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Article

Modeling concept and analytical dependency between data and goal: A case of Australian Airlines

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Modeling concept and analytical dependency between data and goal: A case of Australian Airlines

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ABSTRACT

This paper proposes an approach to utilise information from operational data to support the organization goal. The challenge in this issue is how to convert this vast of data into useful information. This is critical for all enterprises to remain competitive. In this paper, we emphasizes the dependency relationship involve between the elements such as organization goal, sub-goal, action and data. This relationship is important to assist the development of data measurement, data analysis and data modeling.

Keywords: Action, Data, Goals, Organization, Task

1. Introduction

Data are important in every organization as a backbone for organization process and performance. Therefore, the success of an organization depends on the effective usage and management of internal and external data. The behavior of organization is relies on the activities and strategies of the organization goals.

In order to ensure the transformation of data, entire process of the organization needs to be understood. Organization has to make sure that every data created is aligning with their organization goal. So organization needs to ensure the quality transformation in order to achieve the goal. Organization must have the ability to identify, create, store and measure the data. This data is stored in a data storage such database. However, this data is very large and not all data is valuable even the development of technology is improved. This issue becomes recent research focus among business, management or information system researcher. Many studies and approaches has been done toward the management of data within business areas (for example refer (Aalst et al., 2005; Dijkman et al., 2011; Kock et al., 2009; Liu & Lai, 2011; Rozinat et al., 2009; Song & Aalst, 2008; Turetken & Schuff, 2007).

As an attempt to utilize the quality of data in vast amount of data, this paper attempt to extend the relationship between organization goal, sub-goal, action and data. The remaining paper is organized as following ways. In Section 2 is the background. Section 3 discusses on modl development. In Section 4 discusses the model relationship. Section 5 is model definition and Section 6 is process implementation. Section 7 is a conclusion.

2. Background

Goal is the higher achievement target in one organization. It is an outcome that needs to be achieved based on the organization environment. However, several sub-goals are created in order to achieve the main goal and these sub-goals rely on action. The idea behind this concept is to look at usage of data toward organization goal. The degree of data process is the entrepreneur valuable information. Interpretation of this data is a new knowledge. Figure 1 below shows the entire process.

In this paper, the discussion focuses on the goal within the organization. In one organization, organization has a top goal or main goal. As discussed above, this main goal has a sub-goal in order to achieve the main goal. Thus, to achieve the sub-goal, sub-goal requires an action. Action is defines as a task or activity to support the action. However, action relies on the data so organization needs to understand what types of data exist within their organization. In order to perform the action, task need to be identified. Task is important to perform action toward the goal.

