Evaluation and Generation of Meta Modeling tools for Domain Specific Modeling Language

Chanchal Jayaraj, Ramesh.R, Prasanna Venkatesan.V, Martin.A

Abstract— Domain-Specific Modeling (DSM) is a latest approach to software development industry, capable to greatly rise the speed and easily to use of software arrangement, it produces various facts of a new Domain system. DSM care advanced level of metaCASE domain implementation concepts that make general-purpose metaCASE model language. So the DSL takes very small amount of work effort, strength of character and low-level specifics to order a given Domain based system. Domain-specific languages (DSLs) are languages practice made to a specific application domain, throughout the previous circumstances of the software improvement, developers have continuously essential to improve productivity by improving idea, concepts. The new level of concept has then been automatically transformed to the earlier works to new derived metaCASE model idea.

Index Terms— DSM, MetaEdit+, Clooca, EMF, GME, RSA, modeling, software work, tool Cataloguing

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1 INTRODUCTION

Domain-Specific Modeling (DSM) provide a possible solution for successful improvement of productivity by raising the level of idea for coding. With DSM the models are made up of elements representing concepts that are part of the problem domain, full final product code can be automatically generated from these high-level specifications with domain-specific code generators. [1]Introducing DSM and looks at how it differs from other Domain modeling languages, this focus more on the detailed level of the mindless creation of code world. To implement metaCASE model we need a professional domain developer in that design domain, or a small team of them. Usually, software development has been using the method of the physical idea and more programming efforts needs to design an application and source code. These work be likely to make slow and create errors and duplication of effort in problem for manual work solving, design, and coding. Domain-specific modeling (DSM) eliminates these problems by applying the domain modeling concepts to reduce man decided faults.

DSM language aims to make good application creaton using the selected tools to express the structure. This increases the level of idea of the models used, it reduces the amount of information that needs to be used in the models, it reduces planning by touching the modeling language closer to the domain creator, and improves the quality and scope of code generators model. [8]The additional detailed domain can produce the higher output benefits by applying DSM technology. Defining a modeling language involves three aspects. The notation used to represent these in graphical models which is used for designing purpose, and the rules that guide the modeling process for variable connection and oops concepts.

2 METACASE TOOL EVALUATION

2.1 Evaluation Workbench

It is an overview of the evaluation context and criteria chosen to assess metamodeling tools Excellency and benefits of the tool usage. [20]The tools which provide the features of a Meta-CASE tool, these tools present a representative sample of adaptable tools according different approaches RSA represents all tools supporting UML extension mechanism and using the iconic representation of stereotypes MetaEdit+, GME and CLOOCA represent tools which use registered language to build their own editor. A developer could find efficiently get the same functionality by writing just one line instead of several earlier model.

2.2 Case Study

The design and generation of such application using tools can be done either using program-based environment or applying model-based tools called Meta-CASE tools. [21]The major idea behind meta-CASE tools is to desgning or capture the specification and models of the required CASE tools and then generate automatically the tool selected. In wide-ranging, meta-CASE tools provide standard CASE tool components that can be personalized and instantiated into particular CASE tool storage. The term Domain Engineering refers to a software development methodology which support the idea of Domain generation and the entire process of reusing domain knowledge and the software component in the production of new software application development system. A domain can be defined as a set of model applications with similar characteristics of guidelines and connections. [16]DSM have more advantages over the existing programming languages by specifying the solution directly using problem Domain concepts. The final application products are generated from these high level specifications. This mechanization is conceivable as both the programming languages and generations need fit the necessities of only company and selected domain. We define a domain as an area of interest to a particular development determination for the successful creation of selected application.

