Ontological Automation of Strategic Information System Planning

Kasiphan Masakul

Faculty of Informatics
Sripatum University
Bangkok, Thailand

Email: masakul@spu.ac.th

Suchai Thanawastien

Faculty of Informatics
Sripatum University
Bangkok, Thailand

Email: stw@spu.ac.th

Pakorn Sermsuk

The Information Processing Inst. for Education and Development
Thammasat University
Bangkok, Thailand
Email: pramoon@tu.ac.th

Abstract

The formulation of strategic information system planning is a systematic process consisting of SWOT analysis, CRUD matrix formation and affinity analysis, business area analysis, projects definition, prioritization of projects, budget computation, phasing, and defining key performance indicators for follow-up and evaluation. This paper describes the automation of the procedures in formulating the strategic information system documents. The software will assist in collecting, relating, and generating the desired output. Also, the software employs the ontological concepts and built-in domain specific intelligence ontological distribution function to assist the strategic information system planner in the affinity analysis of the CRUD matrix forming the right business areas in implementing the strategic information systems.

1. Introduction

Strategic information system planning is an activity that must be performed every 3-5 years and revised every year. The strategic information system planning activities entail well-defined procedures that can be executed manually. The central processing step of the strategic information system planning is the affinity analysis of the CRUD matrix to form the business areas [1]. The literature so far has no reported research work on the exact complexity of the procedure.

In this paper the general problem of automating the strategic information system planning processes is described and the solution to the affinity analysis using ontological concepts is outlined. The ontology is an important concept that finds many applications [2, 3, 4]. Here, we use this concept to couple the business processes and data classes that should be in the same business area together. In section 2, the procedure of integrated strategic system planning is given. Section 3 will describe the automation process and conclusion is given in Section 4.

2. The Integrated strategic Information System Planning (ISISP)

The ISISP methodology was proposed by Sermsuk and Thanawastien [1] to take the advantages of both top-down strategic information systems planning based on SWOT analysis, and the bottom-up strategic system planning based on CRUD matrix. The ISISP methodology is an integrated bottom-up and top-down approach which unifies the portfolio derived from the bottom-up (set B) and the portfolio derived from top-down (set T) SISPs to obtain a single unified implementable application portfolio. The ISISP methodology depicted in Figure 1 has the following main steps.

1. Obtain vision, mission, and goals statements
2. Perform the bottom-up SISP steps

2.1 Derive data classes and business processes to form the CRUD matrix

2.2 Perform affinity analysis on CRUD matrix to obtain CRUD matrix with business areas defined

2.3 Derive the application portfolio set B

3. Perform the top-down SISP steps

3.1 Perform SWOT analysis

3.2 Define the strategic themes

3.3 Derive from the strategic themes the applications portfolio set T

4. Perform the ISISP steps

4.1 Derive the core application set C (C is B intersect T)

4.2 Perform application transformation for the sets E and C (E union C is B)

4.3 Define business processes and data classes for each application in F (F union C is T)

4.4 Create the ICRUD matrix by combining the CRUD from step 2.2 with the result from Step 4.3

5. Filling in “C” or “U” or “” for each of the new entries in the ICRUD matrix
6. Perform affinity analysis and folding of “C” onto appropriate business area resulting in integrated ICRUD matrix
7. Then the business areas in the ICRUD will include all the applications for the enterprise meeting the strategic requirements and basing on the existing applications
8. Derive the Integrated Application Flow Architecture to obtain application boundaries so that each application can be implemented separately
9. Obtain the final application portfolio from ICRUD in 7