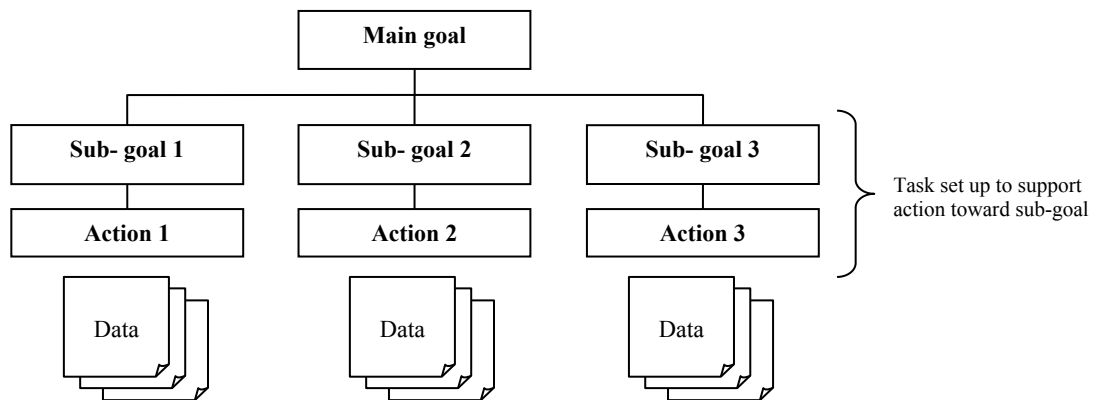


Fig. 1. Goals relationship

Fig. 1 shows simple relationship between goal, sub-goal, action and data. In order to achieve the main goal, several sub-goals are create to assist the process of achieving the goal. Some organization may have many sub-goals and it depends on their organization environment. These sub-goals support by action. However, these action rely on the data and it is important to understand and identify the type of data exist within their organization. Let take one example within university library, if the main objective or goal is to *Transform Student Lives Through Learning* then the possible sub-goal is to *Create Pathways for Underrepresented Students*. Here the possible action to achieve this goal is to *work with relevant university staff to develop programs to support under-prepared students and review and further develop the Library website in order to create more effective gateways for diverse client groups*.

Based on this example, action consist a task to perform. Organization task or task is a task that organization perform within the context of organization environment in order to achieve the organization goal. In this context, task is an activity that depends on the data to perform. During the entire explanation, we identified several elements in order to support our future model. The elements are goal, sub-goal, action, task and data. The development process of model in this paper is based on these five elements.

2.1 Organization elements

In this section, we introduce the basic relationship of organization goal based on organization ontology. The relationships involve the elements between organization goal, sub-goal, action, task and data. In particular, very organization has a goal that specifies the target that the members of organization try to achieve. This organization goal can be modelled as consist a sub-goal or several numbers of sub-goals to achieve. However, action is required to achieve the sub-goal. This action consist task. Task is assumes as a number of activity that involve toward action. This activity relies on data. Fig. 2 shows the basic elements of our organization ontology. In the rest of this paper, we denote organization goal as Org_{goal} , sub-goal as Sub_{goal} , action as A_{action} , task as T_{task} and data as D .

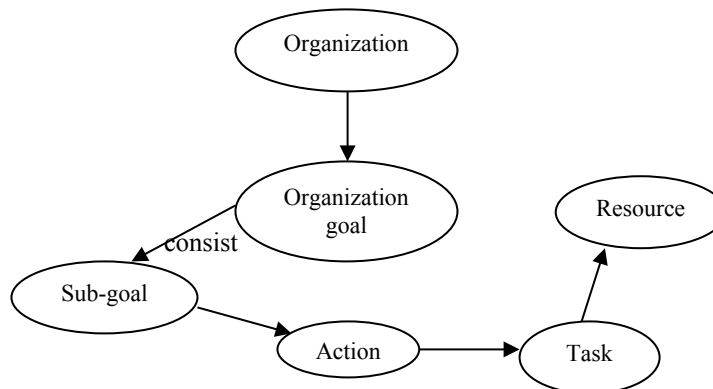


Fig. 2. Elements of organization ontology

2.1.1 Role

Role defines as a function in an organization. Each role can define as

- *Has*: Organization *has* organization goal that the role is intended to achieve.
- *Consist*: Organization goal *consist* sub-goal to support the organization goal.
- *Requires*: Sub-goal *requires* action that the number of activity that have been defined to achieve the goal.
- *Consist*: Action is the number of activity that *consist* several tasks to achieve.
- *Rely*: Task *rely* on resource as data to perform the activity.

2.1.1 Assumptions

Several assumptions are defines in order to priorities our model development.

1. Always prefer data that satisfy the environment toward task and action.
2. If all the data are equally important toward the task and action then data with high priority is use.
3. If the data collected is low then the data is not important but if the higher data do not satisfy the environment than the lower data is important.

3. Modeling development

In order to achieve the goal, organization needs to look at the T_{ask} concept toward action. T_{ask} is the set of activity that required in order to achieve the goal. In this paper, organization T_{ask} is a T_{ask} that organization performed within the context of organization environment. In this context, we defined organization T_{ask} as a process of using the existed data to support the organization goal within organization performance and organization environment. For example, ‘*Attending Staff Training*’ is organization T_{ask} performed by the organization within organization environment toward organization performance. Here organization environment is ‘*Training on Sales Skill*’ and organization performance is ‘*Staff Skill*’.

