DEVELOPMENT OF PHYSICAL SECURITY PROTECTION METAMODEL

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This project report is dedicated to my family for their endless support and encouragement.

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ABSTRACT

Physical Security Management is a multidisciplinary endeavor and a very tough knowledge domain to model. It is a diffused area of knowledge that is continuously evolving and informally represented. The domain has many complex features interconnecting the physical and the social views of the world. Many international and national bodies create knowledge models to allow knowledge sharing and effective physical security management activities. These models are often narrow in focus and deal with specific organizations. Analysis of these models uncover that many physical security management activities are actually common even though organization are different. This project report creates a unified view of physical security management in the form of a metamodel that can be seen as a language for this domain. Design Research Science is a procedure of a series of thoughts and activities by which an artifact is developed and achieved. Design Science conceptualized by supports a practical research prototype that calls for the creation of innovative artifacts to solve real- world problems. The metamodel is validated and refined to serve as a representational layer to unify facilitate and further access to physical security management expertise. This aims to facilitate knowledge sharing, combining and matching different physical security management activities at different organizations. This project report synthesizes and validates a methodical metamodelling process applicable to domains represented in a diffused amid informal manner by focusing on the validation and the metamodelling process on physical security management. Comparison against other models is validation technique which is used to identify any missing concepts in the initial version of the metamodel and to also ensure its broad coverage.

ABSTRAK

Pengurusan Sekuriti Fizikal adalah suatu usaha dalam pelbagai disiplin dan domain pengetahuan yang sukar di dalam sesuatu model. Ia adalah suatu aspek pengetahuan yang sentiasa berkembang dan digambarkan secara tidak rasmi. Bidang ini mempunyai banyak ciri-ciri yang kompleks yang menghubungkaitkan aspek fizikal dan pandangan sosial di dunia ini. Kebanyakan pertubuhan antarabangsa mencipta model untuk berkongsi pengetahuan dan menggalakkan aktiviti pengurusan sekuriti fizikal yang efektif. Model-model ini kebiasaannya fokus kepada organisasi yang tertentu. Analisis model ini menunjukkan bahawa kebanyakan aktiviti pengurusan sekuriti fizikal adalah sama walupun didalam organisasi yang berbeza. Kajian ini menggambarkan pengurusan sekuriti fizikal sebagai sebuah bentuk metamodel yang dilihat sebagai bahasa domain ini. Proses metamodel ini diaplikasi bagi memastikan hasil metamodel adalah lengkap dan konsisten. Rekabentuk kajian sains adalah satu siri prosedur aktiviti dan pemikiran dimana artifak dibina dan dicapai. Rekabentuk Sains dikonsepkan dari sokongan terhadap prototaip kajian praktikal yang menghasilkan ciptaan inovatif sesuatu artifak dalam menyelesaikan masalah sejagat. Metamodel ini dikaji dan diperbaik untuk menjadi wakil dalam memenuhi keperluan akan datang dalam kepakaran pengurusan sekuriti fizikal. Ini menfokuskan dalam memenuhi perkongsian ilmu, gabungan dan memadankan aktiviti pengurusan sekuriti fizikal yang berlainan di organisasi yang berlainan. Generasi terbaru metadata dipermudahkan oleh kesegeraan dan ketentuan pemetaan yang terhasil dari persetujuan semantik diantara peraturan model dan metamodel. Kajian ini menggabungkan dan mengesahkan sebuah proses metamodel dimana ia boleh diaplikasi didalam domain yang terhasil dari sebaran tidak rasmi dengan menfokuskan kepada pengesahan dan proses metamodel pengurusan sekuriti fizikal. Perbandingan diantara model lain boleh dibuat dengan teknik pengesahan dimana ia digunakan dalam mengenalpasti

sebarang konsep yang tiada didalam versi awal metamodel dan ini juga boleh memastikan ia mendapat liputan yang luas.

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CHAPTER 1

1.1 Introduction

Physical Security has many interacting elements (e.g.: people. Safety, security, Ventilation, access control, locations, lighting, alarms, barriers, door locks and many more) that are typically involved in its activities. Modeling coordination of Physical Security activities is tremendously hard and complex. The roles in a Physical Security cycle are fluid and cross many organizational boundaries. Physical Security activities often extend across various government sectors, non-governmental organizations/industry. This dissertation introduces and thoroughly validates a generic representation framework to combine the various Physical Security experiences into a single repository that can then be reused to facilitate and support Physical Security decisions. To create the generic representation, metamodelling is used. This is a Physical Security decision. To create the generic representation, metarnodelling is used. This is a software engineering technique that supports software modeling and software engineering reuse. The dissertation also operationalizes the new representation by creating a Physical Security knowledge repository that the dissertation representation as the foundational layer. Furthermore, the dissertation illustrates how this repository can be used as the basis of Physical Security Decision Support System (DSS). This dissertation in effect adapts metamodelling as a new approach to model Physical Security knowledge and to unify access to it, in order to solve persistent problems in Physical Security.

