenance costs	32%	9.5%
		Increase percentage of equivalent annual cost	28%	8.4%
Customer/ Stakeholder	34%	Increase in customer complaints	15%	5.2%
		Delay in obtaining regulatory approvals	10%	3.5%
		Low participation rates in energy-saving program	22%	7.4%
		Variability in emission levels	29%	9.7%
		Frequency of being fined	18%	6.0%
		Lack of transparency in financial reporting or disclosures	6%	2.1%
Internal Process	30%	Frequency of change in requirement	43%	13.0%
		Low rate of capacity utilization	20%	5.9%
		Increase in produce recalls	37%	11.1%
Learning & Growth	6%	Low completion rates for training programs	33%	2.0%
		Low training hours per employee	13%	0.8%
		Voluntary turnover of employee	27%	1.6%
		Turnover of expertise	27%	1.6%



03.

**Model implementation on  
T1 product line intelligent  
renovation project**

## T1 product line intelligent renovation project

### Fundamental datasheet

		Traditional	Intelligent
<b>Sales</b>	Design capacity	350	350
	Capacity utilization rate	0.7	0.7
	Bottle capacity per ton of plasma	1200	1200
	Unit price per bottle	400	400
<b>Capital expenditure</b>	Initial Investment	20000000	25000000
	Estimated useful life	10	10
	Residual value rate	5%	5%
	Years of usage	4	10
	Current market value	10000000	25000000
<b>Direct Material costs</b>	Final disposal income of production line	500000	800000
	Annual cost per ton of plasma	500000	500000
	Allocated plasma cost	30%	30%
	Annual tonnage consumption of other consumables	150000	150000
<b>Direct labor costs</b>	Annual per capita cost	120000	120000
	Annual average wage growth rate	5%	5%
	Number of production operators	30	10
<b>Maintenance cost(¥ /year)</b>	Year1	0	0
	Year2	50000	0
	Year3	50000	0
	Year4	70000	100000
	Year5	80000	120000
	Year6	100000	150000
	Year7	120000	150000
	Year8	150000	180000
	Year9	180000	180000
	Year10	200000	200000
<b>Energy costs</b>	Annual energy consumption per ton	50000	70000
	Value-added tax	3%	
<b>Tax rate</b>	Urban construction and educational surcharges	12%	
	Income tax rate	15%	
	Required rate of return	14%	

### Difference in Quantitative info

Intelligent

VS

Traditional

Same production capability

Longer lifetime

Less labor

Higher maintenance costs

Higher energy costs



## Score for BSC indicators

Perspectives	Indicator	Medium Mark(PCI)	Traditional	Normalized Value	Intelligent	Normalized Value
Financial	Revenue growth rate	5	5	0.5	5	0.5
	Operating margin	5	20.8%	0.24	19.2%	0.19
	NPV	/	/	/	/	0
	IRR	/	/	/	/	0
	DPP	/	/	/	/	0
	Equivalent Annual Cost	5	6	0.6	5	0.5
	Asset turnover rate	5	/	/	/	0
Customer /Stakeholder	Customer satisfaction index	5	5	0.5	9	0.9
	Market share growth rate	5	5	0.5	5	0.8
	Energy consumption	5	5	0.5	5	0.8
	Carbon emission	5	5	0.4	5	0.8
	Safety and interests of blood donors	5	9	0.9	9	0.9
	Transparency of information disclosure	5	7	0.7	7	0.7
Internal Process	R&D spending percentage	5	3	0.3	8	0.8
	Production capability	5	8	0.8	8	0.8
	Product recall frequency	5	5	0.5	8	0.8
Learning & Growth	Number of training hours per employee per year	5	5	0.5	7	0.6
	Employee satisfaction index	5	6	0.6	6	0.7
	Employee layoff rate	5	8	0.8	4	0.4
	Proportion of expert talent	5	4	0.4	6	0.6

$$0.5 + \frac{\text{Operating margin} - 28\%}{28\%}$$

Marking rule:



For all the indicators scored by BOD, they are marked within the range between **1 and 10**.

