Team 41， Siyuan Deng and Yanze Long (pathways: business and coding)

We adapt AHP (analytic hierarchy process) as a way to rank the company in terms of sustainability. In future version of app (after front end has been completed), the score calculated using algorithm will be presented and the companys’ scores will be presented.

Once the apprentices set a criterion, if the company is below certain score, then they will be filtered out. The factors we consider for sustainability are listed below along with their weights (we get this information from  [http://www.doc88.com/p-84087077841776.html](%20http://www.doc88.com/p-84087077841776.html) ).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Goal | Criterions | Sub criterions (score: between 0 and 100) | Maximum score | weight |
| Sustainability | Development status of a company | Return on equity (ROE) | 100 | 0.05 |
| Operating growth rate | 59 | 0.05 |
| Satisfaction of staff and surrounding residents | 82.2 | 0.04 |
| The level of green supply chain management | 75 | 0.03 |
| The level of water pollutant discharged | 100 | 0.04 |
| The level of solid emission | 97 | 0.04 |
| Amount of CO2 produced for every $10,000 revenue | 100 | 0.05 |
| Development potential of a company | Profit growth rate | 100 | 0.05 |
| Total assets growth rate | 100 | 0.05 |
| Public impression | 75 | 0.04 |
| The level of contributing to social welfare | 100 | 0.04 |
| Environmental protection investment for every $10,000 revenue | 100 | 0.03 |
| The reduction on ‘THREE WASTES’ | 75 | 0.02 |
| CO2 emission growth rate | 99 | 0.03 |
| Energy growth rate | 93.9 | 0.02 |
| The growth rate of number of specialists | 100 | 0.02 |
| The growth rate of R&D funds | 100 | 0.02 |
| Ratio of cost on training staff to revenue | 93.6 | 0.02 |
| Green competitiveness | 75 | 0.01 |
| Development coordination of a company (how well a company doing in welfare of staffs, health care and so on) | Investment elastic coefficient of annual output value | 83.3 | 0.03 |
| Ratio of number of managers to number of staff | 100 | 0.04 |
| Regional contribution | 75 | 0.04 |
| The percentage of staff having medical insurance | 98 | 0.04 |
| The ability to control the level of ‘THREE WASTES’ | 75 | 0.04 |
| The ability to reduce CO2 emission | 100 | 0.04 |
| Strategy to be environmentally friendly | 75 | 0.03 |
| The completeness of management strategies | 100 | 0.03 |
| Creativity | 100 | 0.03 |
| The ability to react to emergency | 75 | 0.03 |

By considering these criterions, we can construct the mathematical model. We are transforming the score and weight we get from each company into a judgmental matrix. We firstly breakdown the goal of sustainability into three criterions (table above). Here we are taking one of them, development status of a company, to illustrate how the whole thing works.

Text, whiteboard

Description automatically generated

Judgmental matrix for one criterion (call it A)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Goal | C1 | C2 | C3 | C4 | C5 | C6 | C7 |
| C1 | W1/W1 | W1/W2 | W1/W3 | W1/W4 | W1/W5 | W1/W6 | W1/W7 |
| C2 | W2/W1 | W2/W2 | W2/W3 | W2/W4 | W2/W5 | W2/W6 | W2/W7 |
| C3 | W3/W1 | W3/W2 | W3/W3 | W3/W4 | W3/W5 | W3/W6 | W3/W7 |
| C4 | W4/W1 | W4/W2 | W4/W3 | W4/W4 | W4/W5 | W4/W6 | W4/W7 |
| C5 | W5/W1 | W5/W2 | W5/W3 | W5/W4 | W5/W5 | W5/W6 | W5/W7 |
| C6 | W6/W1 | W6/W2 | W6/W3 | W6/W4 | W6/W5 | W6/W6 | W6/W7 |
| C7 | W7/W1 | W7/W2 | W7/W3 | W7/W4 | W7/W5 | W7/W6 | W7/W7 |

For every criterion, if we are going to compare multiple company then we are generating a matrix representing the ratio of the score for one criterion again. Taking criterion one as an example here. (Call it B1 and similiarly Bn for criteria n)

|  |  |  |
| --- | --- | --- |
| Criterion 1 | Company 1 | Company 2 |
| Company 1 | Score1/Score 1 | Score1/Score 2 |
| Company 2 | Score2/Score 1 | Score2/Score 2 |

A 🡪(Normalizing the column vector of the matrix) A’🡪sum all elements in a row to become a nx1 matrix 🡪 normalizing the matrix again to get W0 (nx1 matrix)

For the matrix (B1-Bn), we can undergo the same process again

B1 🡪(Normalizing the column vector of the matrix) B1’🡪sum all elements in a row to become a nx1 matrix 🡪 normalizing the matrix again to get W1 (nx1 matrix)

For the other matrices we can get W1-Wn and we put them into a ‘box’(larger matrix)

W = {W1 W2 W3… Wn}

W (nxn matrix) W0(nx1 matrix) = D (nx1 matrix)

Each component in D represent one company, the higher the value is, the higher the score/rank the company will get. This is just for one criterion, we have three of them.

For the whole sustainability goal, we undergo the same process as above