In order to deeply understand the concept, let use a simple scenario to assist above discussion. The scenario discusses A_{ction} perform by La Trobe University Library toward La Trobe University mission or goal (see www.latrobe.edu.au/library). Here, university goal is to ‘Transform the lives of students and communities through learning and knowledge’. This goal consist a Sub_{goal} which is ‘Create new and useful knowledge’. Next, university require several A_{ction} to achieve this Sub_{goal} . This scenario attempts to look at the library A_{ction} that supports the university A_{ction} , Sub_{goal} and goal.

The first university A_{ction} to support the Sub_{goal} is ‘Increase quantity and quality of research activity’. This university A_{ction} is supported by library A_{ction} such ‘establish research data management services’, ‘investigate the provision of a bibliometric citation reporting service, promote the new postgraduate study room in library Melbourne campus’ and ‘extend and promote digital object management services’.

The next university A_{ction} toward Sub_{goal} is ‘Develop knowledge exchange programs’. In order to achieve this university A_{ction} , library has come out with several A_{ction} such ‘develop strategies for increasing the number of full text open access research output in the repository’ in which this A_{ction} is important to increase the impact and reputation of La Trobe University research and the other library A_{ction} is ‘enhance the profile and maximise the use of library special collection’. This process is done through promotion, digitisation and collection acquisition.

The last university A_{ction} toward university Sub_{goal} is ‘Produce more excellently trained research graduates’. Library has come out with an A_{ction} to assist this university A_{ction} . The A_{ction} is ‘develop a research gateway on the Library website for academic staff and postgraduate students’ and ‘provide targeted outreach services for academic staff and postgraduate students’ that include to tailored research skills training.

The example gives the entire picture of Org_{goal} , Sub_{goal} and A_{ction} within organization environment. Here, the environment is assumes as knowledge creation toward research improvement in the university. For example, Fig. 3 shows the entire relationship based on the ontology. In this concept, A_{ction} consist T_{ask} and T_{ask} rely on data (D) to perform. Let take one university and library A_{ction} as example, where university A_{ction} is ‘Produce more excellently

trained research graduates’ and library A_{ction} that consist of possible T_{ask} is ‘develop a research gateway on the Library website for academic staff and postgraduate student’. The possible data (D) that the library required toward T_{ask} and A_{ction} is ‘data on previous year research’, ‘data on research area’ and ‘data on research publication’. This data (D) help the library to develop a research gateway within the website. Here, user can rely on this data (D) to perform their research.

In this paper, we attempt to develop a model based on the dependency relationship between Org_{goal} , Sub_{goal} and A_{ction} in the context of organization. The purpose of this model is to look at the data usage in order to develop new knowledge toward decision making.