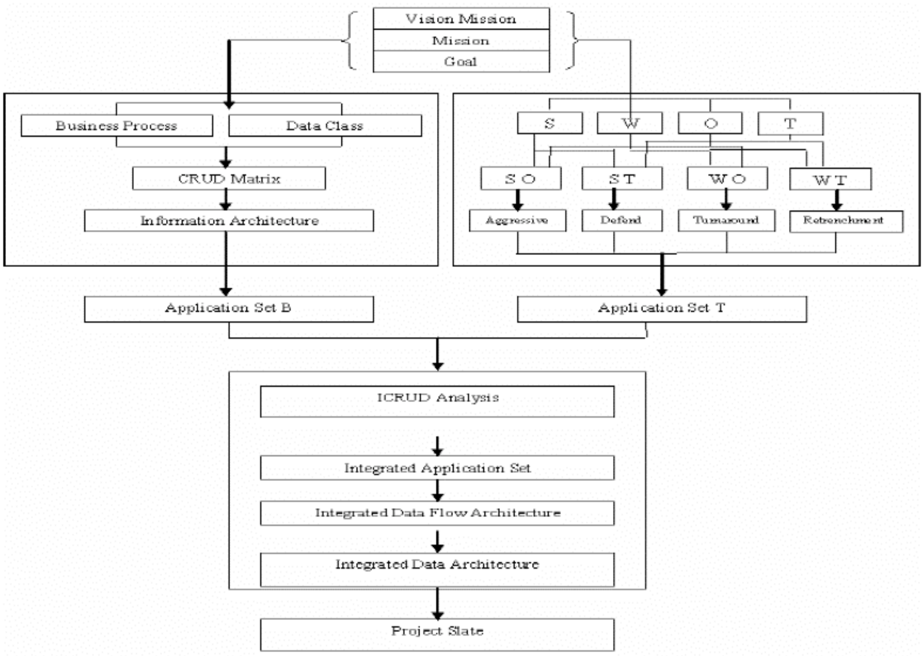

Figure 1 The ISISP methodology

3. The Automation of ISISP

The software architecture of the A-ISISP is shown in Figure 2. The system consists of three main components: The data entry component which is used to accept various data needed to support the construction of set T, set B and set C as well as other essential data. Shown in Figure 3 is a sample user interface of the data entry component. The Generation component of the A-ISISP is used to generate the CRUD matrix and various sets of applications. The generation needs the Processing component such as affinity analysis, folding of rows or columns, ranking of applications, and budgeting of each of the applications in the portfolio.

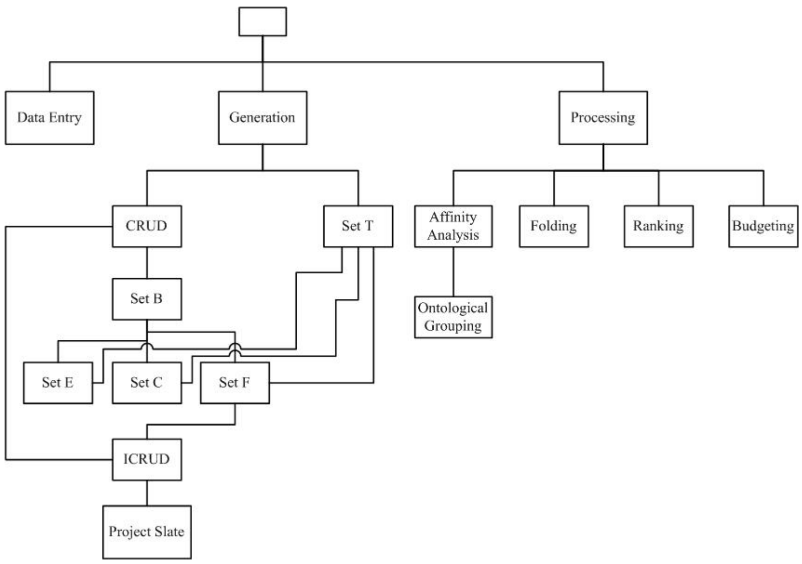

Figure 2 Software architecture of the A-ISISP

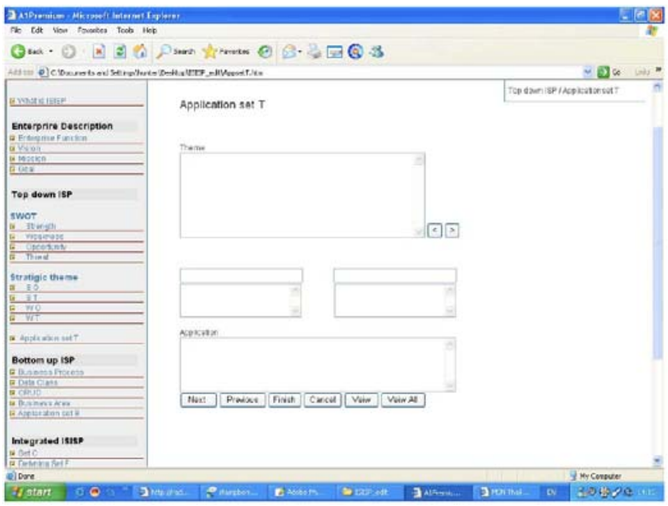

Figure 3 Software architecture of the A-ISISP

The hardest part of the automation is the affinity analysis of the CRUD matrix so as to derive the business areas. Shown in Figure 4 is the normal CRUD matrix before the affinity analysis and Figure 5 is the result after the affinity analysis. The process of deriving Figure 5 from Figure 4 entails the shuffling of rows and columns so as to align all the entries with "C" along the north-west, south-east diagonal so that disjoint sub-matrices can be formed cascading along that diagonal.

