Configuring the Relationships of Organizational Goals Based on Ontology Framework

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Abstract—Organizational data is essential to assist domain experts and entrepreneurs for decision making process in relation to the organizational goals. However, the trustworthiness of organizational data in relation to achieving the organizational goals is often questioned because of the vast amount of organizational data available. This paper proposes a framework based ontology to evaluate organizational data that relates to the organizational goals. Ontology is applied to develop the relationship between organizational goals and organizational data. This refers to the importance of assisting the organization in decision making towards the organizational goals by utilizing the relevance of organizational data from the vast amount of available data. A case study is presented based on Australia Industry and Small Business Policy Division of the Department of Innovation, Industry, Science and Research. The results show the interaction value of analyzed data depicting its contribution to the Australian economy and the viability of our proposed framework.

Keywords—organizational data; organizational goals ontology; metrics; dependency relationship

I. INTRODUCTION

Organization relies on the resources to assist the process of business plan, strategy and decision making in relation to the organizational goals. The trustworthiness of organizational data in relation to meeting the organization goals is questioned and it poses an issue on how to optimally select data that may be used for better decision making and in fully achieving the organizational goals.

However, there is a shortcoming when it comes to evaluating the organizational data in relation to the organizational goals. Modelling the organization goals are limited to the business process and the organizational process [4-7]. The aim of this paper is to present a set of methodology employing ontology to measure organizational data that relates to the organizational goals as an effort to assist domain experts and entrepreneurs for decision making process in achieving the organizational goals.

The remainder of this paper is organized as follows. Section II described the research methodology. Case study is discussed in Section III, and Section IV provide our concluding remarks.

II. RESEARCH METHODOLOGY

There are three tasks during the development of the proposed methodology. Firstly, to identify dependency relationship of the organizational goals based on ontology [2, 3]. An ontology is important to represent the organizational goals which provide the means in understanding the relationship between the organizational goal elements and organizational processes. Secondly, to identify dependency relationship of organizational data that relates to the organizational goals. This relationship is important to identify the dependency of data and attributes that relates to the organizational goals. Finally, metrics definition as a measurement approach to evaluate the value of organizational data in relation to the organizational goals.
A. Dependency relationship of organizational goal elements based on an ontology

We propose an ontology as an approach to identify the dependency relationships of the organizational goals element which includes sub-goal and organizational data [2, 3]. We considered ontology as an important instrument to improve the understanding of the relationships between organizational goals elements. Despite the vast amount of research on ontology, there remains relatively little research that applies ontology for the organizational goals. In this paper, we unified the previous models that cater to the structure of the organizational goals [5, 7, 8]. Fox et al. [8] addressed an organization to be a set of constraints on the activities performed by the organizations. This study has been extended in Sharma & Osei-Bryson [5], who discussed the relationships such as the business process with a various types of the resources. Sharma & Osei-Bryson [5], and Rao et al. [7] included the entire organization resources in their ontology.

In contrast to the previous studies, we evaluate the organizational resource which is the organizational data. Most previous studies focused on the organizational structure and performance that include the entire business processes and organizational processes [5, 7, 8]. We adapted these studies in the organizational goals ontology as shown in Fig. 1.

The development of the ontology for the organizational goals model is comprised of the following stages: i) determining the scope, ii) conceptualization and iii) application of the ontology. The ontology is planned to be built to address the following dependency relationship: to address the relationship of the organizational goals elements and to address the relationship of organizational data that relate to the organizational goals. The implementation of ontology on the organizational goals constrained the interpretation of the dependency relationship of organizational data that relate to the organizational goals. Despite the huge volume of created organizational data, to the best of our knowledge, it is difficult to identify the relevance of organizational data that relate to the organizational goals. Therefore, the implementation of ontology will reduce irrelevant organizational data because an ontology represents the dependency relationship of organizational data that only relate to the organizational goals.

![Dependency relationship of organizational goals ontology](image)

An ontology shows the dependency relationship of the organizational goals, dependency relationship of organizational data that relate to the organizational goals and then evaluate the weight of this dependency between organizational data and organizational goals. The evaluation aims to test the flexibility of this ontology to develop these dependencies and how ontology is applied to define the organizational goals.