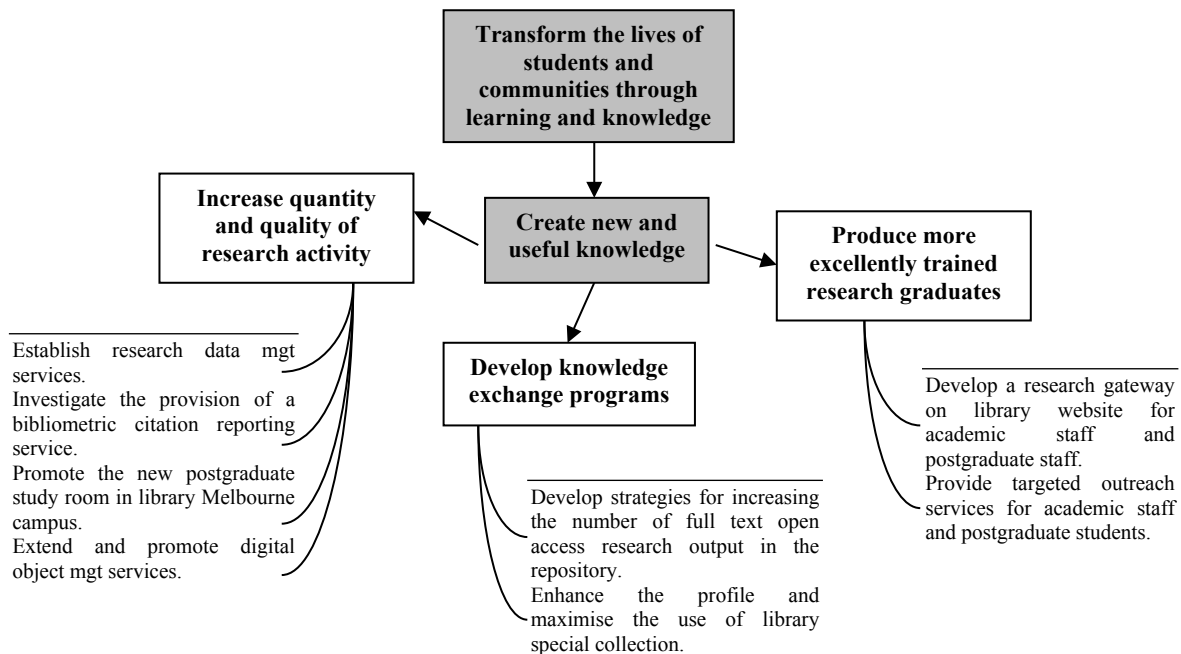


Fig. 3. Ontology relationship between goal (university goal), sub-goal (university sub-goal) and action (university action and library action)

3.1 Organization goal modeling

In one organization, Org_{goal} is very important because it is an achievement target. It is an important aspect within the organization. Sub_{goal} is developed in order to support the main goal. This Sub_{goal} becomes a guideline for organization toward the performance. However, Sub_{goal} requires an A_{ction} and this A_{ction} consist a T_{ask} . In order to achieve the Sub_{goal} , organization need to understand the type of data exist to support the A_{ction} . This is because A_{ction} relies on data. The concepts we identified here is between Org_{goal} , Sub_{goal} and A_{ction} as we define as organization goal relies on Sub_{goal} to achieve the organization main goal and Sub_{goal} relies on organization A_{ction} . If we define Org_{goal} within the organization, then

$$\text{Org}_{\text{goal}} = \text{Sub}_{\text{goal}} + \text{A}_{\text{ction}}$$

where Org_{goal} is depend on Sub_{goal} and A_{ction} . We introduce our model based on these three elements (Org_{goal} , Sub_{goal} and A_{ction}).

3.2 Organization sub-goal modeling

Sub_{goal} requires A_{ction} in order to perform. This A_{ction} is a set of activity as we defined as a T_{ask} . Thus, T_{ask} and A_{ction} must be taken into consideration to perform Sub_{goal} . Sub_{goal} can be represent as

$$\text{Sub}_{\text{goal}} \{ \text{A}_{\text{ction}} (\text{T}_{\text{ask}}) \}$$

3.3 Organization action modeling

As discussed in Section 2, we understand that every A_{ction} consist T_{ask} . A_{ction} relies on data (D) to run the T_{ask} . So we represent A_{ction} as

$$\text{A}_{\text{ction}} (\text{T}_{\text{ask}})$$

and

$$\text{A}_{\text{ction}} (\text{T}_{\text{ask}}^1, \text{T}_{\text{ask}}^2, \dots, \text{T}_{\text{ask}}^n)$$

where T_{ask} is written as $\text{T}_{\text{ask}}^1, \text{T}_{\text{ask}}^2, \dots, \text{T}_{\text{ask}}^n$, where n is a number of T_{ask} .

3.4 Organization task modeling

T_{ask} can be defines as the group of activity that is required in order to perform A_{ctions} toward goal. In this paper, organization task is a T_{ask} that organization performed within the context of organization environment in order to achieve the Org_{goal} . T_{ask} rely on data (D) in order to assist A_{ction} toward goal. This data (D) is use as information for individual or organization to perform the T_{ask} . So data (D) can be written as $D = (D_1, D_2, \dots, D_n)$ where n is a number of data (D). So T_{ask} is represent as

$$\text{T}_{\text{ask}} (D_1, D_2, \dots, D_n)$$

3.5 Organization environment

Organization environment assist the decision to perform T_{ask} and A_{ctions} . This is because organization must consider the environment aspect such *organize training for staff if the staff can gain new skills than other organization do not have, if the training can improve the presentation skills and if the organization has to spend high cost for training or not*. The percentage metric of

data (D) involve between T_{ask} and A_{ctions} need to identify in order to consider the organization environment. Here, let denote organization environment as E and the rule to consider E is based on simple scale: very low (0), low (1), medium (2) and high (3). If the $E \leq 1$ then data toward T_{ask} and A_{ction} are not important and if $E \geq 2$ then data toward T_{ask} and A_{ction} are important and need to be consider during decision making.