Table. 1
Different types of Metamdeling tools used in model development

NAME	VENDOR	VERSION
AGILIAN	Visual Paradigm	4
ALTOVA UMODEL	Altova	2012

| ARGOUML	- - -	0.34
ARCHI	University of Bolton	2.3
ARIS BUSINESS ARCHITECT	Software AG	7.1
ARIS EXPRESS	Software AG	2.3
ARTISAN STUDIO	Atego	7.4
ATOM3	McGill University	2008
BIZAGI PROCESS MODELER	Bizagi	2.3
BOUML	Bruno Pagès	
BUSINESS PROCESS ARCHITECT	Visual Paradigm	4,5
CADIFRA UML EDITOR	A. & F. Buehlmann	1.3.3
CASE COMPLETE	Serlio Software	7.0
CONCEPT DRAW	CS Odessa	9
DB CONSTRUCTOR	DBDeveloper Solutions	
ER/STUDIO SOFTWARE ARCHITECT	Embarcadero Technologies	1.1.0
ER/STUDIO BUSINESS ARCHITECT	Embarcadero Technologies	1.7.0
GENERIC MODELING ENVIRONMENT	Vanderbilt University	10.8
IGRAFIX PROCESS	iGrafix	2011
MARAM METAMODELING TOOLS	Auckland University	
METAEDIT+	MetaCase	5.0
MICROSOFT VISIO	Microsoft	2010
VISUALIZATION TOOL META MODELING SDK	Microsoft Corporation	VS 2011-2012
VISUAL USE CASE	TechnoSolutions	4.069 (2009)
YED	yWorks	3.9.2
RISE	RISE to Bloome Software	4.5
UML LAB	Yatta Solutions	1.4.3
PROCESS MODELER	itp commerce	5
CLOOCA	Clooca	2

The process of identifying, choosing Domains, clearing among the systems in the domain is called domain analysis. The information from the DSM will be taken in the models that are used in the Domain implementation phase to create artifacts such as reusable code creation, a new application generators that can be used to build new systems in the area of Domain model Engineering work. [26]The Domain-Specific Languages create successful generation of summary code recyclable size, in both number of methods and number of packages, presentation and social effort for software development will be reduced by 45%, and the total number of lines of code also reduced by nearly 55% these are the benefits of the DSM.

Domain engineering focuses on capturing knowledge gathered during the software engineering process. By budding new developed software systems at low cost and high quality. The growth of data usage over the Web and the growth of the internet the usage of domain engineering approach is attractive relevant to other disciplines as well as in the application creation stage. The emergence trends of deep chains of Web services highlights that Domain service concept is relative simple and easier. [19]Web services are industrialized and controlled by one group can be used as part of a platform by additional suggestion. As metamodeling services may be used in different settings and hence require different outlines, the design of families of services may benefit from a domain engineering approach.

Table. 2
Import and Export formats of metaCASE modeling tool

Agilian

Import	Rational Rose (mdl), rational DNX, XML, EclipseUML, MSExcel, netbeans6.x.
Export	BPMN 2.0, XMI, ZIP projectarchive, MS Excel, Eclipse UML.

Business Process Visual Architect

Import	XML with specific schema, UML.
Export	ADF, XML, Visioo, Bpel, ADB.

ConceptDraw

Import	Visioo(VDX), MSpowerpointmicrosoft.
Export	CDX file, XML, MSPowerPoint, Visioo

iGrafix Proceess

Import	Visioo models and Metamodels
Export	BPEL, XML, XPDL

MetaEdit+

Import	GXL-adapted
Export	GXL-adapted

Clooca

Import	Node.js, class, NXT
Export	C,C++,java

Domain can be a technical domain or non technical domain, these two categories are classifieds with the real worl domains such as commercial domain, such as corporate banking domain, [30] telecommunication domains, robot control applications (high level), insurance or retail industry application domain. In everyday use of each domain keys focuses on even smaller domains because the developer focus and enables better possibilities for automation and they are also easier to outline and generate application coding. Usually, DSM solutions are used in relation to a specific product, creation line,

target background or platform.

3 RATIONAL SOFTWARE ARCHITECTURE

Rational Software Architecture (RSA) is a UML 2.0 combined software improvement stage, it built on top of the Eclipse stage RSA delivers the UML allowance tool and allows designer to produce, edit for created profiles. [10]The tool platform provides various features, together with packing, legalizing so on drag and drop from explorer to publishing supervisor, confirmation, manufacture, belongings and connection sheet, etc.