1.2 Problem Background

The lost of organizations physical security whether it is an asset or information on their subsequent management are caused by so many factors. They are often due to an accumulation of a complex chain of events and often accompani ed by changes in both internal and external factors. Hence, the attacks are not mo stly the same and every attack requires its own management process. On the other hand, the way attack's impact to the organizations and business processes may well be similar and responses are often transferable between disaster causes by attacks.

On the reason for failure of many physical security protections my rest in the inflexibility of the model to domain user. Domain model developers will normally need to spend a lot of times in understanding the nature of the domain which they de sire to model. Generally they use a general purpose language such as the Unified Modelling Language (UML) in modelling their domain application models. But when they come to the situation in which the models they create do not perfectly fit the modelling needs as they desire, a more specific domain modelling language such as physical security protection Meta-model is believed can offer a better alternative approach to the problem (Robert, 2010). The problem when designing a new model of the domain is the issue of identification of the domain concepts and the ambiguity of the concept terminologies. This will be a big problem especially to the n ewcomers of the domain. As with any domain, the power of its domain-specific lang uage is directly tied to the abstraction level of the domain concepts.

Although modelling and Meta-modelling are extensively studied and referred to in many research today, the specific meaning of key terms and phrases can vary between researchers.

To avoid confusion, this research applies the following definitions to provide context for each notion it uses throughout this dissertation:

• **Metamodelling**: A modular and layered way to endow a well-established me thodology or modelling language with an abstract notation, discerning the abstract syntax and semantics of the modelling elements.

• **Modelling Language**: Is a specification about the set of allowed symbols and rules on how to combine them in order to create a model that conforms the modeling language. It contains all the elements with which a model can be described.

• **Meta-model**: Is a model of models. It is the specification of modeling environment for certain domains, and defined syntax and semantics of the domain and can represent all systems in the domain. It also a Meta-modelling artifact which contains a set of constructs of a modelling language and their relationships, as well as constr aints and modelling roles.

i. **Domain**: The realm of existence of a physical security protection.
ii. **Model**: Is a document that contains statements about the properties of an artifact (object) of a real or imagined world (universe of discourse). In our case is a model of the Physical Security domain. The model is called syntactically correct if it only used to allow symbols and it conforms the rules of the modeling language
iii. **Concept**: An abstract object which represents an entity, action or a state of the domain prospective (Morris et al., 1993).

1.2 Problem Statement

Physical Security is today's most important issue that every organization is struggling to secur its asset, whether its an information or physical assets and the attackers or intruders are always busy to find out the security weakness that every organization have. These are the two main things that security will be the most focused area in every aspect.

In the security domain physical security is considered the first place that security process begins. This research will conduct the physical security protection and develop a multimodal. By understanding the major causes of physical security weaknesses we can try to target and solve these problems. The research highlights the suggested solutions of these errors from both technical and social perspectives.

The main questions in this research area

1. How does **Meta-modelling** approach capable to support domain Physical security complexity knowledge.
2. How **to model the language** of Physical security domain and the **instantiation of model** from the metamodel can be done?

1.4 Research aims

The aim of this project is to develop a generic Physical Security management Meta-model that wil used as a reference for users of the domain. To check the completeness and correctness of the initial Meta-model, and evaluation Meta-model validation technique " Comprison against other models is used".

1.5 Objectives of the Project

The following research objectives are formulated on the base of the research physical security protections

1. To study and analyze how Meta-modeling approach is capable to support the physical security domain and find the best model for physical security protection solutions.

2. To develop a physical security protection Meta-model.
3. To evaluate the new physical security protection Meta-model by using Meta-model validation techniques.

1.6 Scopes of the Project

This research will conduct within the scope described below:

1. A study on physical security models collected from various sources (e.g.: journals, conference papers, government reports, organizations, online websites and etc.)
2. Observation on all concepts used in a physical security management domain
3. A development of a proposed physical security Meta-model based on the collected domain models. This artifact will describe the semantic of all models of the domain
4. A validation of a Meta-model by using a Meta-model validation technique namely, a “Comparison against other models”.

1.7 Project Organization

This project is organized as follows:

i. **Chapter 1** presents introduction Physical security domain, background of the problem, , the premises that was carried out this research, problem statement, project aim, objectives and scope of the project.

ii. **Chapter 2** describes the related literatures of Physical security, definition of physical security, threat to physical security, vulnerabilities, metamodel, model, previous work related to physical security, metamodel and mode,l and finally structure and main functions contained by the current models used in this study namely.

iii. **Chapter 3** illustrates the methodologies of this research called Design Science Research such as models collections, identifying sub-sets, extraction of general concepts, shortlisting the candidate definitions, Reconciliation of defintions, Designation of concepts, Identification of relationships, Validating the metamodel.

iv. **Chapter 4** presents the implementation of the methodology defined in Chapter 3. The expected results of the first two phases of the research methodology are discussed.

v. **Chapter 5** iterating the validation process and validated metamodel

vi. **Chapter 6** presents conclusions and contributions of the research, and the works that have been carried out in order to achieve the objectives of the research. The discussion then concludes with recommendations for future works.

LIST OF FIGURES

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