$$E = \text{Metric} (T_{ask} \text{ and } A_{ctions})$$

4. Model relationship

The model attempts to look at the usage of data toward organization task in order to achieve the organization goal, sub-goals and actions. Therefore our model will focus on these four main elements. They are, organization goal (Org_{goal}), sub-goal (Sub_{goal}), action (A_{ction}) and task (T_{ask}). These elements are evaluated within data (D) and organization environment (E) toward goal. In order to extend our model relationship, these elements need to define. In order to support our discussion, we developed a simple AND/OR goal tree model. This goal tree model assist further understanding toward the relationship.

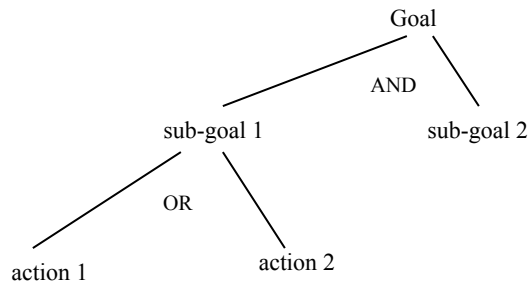


Fig. 4. Goal tree model

Let take one example within university library, if the main objective or goal is to *Transform Student Lives Through Learning* then the possible Sub_{goal} is to *Create Pathways for Underrepresented Students* AND *Substantially increase student enrolments*. In order to achieve this Sub_{goal} , Sub_{goal} is decomposed into A_{ction} , for example, Sub_{goal} *Create Pathways for Underrepresented Students* is decomposed into *Contribute to the School Partnership Program* OR *Work with relevant University staff*.

5. Definitions

In order to extend our model, identified variables are defined. This is important to support our model development as we discussed organization environment assist the decision between organization tasks and actions toward goal.

Definition 1 (Organization). Social group of people work in one scope of activity to achieve some develop objective. This group of people will distribute task toward implementing the develop activity.

Definition 1.1 (Organization entrepreneur). Group of people or a single person that directly associated with profit-making business undertaking.

Entrepreneurs in organization is recognized as the uncertainty and tight resource constraint by individual initiative and effort (Low, 2001). This mean large organization need to develop an internal culture that allows their staff to be more initiative even though it tends to be more on experience initiative (Williams & Lee, 2009).

Definition 2 (Organization goal). Achievement target. An out-come based on organization environment to be achieved in some period of time. Main goals show the overall organizational operations which specific processes are used and involved. Main goal shows the main factors that the organization needs to be pay attention towards the organization contribution of success factor. Based on Fig. 4, the figure shows the tree relationship of goal. If the relationship is ‘AND’ and ‘AND’ is represent as \wedge , then we can present goal as

$$\text{Org}_{\text{goal}} = \text{Org}_{\text{goal}} (\text{Sub}_{\text{goal}}^1 \wedge \dots \wedge \text{Sub}_{\text{goal}}^n).$$

Defines as Org_{goal} consist a $\text{Sub}_{\text{goal}}^1$ AND several other Sub_{goal} where n is a number of Sub_{goal}

Definition 2.1 (Sub-goal). An out-come developed in order to achieve the main goals. Sub_{goal} is important in order for organization to set a plan toward the main goal. Sub_{goal} is use as platform to look at the organization achievement toward main goal. Sub_{goal} requires the output of A_{action} and T_{ask} toward achieving the Sub_{goal} .

Overall discussion defined that Sub_{goal} requires A_{action} . If the relationship is ‘OR’ and ‘OR’ is represent as \vee , then we define Sub_{goal} as

$$\text{Sub}_{\text{goal}} = \text{Sub}_{\text{goal}} (A_{\text{action}}^1 \vee \dots \vee A_{\text{action}}^n)$$

where Sub_{goal} require A_{action}^1 OR other A_{action} where n is a number of A_{action} .