Fig. 1 is the extended version of organizational goals ontology in [2,3]. Fig. 1 shows the relationships of the organizational goal elements. It is suggested that it is important to evaluate organizational resource which is the organizational data in relation to the organizational goals [2, 3] so this organizational data can be considered relevant. This will provide domain experts and entrepreneurs with knowledge to identify the most relevant organizational data in relation to the organizational goals. One approach to evaluate this data is by using metrics as a measurement approach to evaluate the weight of organizational data that relates to the organizational goals.

B. Metrics definition to the organizational goals

In this section, we attempt to measure organizational data that relates to the organizational goals. At this stage we identify metrics approach to measure analysed data as an effort for domain experts to come out with decision making process in relation to the organizational goals. Fig. 1 shows the dependency relationship of organizational data and organizational goal. It is important to identify the value for each data and attributes that relates to the organizational goals so this organizational data can be considered as relevance of organizational data in relation to the organizational goals. Therefore, it is important to define the metrics assuming the factor of;

- weight of the relationship
- number of attributes
- frequency of attributes
- percentage value of attributes

III. CASE STUDY

The aim of the experiments conducted in our case study was to evaluate the proposed modelling concept within a common business situation. The presented data in this paper were prepared by the Australia Industry Policy and Economic Analysis Branch in the Industry and Small Business Policy Division of the Department of Innovation, Industry, Science and Research. It is available through the small business key facts and statistics link on the department's website at [www.innovation.gov.au](http://www.innovation.gov.au). Furthermore, the aim of this experiment is to provide a comprehensive overview of Australia’s businesses for small, medium and large business size, with emphasis on business counts, characteristics and performance. In order to achieve this aim, the experiment provides information about employment and industry value added by looking at the contribution of business size to Australian economy. Business size is a vital part of the
Australian economy, providing almost half of total industry employment and around a third of industry value added in 2009-2010.

A. Evaluation of the case study

The aim of the case study is to identify the contribution of industry sector to Australian economy by looking at the interaction of number of employee and number of value added in relation to Australian economy. It is important to identify the performance of Australian economy based on the industry sector by observing which sub-goals contribute more to Australian economy. To achieve this aim, the contribution of industry sector for each sub-goal is evaluated in relation to Australian economy. Therefore, the evaluation weight is defined as a metric to identify the percentage contribution of sub-goal 1 and sub-goal 2 to Australian economy.

B. Evaluation metrics

The weight of business size to sub-goals is evaluated based on; 1) higher percentage number of employee, 2) higher number of value added based on the percentage number of employee, 3) business size contribute to sub-goals in relation to Australian economy. It is important to evaluate these categories in order to identify the higher weight percentage of sub-goals that contributes to the Australian economy. In the end, it is important to identify which sub-goals have been achieved and contribute more to Australian economy.

C. Percentage metrics

To evaluate the percentage value for both sub-goals that contribute the higher number to Australian economy, we examined the weight of business size to sub-goal 1 and sub-goal 2. To evaluate this weight, business size was evaluated based on industry sector. The interaction of value and graph will change based on the requirement of domain experts and entrepreneurs to assist their decision making process in relation to the goal. The value field is shown as the percentage of column for business size to identify the weight of sub-goal 1 and sub-goal 2. We evaluate the weight for this dependency relationship of business size to identify the value requirement of sub-goals to be considered achievable to Australian economy.

We categorize the weight definition based on;

- Goal: Higher contribution to Australian economy.
- Sub-goal 1: Employee contribution to Australian economy.
- Sub-goal 2: Value added contribution to Australian economy.
- Dependency: Business size
- Business size: Small, medium and large.

The evaluation of percentage weight to Australian economy is shown in Fig. 2 in order to identify which sub-goals contribute more to Australian economy. In this evaluation, weight is also measured based on industry sector for business size that match to Australian economy.

D. Data test

The results in Table 1 show the interaction of weight for business size to sub-goal 1 and sub-goal 2. Table 1 shows a comparison of weight for the overall value for business size that contribute to sub-goals as an effort to assist decision making in relation to Australian economy. In the next stage, the experiment shows the weight for each business size based on industry sector as shown in Tables 2, 3 and 4, in order to support the results in Table 1. The presented weight compares which industry sector for business size contributes more to Australian economy.