Fig. 1. RSA Architecture of metaCASE creation.
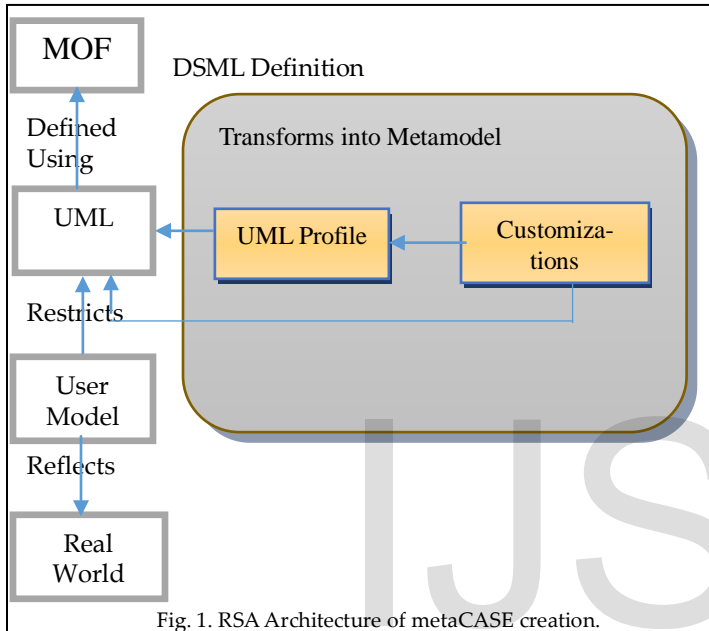
The customization on one hand it transforms stereotypes to new metamodel elements by defining customization classes for stereotypes on the other hand it restricts the UML metamodel by hiding unnecessary languages parts and enabling certain rules for relating UML elements to the new domain-specific elements. [12]RSA does not support custom restrictions on contacts, flair, and custom affiliation, it also denotes to a diagram editor called tooling model, to create custom Platte entries, list of options item, and creation supporters.

UML-based software engineering is an extension of .UML can comprise more than a few submissions into a domain. Identifying the similarities and differences between the application mostly using Use Case diagrams

Advantages:

- The method and useses of UML principle programs, which styles it easier to use, create the skeleton.

Disadvantages:

- This technique are used in different places and maybe we don't need all of them in order to achieve our goal

4 ECLIPSE MODELING FRAMEWORK

Eclipse is an open source and extensible java based platform that offers several useful service area for the con-

struction of textual or metamodel copyreader. [2]Eclipse has its private IDE platform for java programme development and execution EMF will allows you to input or import our designed data model, and it can generate simple table based editors and an XMI schema for such created model. EMF which will provide a data entry and packing environment for the selected metamodel and EMF code generator can generate the editor for data subsequent the schema design. [5]The editor can uses the designed classes' form the EMF model or it can edit, understanding background to offer standard board and property leaf for the designer. If the formed code is inadequate for application development, we can add your own manual handwritten code, the designed code provides correctly well-designed finished application, and the code creator will not overwrite your handwritten code when the schema is updated or regenerated.

Fig. 2. EMF Architecture for modeling tool
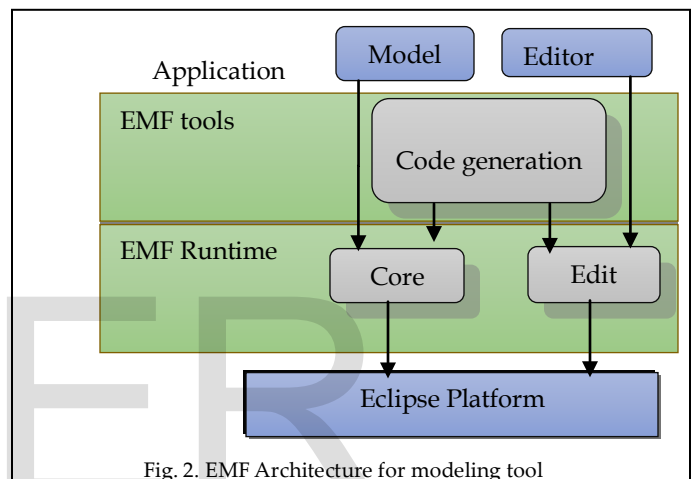
EMF is an EMOF implementation and code generation capability for designing and building tools and other applications based on a structured data model for generation. It support runtime creation for the domain specific modeling language

GEF: it provide the graphical support needed for building a diagram editor on top of the EMF framework.

GMF Tooling: The GMF Tools project provides a model-driven approach to develop and generating graphical editors in Eclipse, graphical plan and scheduling model definition, these can generate a fully functional code for the designed graphical editor based on the GMF Runtime environment.