The higher the given mark , the better the performance.

- Normalized value

$$= \frac{\text{Mark}}{10}$$

## Score for BSC indicators

Perspectives	Indicator	Medium Mark(PCI)	Traditional	Normalized Value	Intelligent	Normalized Value
Financial	Revenue growth rate	5	5	0.5	5	0.5
	Operating margin	5	20.8%	0.24	19.2%	0.19
	NPV	/	/	/	/	0
	IRR	/	/	/	/	0
	DPP	/	/	/	/	0
	Equivalent Annual Cost	5	6	0.6	5	0.5
	Asset turnover rate	5	/	/	/	0
Customer /Stakeholder	Customer satisfaction index	5	5	0.5	9	0.9
	Market share growth rate	5	5	0.5	5	0.8
	Energy consumption	5	5	0.5	5	0.8
	Carbon emission	5	5	0.4	5	0.8
	Safety and interests of blood donors	5	9	0.9	9	0.9
	Transparency of information disclosure	5	7	0.7	7	0.7
Internal Process	R&D spending percentage	5	3	0.3	8	0.8
	Production capability	5	8	0.8	8	0.8
	Product recall frequency	5	5	0.5	8	0.8
Learning & Growth	Number of training hours per employee per year	5	5	0.5	7	0.6
	Employee satisfaction index	5	6	0.6	6	0.7
	Employee layoff rate	5	8	0.8	4	0.4
	Proportion of expert talent	5	4	0.4	6	0.6

## Difference in Qualitative info

Lead the domestic wave of intelligent transformation, better brand image

R&D spending is expected to increase

The product quality is more stable

Higher requirements on staff expertise

Intelligent transformation may bring layoffs

Need more expert

## Score for risk indicators

First Level Index	Second Level index	Median Mark(PCI)	Traditional	Normalized Value	Intelligent	Normalized Value
Financial	Increase in percentage of market saturation	5	5	0.5	5	0.5
	Rise in COGS	5	5	0.5	5	0.5
	Variance between forecasted and actual figures	5	5	0.5	5	0.5
	Increase in maintenance costs	5	3	0.3	6	0.6
	Increase percentage of equivalent annual cost	5	5	0.5	5	0.6
Customer/ Stakeholder	Increase in customer complaints	5	6	0.6	4	0.4
	Delay in obtaining regulatory approvals	5	5	0.5	5	0.5
	Low participation rates in energy-saving program	5	5	0.5	5	0.5
	Variability in emission levels	5	4	0.4	6	0.6
	Frequency of being fined	5	5	0.5	5	0.5
	Lack of transparency in financial reporting or disclosures	5	5	0.5	5	0.5
Internal Process	Frequency of change in requirement	5	5	0.5	5	0.5
	Low rate of capacity utilization	5	5	0.5	5	0.5
	Increase in produce recalls	5	5	0.5	5	0.5
Learning & Growth	Low completion rates for training programs	5	5	0.5	5	0.5
	Low training hours per employee	5	5	0.5	5	0.5
	Voluntary turnover of employee	5	5	0.5	5	0.5
	Turnover of expertise	5	4	0.4	6	0.6

## Marking rule:



For all the indicators scored by BOD, they are marked within the range between **1 and 10**.

The higher the given mark, the higher the risk.