The contribution of business size to Australian economy is somewhat showing a different weight of percentage based on industry sector. Nevertheless, the proposed model identified the value for business size that match to sub-goal 1 and sub-goal 2, therefore the results conclude which sub-goals is more achievable to Australian economy.

<table>
<thead>
<tr>
<th>Business size</th>
<th>Contribute to Australian economy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employee contribution (Sub-goal 1)</td>
</tr>
<tr>
<td>Large business</td>
<td>33.40%</td>
</tr>
<tr>
<td>Medium business</td>
<td>23.46%</td>
</tr>
<tr>
<td>Small business</td>
<td>43.15%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

The results in Table 1 show that large business and small business contribute more to Australian economy compared to medium business with large business doing very well for sub-goal 2 and small business doing very well for sub-goal 1. Table 1 conclude that medium business in Australia not doing very well as result show that medium business has the lowest percentage for both sub-goal 1 and sub-goal 2. Tables 2, Table
3 and Table 4 shows an interesting knowledge to support the value for each business size in Table 1. Industry sector in these tables match to sub-goal 1 and sub-goal 2 as an effort to support the weight of business size to Australian economy.

Table 2
Comparison of sub-goals (contribute to Australian economy) based on large business.

<table>
<thead>
<tr>
<th>Business size</th>
<th>Industry sector</th>
<th>Employee contribution (Sub-goal1)</th>
<th>Value added contribution (Sub-goal 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large business</td>
<td>Agriculture, forestry and fishing</td>
<td>0.84%</td>
<td>0.25%</td>
</tr>
<tr>
<td></td>
<td>Education and training</td>
<td>6.53%</td>
<td>2.88%</td>
</tr>
<tr>
<td></td>
<td>Information media and telecommunication</td>
<td>7.44%</td>
<td>14.00%</td>
</tr>
<tr>
<td></td>
<td>Manufacturing</td>
<td>25.54%</td>
<td>24.33%</td>
</tr>
<tr>
<td></td>
<td>Mining</td>
<td>6.95%</td>
<td>31.36%</td>
</tr>
<tr>
<td></td>
<td>Rental, hiring and real estate services</td>
<td>2.11%</td>
<td>3.59%</td>
</tr>
<tr>
<td></td>
<td>Retail trade</td>
<td>39.23%</td>
<td>13.49%</td>
</tr>
<tr>
<td></td>
<td>Wholesale trade</td>
<td>11.37%</td>
<td>10.10%</td>
</tr>
<tr>
<td>Large business Total</td>
<td></td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

The results in Table 2 show that large businesses are doing well in retail trade that contribute the highest percentage to Australian economy with 39.23% followed by manufacturing with 25.54% for sub-goal 1. However, large businesses are not doing well in agriculture, forestry and fishing with only 0.84% contributes to Australian economy. Meanwhile, for sub-goal 2, large business doing well in mining that contribute the highest percentage with 31.36%, follow by manufacturing with 24.33%.

In Table 3, the results show that medium businesses are doing well in manufacturing that contribute the highest percentage to sub-goal 1 with 30.17% followed by retail trade with 23.38%. Medium businesses are also doing well in manufacturing to sub-goal 2 with 30.45% follow by wholesale trade with 18.87%. However, it is not doing very well in mining for sub-goal 1 and agriculture, forestry and fishing for sub-goal 2. Meanwhile Table 4 shows that small business doing well in retail trade that contributes 27% to the sub-goal 1 follow by agriculture, forestry and fishing with 21.73%. For sub-goal 2, small business doing well in rental, hiring and real estate services and retail trade contribute the highest percentage with 28.98% and 18.69%. However, small businesses are not doing well in mining for sub-goal 1 with only 1.09% and education and training for sub-goal 2 with only 2.29%.