GMF Notation: The GMF Notation Project provides a standard EMF notational metamodel. The notational metamodel is a standard means for persisting diagram information separately from the domain model. [30]It was based on the principles in the OMG Diagram Interchange Specification.

EMF Components:

Core runtime:

- Notification framework
- Ecore metamodel

- XML/XMI, validation, change model

EMF Edit

- EMF framework support for meta-model based editors and viewers.
- Default reflective editor

Code generation

- Code generator framework for model application and editors.
- It can be more changeable model framework importer/exporter is available.

Generator features

- Customizable, JSP template.
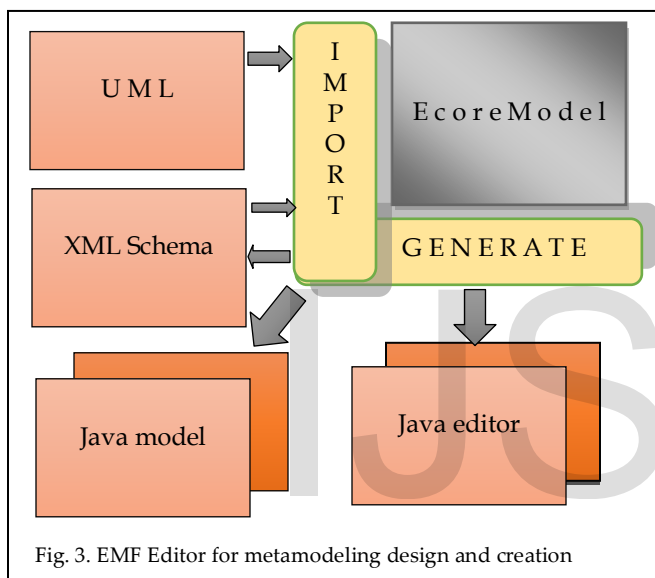- JTD integrated command line.
- Full support for regeneration and merge.

Fig. 3. EMF Editor for metamodeling design and creation

5 GENERIC MODELING ENVIRONMENT

The Generic Modeling Environment (GME), is a Windows-based, domain specific, model program tool for forming and growing domain specific models. [25]The GME is user editable it launches user to swift, plan new modeling languages using other support based metamodel designed project application, which means it can be programmed to work with greatly different Domains concepts. GME was developed by the institute for software integrated systems. Another important feature is that GME models are generated from official modeling platform qualifications, it is the part of the GME metamodel editor tool suit. The GME includes several features. It allows inclusion (import/export) different schemes in order to create applications in a specific domain. [15]The program generates rather extensive models, which includes graphical representation of the domain model, together with syntax and semantics for additional explanation of code and domain making. In the first stage of the tool must build a metamodel for the selected application, which defines the type of the project or application for manipulative, form and characteristics of the objects that will be used in the distinct meta-CASE models. Furthermore, one essentialy outline and display

of the associations between the objects and the platform boundaries for the models structure and storage period of metamodel. [19]Using the metamodel can generates a Generic Modeling Environment application for the certain domain, which enables the generation of models exactly for the domain environment. That is after an iterative process of modification and improvement product quality.