- Normalized value

$$= \frac{\text{Mark}}{10}$$

## Score for risk indicators

First Level Index	Second Level index	Median Mark(PCI)	Traditional	Normalized Value	Intelligent	Normalized Value
Financial	Increase in percentage of market saturation	5	5	0.5	5	0.5
	Rise in COGS	5	5	0.5	5	0.5
	Variance between forecasted and actual figures	5	5	0.5	5	0.5
	Increase in maintenance costs	5	3	0.3	6	0.6
	Increase percentage of equivalent annual cost	5	5	0.5	5	0.6
Customer/ Stakeholder	Increase in customer complaints	5	6	0.6	4	0.4
	Delay in obtaining regulatory approvals	5	5	0.5	5	0.5
	Low participation rates in energy-saving program	5	5	0.5	5	0.5
	Variability in emission levels	5	4	0.4	6	0.6
	Frequency of being fined	5	5	0.5	5	0.5
	Lack of transparency in financial reporting or disclosures	5	5	0.5	5	0.5
Internal Process	Frequency of change in requirement	5	5	0.5	5	0.5
	Low rate of capacity utilization	5	5	0.5	5	0.5
	Increase in produce recalls	5	5	0.5	5	0.5
Learning & Growth	Low completion rates for training programs	5	5	0.5	5	0.5
	Low training hours per employee	5	5	0.5	5	0.5
	Voluntary turnover of employee	5	5	0.5	5	0.5
	Turnover of expertise	5	4	0.4	6	0.6

High tech production line needs more frequent maintenance

High tech ensures products quality

Greater variation involved with more carbon emission

High-pressure environment of many tech jobs can lead to burnout



## Evaluation results

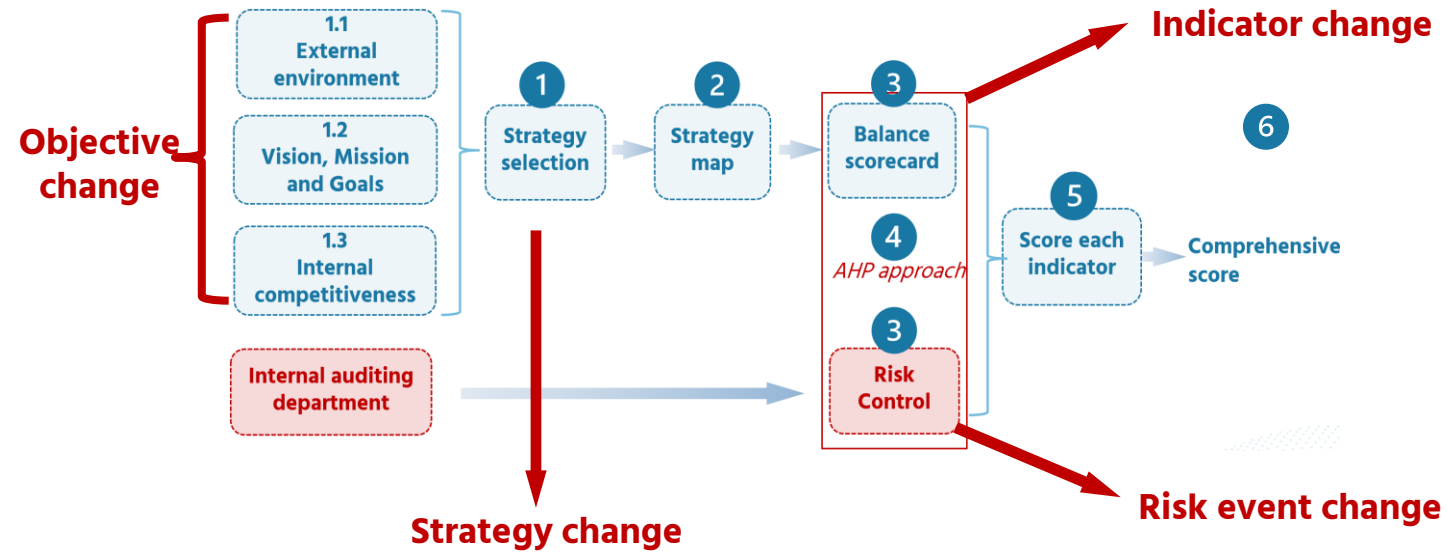
*Comprehensive score*

*= BSC Score – Risk Score*

*=  $W_{BSC} \times Normalized\ value_{BSC} - W_{Risk} \times Normalized\ value_{Risk}$*

	Traditional	VS	Intelligent
<b>BSC Score</b>	0.448		0.625
Minus			
<b>Risk Score</b>	0.473		0.523
Equal to			
<b>Comprehensive Score</b>	-0.026	<	0.102

### Extensibility of our model





*Thanks for your listening!*

*YHY  
HD20233085*