Process \ Data Classes	Policy/Regulation/Law/Legal	Mission and Function	Agency Agreements	Planning	Work in Progress	Products	Financial Status	Procurement and Contracts	Man Power	Training	Personnel	Security and Safety	Reference Information	Fixed Assets and Expenses	ADP Information
Implement Policy Guidance from OCE	U	C	C	C	U	U		U	U			U	U	U	
Provide Strategic Direction	U	C	C	U	U								U		
Formulative Army RDT&E Programs	C	U	U	C	U	U	U		U	U	U	U	U	U	U
Manage Research and Development Programs	U	U	U	U	C	C	U	U	U	U	U	U	U	U	U
Manage Reimbursable and Small Problem Program	U	U	U	U	C	C	U	U	U	U	U	U	U	U	U
Develop Improved Planning, Design & Construction Procedures	U				C	C	U								
Develop Improved O&M Procedures	U				C	C	U								
manage Financial Resources	U		U	U	U		C	U	U					U	
Manage Procurement and Contract				U	U		U	C	U				U	U	U
Manage Manpower	U	U	U	U	U		U	U	C	C	C	U		U	U
Manage Organizational Effectiveness Programs	U			U	U	U	U		C	C	U			U	
Manage Personnel Training	U	U		U			U	U	U	C	U	U	U		U
Provide Staff Review and Approval	U	U	U	U	U	U	U	U	U	U	C	U	U	U	
Investigate and Solve Personnel Problems	U				U	U	U			U	C	U			
Manage Safety and Security Activities	U									U	U	C			U
Manage Public Affairs Program	U	U	U	U	U	U			U		U		C	U	U
Manage Laboratory Support Functions	U	U	U	U	U	U	U		U			U	C	C	U
Manage Automation and Information	U			U	U	U	U	U		U		U		U	C

Figure 4 Example of the CRUD matrix (Adapted from IBM's Business System Planning)

In performing the affinity analysis, it is recognized that the clustering of business processes and data classes into disjoint sets is highly context-sensitive since it is expected that those business processes within the same application area should be highly coupled and hence should stay together. Here, a new approach which is based on the ontology concept is used in the implementation. The process is outlined as follows.

1. Create the ontological block for each of the possible named business area such as OBB1: Financial, OBB2: Human Resource, OBB3: Procurement, etc.

2. Create the ontological block for each of the possible named data classes such as OBD1: Financial Data, OBD2: Human Resource Data, OBD3: Procurement Data, etc.

3. Assign each business process and data class to the corresponding ontological block, noting that a business process or data class might belong to more than one ontological block. The item which appears

in more than one block must be tagged. Shown in Figure 5 is an example of the Ontological Block for business processes with tagged items. Figure 6 is an example of the layout of the Ontological Block.

Process \ Data Classes	Policy/Regulation/Law/Legal	Mission and Function	Agency Agreements	Planning	Work in Progress	Products	Financial Status	Procurement and Contracts	Man Power	Training	Personnel	Security and Safety	Reference Information	Fixed Assets and Expenses	ADP Information
Implement Policy Guidance from OCE	U	C	C	C	U	U		U	U			U	U	U	
Provide Strategic Direction	U	C	C	U	U								U		
Formulative Army RDT&E Programs	C	U	U	C	U	U	U		U	U	U	U	U	U	U
Manage Research and Development Programs	U	U	U	U	C	C	U	U	U	U	U	U	U	U	U
Manage Reimbursable and Small Problem Program	U	U	U	U	C	C	U	U	U	U	U	U	U	U	U
Develop Improved Planning, Design & Construction Procedures	U				C	C	U								
Develop Improved O&M Procedures	U				C	C	U								
manage Financial Resources	U		U	U	U		C	U	U					U	
Manage Procurement and Contract				U	U		U	C	U				U	U	U
Manage Manpower	U	U	U	U	U		U	U	C	C	C	U		U	U
Manage Organizational Effectiveness Programs	U			U	U	U	U		C	C	U			U	
Manage Personnel Training	U	U		U			U	U	U	C	U	U	U		U
Provide Staff Review and Approval	U	U	U	U	U	U	U	U	U	U	C	U	U	U	
Investigate and Solve Personnel Problems	U				U	U	U			U	C	U			
Manage Safety and Security Activities	U									U	U	C			U
Manage Public Affairs Program	U	U	U	U	U	U			U		U		C	U	U
Manage Laboratory Support Functions	U	U	U	U	U	U	U		U			U	C	C	U
Manage Automation and Information	U			U	U	U	U	U		U		U		U	C