GME is a model-integrated, program combination tool for creating domain-specific modeling language, which maintenance higher-level ideas than universal determination programming languages (such as C++/C and Java) and general-purpose modeling languages (such as UML), so they need less effort and less low-level details to develop a specified metamodel system into application. [11]GME also allows users to define new modeling languages using metamodel environment, which describe the rules for affiliation, constrictions for clarification, and notions appropriate and valuable for modeling a class of problems. EMF only provide part of the solution for DSM-data filling, characteristic sheets, and hierarchy based browsing or table based browsing, and code generation framework will help to create self-generated code. GEF provides the graphical support for the designing or impoting a diagram editor on top of the EMF framework
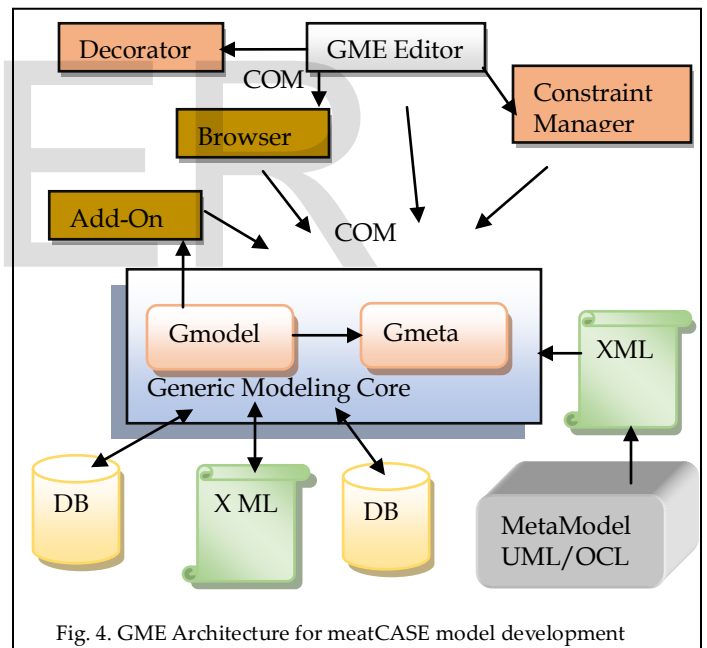

Fig. 4. GME Architecture for meatCASE model development

Advantages

- The unique display enables visualization in different levels of abstraction and in different intersections. Meaning, one can see the entire domain or just a specific application on one hand and can see only components related to a specific attribute on the different side.
- GME allows using object-oriented modeling, so it relatively meets our needs.
- The iterative process for GME developments helps in spending the models, as knowledge is being collected and since our work.

Disadvantages

- The tool gives an extremely wide freedom of action and the variety of possibilities might confuse the user.

5 METAEDIT+

MetaEdit+ is the most widely-used commercial meta-CASE tool was built on the principal that all CASE tools are essentially the same can put objects on a diagram. The principle of GOPPRR method, [12]it includes general CASE for object and connections for the diagram editor, object model and graph browsers dialogs. The DSM metaCASE developer need only specify the modeling language. It also includes common features can import and export. The code producer uses a Domain Specific language that allows the Domain Specific modeling creator to specify how to walk through models and output their contents along with other text. This makes defining code creators with simple corrector, the one line of a code generator definition matching to several lines in the scripting languages sometimes used for this purpose. [3]As the generator hasn't idea around the metaCASE modeling language, code language, or outline the code determination run on top of, the DSM developer has wide-ranging freedom to produce the best code possible from this procedure. The principles founded on the domain is defined using forms that strip the domain into more than a few altered ideas: Objects, Properties, and Associations between the objects, the Roles of the objects in the relationships and the Constraints on those associations. In addition, the associations over the metamodel and the links are viewed graphically same way we can edit the graphical model for the user necessities. Finally, after all the metamodel classifications are completed, the MetaEdit+ tool creation program produces code mechanically and easily for the designed model if any extra design needs ourself can enter and run it successfully.
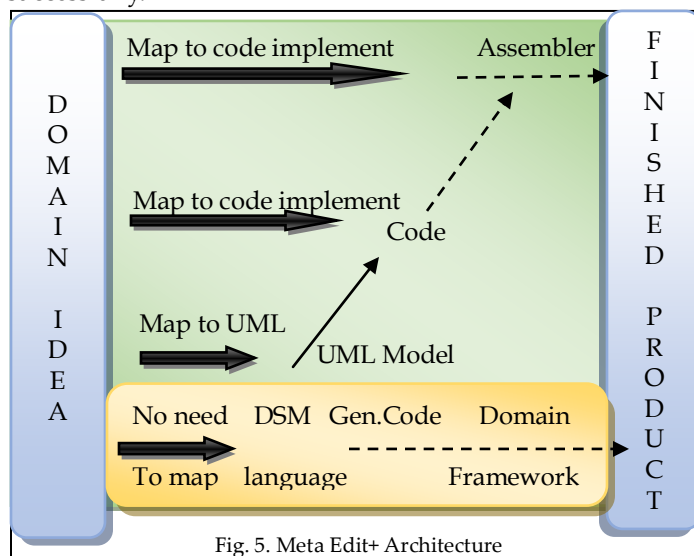

Fig. 5. Meta Edit+ Architecture

Advantages
- The automatic code generation helps a lot in the latter stages of the development.