Definition 2.2 (Action). Set of activities in order to achieve the goals. Here, A_{action} depend on data of organization. For example, business organization relies on data such financial and profit in order to set an action toward sales. A_{action} is an activity within organization that perform to achieve the Sub_{goal} . Based on Fig. 4, A_{action}^1 depend on A_{action}^2 if A_{action} is not achieve or important. Here depend is represent as \supset , then

$$A_{\text{action}} = A_{\text{action}}^1 \supset A_{\text{action}}^2.$$

However, activity toward A_{action} can define as a T_{ask} . Then, the relationship between A_{action} and T_{ask} is represent as

$$A_{\text{action}} (T_{\text{ask}}^1, T_{\text{ask}}^2, \dots, T_{\text{ask}}^n)$$

where n is a number of T_{ask} .

Definition 3 (Organization task). Organization task is a T_{ask} that organization performed within the context of organization environment in order to achieve the Org_{goal} . In this context, T_{ask} is assumes as a number of activity. But, this activity relies on data (D) and data (D) is written as $D = D_1, D_2, \dots, D_n$ where n is a number of data (D). Then, T_{ask} is defines as

$$T_{ask} (D_1, D_2, \dots, D_n).$$

Definition 4 (Data repository). Data is store systematically to that the data can be use effectively. The case will show two ways of data usage. First data input (IN) is where in one organization, data is increase everyday and all these data is kept in the storage and repository. Second, data output (OT) is where data that has been measured and has value to support the organization action.

Definition 4.1 (Data). Raw material such number. Organization relies on this data (D) toward Org_{goal} and A_{ction} . Specific team use data (D) and convert it into valuable information. Every stage of organization activities involves data. Every organization created data (D) almost every day and this data (D) is store in data storage such as database. In this paper, data (D) is used to support the decision. So data (D) can represent as x

$$D = x_1, x_2, \dots, x_n$$

where n is a number of data (D).

6. Process implementation

In this case, we try to use the data from two different organizations in order to support our discussion. We use the same situation as discussed in Section 3 but we narrow it down by considering goal as Flight Ticket, sub-goals are Search for Ticket, Search for Price and Search for Date. In order to achieve this, he/s has to compare the ticket price based from several airlines.

In order to support above paragraph, the case can be describe as the following. He/s want to travel from Melbourne to Sydney on one particular date. He/s search two airline website which are *Virgin Australia* and *Jetstar Australia*. Both airline provide a journey to Sydney however, he/s prefer to travel in the morning from Melbourne. Next, he/s has to search for a ticket from these two airlines (refer Fig. 5 and Fig. 6). *Virgin Australia* provides more data in term of time of departing compare to *Jetstar Australia*. In this case, data from *Virgin Australia* is more important than data from *Jetstar Australia* because he/s can has more choices in term of ticket price.

However, he/s prefer to depart from Melbourne in the morning and *Virgin Australia* does not have any schedule in the morning but *Jetstar Australia* provides three flights in the morning. In this case, data from *Virgin Australia* is not important anymore because it does not fulfill the user environment. The environment aspect is he/s prefers to depart in the morning. Based from this data, he/s can decide what flight he/s want to book. The example shows the entire process of data usage to support the decision making.

1. Select Departing Flight Melbourne - Tullamarine to Sydney

Month view
Click here to browse the cheapest fares in a four week range

Our fare types have changed!
Baggage, flexibility & more can now be added to any flight - select a flight below and view all available options
Learn more about our new fare types Don't show this message again

Departs	Arrives	Flight Detail	Price
7:10 AM Melbourne - Tullamarine	8:35 AM Sydney	Direct flight 1hrs25mins	\$89
9:10 AM Melbourne - Tullamarine	10:35 AM Sydney	Direct flight 1hrs25mins	\$89
10:20 AM Melbourne - Tullamarine	11:45 AM Sydney	Direct flight 1hrs25mins	\$109
13:35 PM Melbourne - Tullamarine	15:00 PM Sydney	Direct flight 1hrs25mins	\$109
18:00 PM Melbourne - Tullamarine	19:25 PM Sydney	Direct flight 1hrs25mins	\$109
20:40 PM Melbourne - Tullamarine	22:05 PM Sydney	Direct flight 1hrs25mins	\$89

Prices quoted are per adult passenger, in AUD and include airfare related surcharges, fees and taxes. Unless otherwise stated, fares are non refundable, limited changes are permitted charges apply.