Figure 5 Six business areas after the affinity analysis

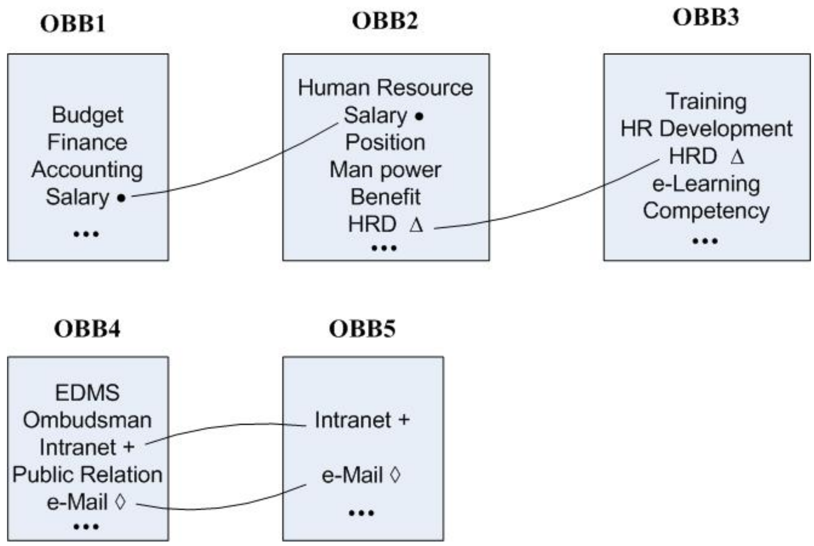

Figure 6 The general ontological block

4. Assume that the results are the ontological block pairs: (OBB1, OBD1), (OBB2, ODB2),… Construct the CRUD matrix by using the OBB1, OBB2,…as the business process dimension, and OBD1, OBD2, …as the data class dimension. Then,

assign "C" to the entry if the corresponding business process creates any data in the corresponding data class. Likewise, assign "U" to the entry if the corresponding business process "uses" any data in the corresponding data class. In forming the CRUD matrix, each of the tagged items must appear only once.

5. Affinity analysis

a. For each "C" outside the sub-matrix (OBBi, OBDi), if it is from one of the tagged item, exchange the tagged business process or tagged data class to bring the "C" into the appropriate sub-matrix.

b. If there are still entries with "C" outside, apply the folding procedures as shown in Figures 7 and 8.

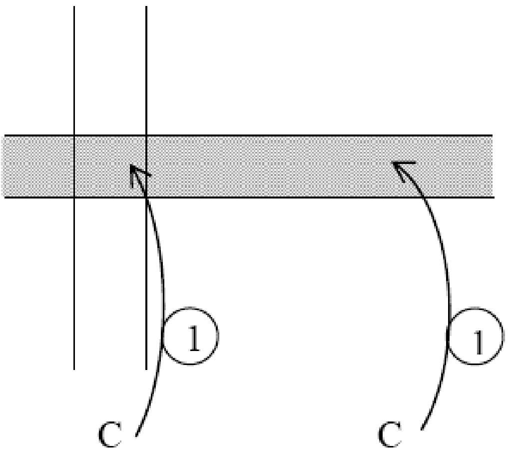

Figure 7 The row folding procedures

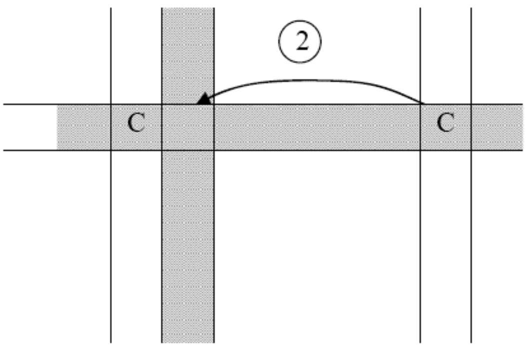

Figure 8 The column folding procedures

4. Conclusion

The A-ISISP is a software automating the integrated strategic information system planning methodology. The application of the ontology in the CRUD matrix analysis results in a practical useful procedure that facilitates the forming of the business areas. The system is currently under refinement and expects to use in the real-world problem of strategic system planning for various agencies in Thailand.

5. References

[1] Sermsuk P. & Thanawastien S.(2007), "Integrated Strategic Information System Planning" , Proceedings of the IEEE International EDOC Conference EDOC.

[2] Wu B., Li L. & Yang Y. (2006), "Ontological Approach Towards E-Business Process Automation", Proceedings of the IEEE International Conference on e-Business Engineering ICEBE.

[3] Rosengard J. & Ursu M.F. (2004), "Ontological Representations of Software Patterns", Proceedings of KES'04, Lecture Notes in Computer Science, vol. 3215, pp. 31-38, Springer-Verlag,.

[4] Sanfilippo A., Tratz S., Gregory M., Chappell A., Whitney P., Posse C., Paulson P., Baddeley B., Hohimer R. & White A. (2006), "Ontological Annotation with WordNet", Proceedings of the International WordNet Conference GWC.