![Australian economy](image1)

**Fig. 3.** Comparison of sub-goals (contribute to Australian economy) based on business size.

![Australian economy](image2)

**Fig. 4.** Comparison of sub-goals (contribute to Australian economy) based on large business.
Fig. 5. Comparison of sub-goals (contribute to Australian economy) based on medium business.

The experiment creates knowledge to assist decision making in relation to Australian economy. Tables 2, Table 3 and Table 4 assists the value in Table 1 with various values of industry sector for each business size that contributes to sub-goal 1 and sub-goal 2.

Table 4
Comparison of sub-goals (contribute to Australian economy) based on small business.

<table>
<thead>
<tr>
<th>Business size</th>
<th>Industry sector</th>
<th>Employee contribution (Sub-goal1)</th>
<th>Value added contribution (Sub-goal2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small business</td>
<td>Agriculture, forestry and fishing</td>
<td>21.73%</td>
<td>13.37%</td>
</tr>
<tr>
<td></td>
<td>Education and training</td>
<td>5.05%</td>
<td>2.29%</td>
</tr>
<tr>
<td></td>
<td>Information media and telecommunication</td>
<td>2.12%</td>
<td>2.37%</td>
</tr>
<tr>
<td></td>
<td>Manufacturing</td>
<td>15.64%</td>
<td>14.61%</td>
</tr>
<tr>
<td></td>
<td>Mining</td>
<td>1.09%</td>
<td>6.30%</td>
</tr>
<tr>
<td></td>
<td>Rental, hiring and real estate services</td>
<td>15.54%</td>
<td>28.98%</td>
</tr>
<tr>
<td></td>
<td>Retail trade</td>
<td>27.00%</td>
<td>18.69%</td>
</tr>
<tr>
<td></td>
<td>Wholesale trade</td>
<td>11.84%</td>
<td>13.39%</td>
</tr>
<tr>
<td></td>
<td>Small business Total</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Fig. 6. Comparison of sub-goals (contribute to Australian economy) based on small business.

The experiment in this section is presented to evaluate the analysed data that relates to sub-goal 1 and sub-goal 2 in relation to the Australian economy. The evaluation weight of percentage for business size show the comparison between sub-goal 1 and sub-goal 2 and which sub-goals contributes more to Australian economy. The interaction value of sub-goal 1 and sub-goal 2 assist the process of decision making which the contribution of industry sector support the total value for business size in relation to Australian economy.

Fig. 7. Summary of sub-goal 1 that contribute to Australian economy.
Fig. 7 and Fig. 8 summarized the experimental results based on business size that evaluate the weight for industry sector in relation to the Australian economy. The experiment show the interaction value based on the weight of percentage of employee and value added that contribute to Australian economy.

In the case study, evaluation value of analysed data for sub-goal 1 and sub-goal 2 show the interaction value of industry sector in relation to Australian economy. Experiment in the case study is applied and we identified the relationship of goals as shown in Fig. 4 and we identified the linkage between data and goals. This relationship assists the evaluation measurement of analysed data that relates to Australian economy. Based on the experiment result, the result concluded the value of industry sector to sub-goal 1 and sub-goal 2 that contribute to Australian economy. The experiment in this section is applied as a first step to implement the proposed methodology to be applied in any case with different datasets and different set of the organizational goals.

IV. CONCLUSION

We have presented the design, implementation and evaluation of the proposed methodology for the achievement of the organizational goals. The purpose of the proposed methodology is to evaluate organizational data that relates to the organizational goals as this organizational data is considered relevant in relation to the organizational goals. In the first half of this paper, we discussed the concept of proposed methodology with three main approaches. The approaches included identifying the organizational goal elements, identifying the relationship of organizational data that relates to the organizational goals and defining the metrics measurement as an effort to evaluate the relevance of organizational data in relation to the organizational goals. In the second half of this paper, we implemented the methodology to a case study. We applied data from Australia Industry Policy and Economic Analysis Branch in the Industry and Small Business Policy Division of the Department of Innovation, Industry, Science and Research. The data showed the contribution of employees and value added based on Australian industry sector for business size to the Australian economy. The results show the interaction value of industry sector that match to sub-goal 1 and sub-goal 2 in relation to Australian economy, thereby validating the viability of our proposed framework.

REFERENCES