First up Choose your flight...
Then add Baggage, flexibility & more.

Fig. 5. Data on ticket for Jetstar Australia Airline

Search Select Guest Pay Itinerary

Select your flights

Internet discounted fares are per adult and quoted in AUD including taxes and fees
If making payment with a credit or debit card, a surcharge of 4.50 AUD per Guest per sector will be added to the total price of your booking at payment
Prices for flights are not guaranteed until full payment is received or a reservation number is provided
Fares not identified as business in the premium column are premium economy fares

Departing: Melbourne to Sydney

Departure	Arrival	Flight	saver	flexi	premium
14:15 pm Melbourne	15:40 pm Sydney	QJ 899	\$299.00	\$359.00	\$425.00
15:15 pm Melbourne	16:40 pm Sydney	QJ 895	No Fares	\$359.00	\$425.00
16:15 pm Melbourne	17:40 pm Sydney	QJ 861	No Fares	\$405.00	\$425.00
16:45 pm Melbourne	18:10 pm Sydney	QJ 865	No Fares	\$359.00	\$425.00
17:15 pm Melbourne	18:40 pm Sydney	QJ 869	No Fares	\$405.00	\$425.00
17:45 pm Melbourne	19:10 pm Sydney	QJ 873	No Fares	\$405.00	\$425.00
18:15 pm Melbourne	19:40 pm Sydney	QJ 877	No Fares	\$405.00	\$425.00
18:45 pm Melbourne	20:10 pm Sydney	QJ 881	No Fares	\$359.00	\$425.00
19:15 pm Melbourne	20:40 pm Sydney	QJ 885	\$299.00	\$359.00	\$425.00
19:45 pm Melbourne	21:10 pm Sydney	QJ 889	\$185.00	\$235.00	\$425.00
20:15 pm Melbourne	21:40 pm Sydney	QJ 893	\$135.00	\$199.00	\$425.00
20:45 pm Melbourne	22:10 pm Sydney	QJ 895	\$109.00	\$199.00	\$425.00
21:15 pm Melbourne	22:40 pm Sydney	QJ 899	\$109.00	\$199.00	\$425.00

Flight Operated by: Virgin Australia
*Optional checked baggage charge does not apply to Velocity Frequent Flyer Platinum, Gold and Silver Members
*Not all food & drink offerings are available on all flights

Important Information

Fig. 6. Data on ticket for Virgin Australia Airline

6.1 Data model on RDF

In this example, we implement resource description framework (RDF) in order to support our discussion. RDF is use to show the entire of data model. RDF is a family of World Wide Web Consortium (W3C) specifications originally designed as a metadata data model. It has come to be used as a general method for conceptual description or modeling of information that is implemented in web resources, using a variety of syntax formats. . Data model is developed based on the original document of RDF/XML. The example below shows a simple RDF for both airlines *Virgin Australia* and *Jetstar Australia* (for more on RDF development see <http://www.w3.org/RDF/Validator/>).

```
<?xml version="1.0"?>

<rdf:RDF
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:subgoal="http://www.jetstar.com/au/Subgoal#">

<rdf:Description
rdf:about="http://www.jetstar.com/goal1/Flight Ticket">
  <subgoal:one>Search for ticket</subgoal:one>
  <subgoal:two>Search for price</subgoal:two>
  <subgoal:three>Search for date</subgoal:three>
</rdf:Description>
.
.
</rdf:RDF>

<?xml version="1.0"?>

<rdf:RDF
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:subgoal="http://www.virginaustralia.com/au/Subgoal#">

<rdf:Description
rdf:about="http://www.virginaustralia.com/goal1/Flight Ticket">
  <subgoal:one>Search for ticket</subgoal:one>
  <subgoal:two>Search for price</subgoal:two>
  <subgoal:three>Search for date</subgoal:three>
</rdf:Description>
.
.
</rdf:RDF>
```

The original RDF/XML document shows the document that involve toward data model that support the RDF. Then, data model is developed as Figure 5 and Figure 6 below.

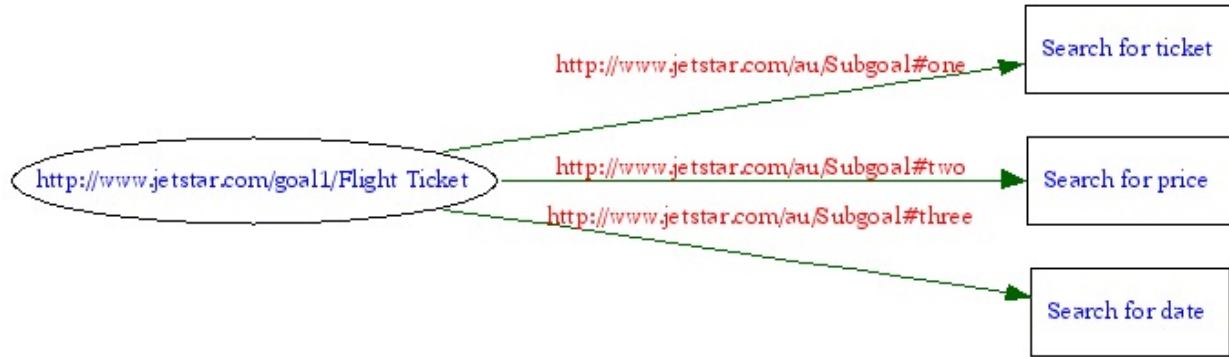


Fig. 7. Graph of data model for Jetstar Australia

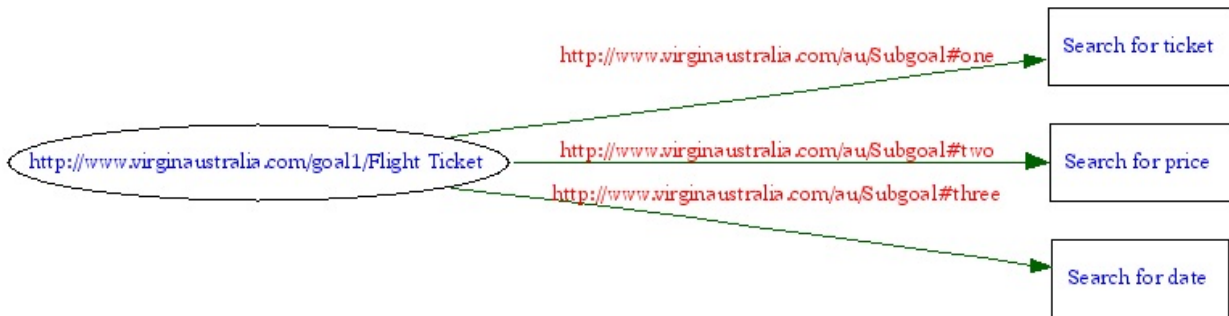


Fig. 8. Graph of data model for Virgin Australia

In this case, he/s has several data regarding airline ticket based on two airlines such *Virgin Australia* and *Jetstar Australia*. *Virgin Australia* provides more data and information on ticket. The data include more flight time and more price choices. Compare to *Jetstar Australia* only provide few flight to Sydney from Melbourne. In this case, data from *Virgin Australia* more important because of the number of data is higher compare to *Jetstar Australia*.

However, he/s only prefer to depart from Melbourne during morning and he/s decision must satisfy this environment. Thus, data from *Virgin Australia* is not important anymore because they do not provide any flight to Sydney during morning. Here, data from *Jetstar Australia* is important because they provide a few flights to Sydney during morning. Data from *Jetstar Australia* satisfy the environment.

7. Conclusion

This paper discussed the overall concept development of data measurement. Several variable such goals, sub-goals, action, data input and data output are defined. This paper also discussed the entire relationship of organization process toward data usage. Definitions are provided in order to assist reader to deeply understand the concept.

In this paper, we develop a relationship between goal, sub-goal and action in order to support the organization task, environment and performance. This is important to assist our future work to develop a goal modeling and implement the model in the real world situation.

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