Disadvantages
- There is no location to applications end the apparatuses that are included in the domain.

6 CLOOCA

It is a web based tool for Domain Specific Modeling, everybody can find suitable DSML explanations on the cloud working environment, and DSML improve productivity and quality of software because the source code was generated from intellectual intended model. [17]Presently certain tool cloud oriented tools to develop software are provided as web services. We can use the tool without put in any of the computer system software and without professional knowledge of software development. It will easily create corresponding language for the model.
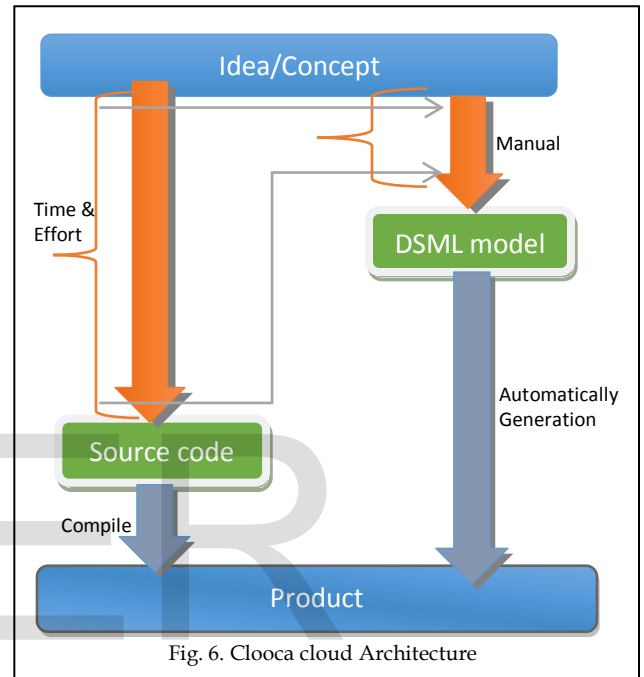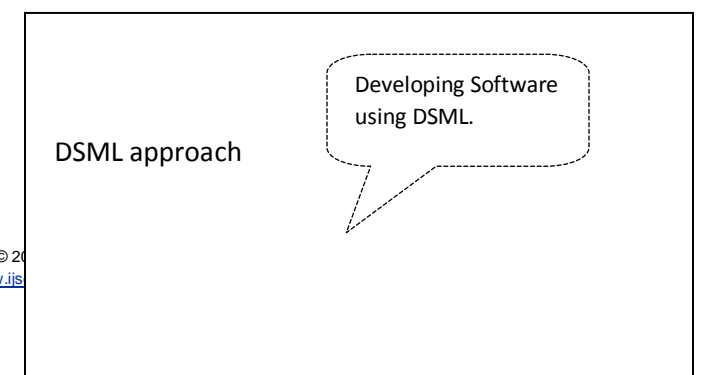

Fig. 6. Clooca cloud Architecture

Clooca development location that permits to form up Domain-Specific Modeling languages, and their code creators. Clooca was provided that as a facilities linked to Gmail, Google (web services). [27]It is simple to design the metamodel we can open from web browser then select the tool and environment where we want to design and develop, it is providing many benefits for using the development tool from the cloud environment. DSML tool has two benefits the everyone can define a modeling language according to level of ability second it can generate fully functional codes from these models itself and this environment includes new developing application android
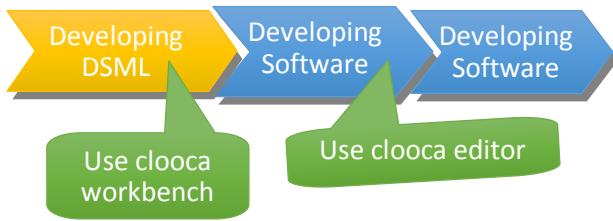
Fig. 7. Clooca cloud environment Editor

The clooca architecture contains server runs on web servers such as apache and stored models and meta-models from clooca client. The clooca client runs on web browser that support HTML5 and Java Script language, it contains workbench and model editor.

Clooca Editor:

- Evolving DSML : The developing environment support default tool stofage in cloud
  NODCA based application,
  Linetracer Robotic application,
  Android application development so on categories can be used to generate the coud platform
- Evolving Software : The metaCASE metamodel platform includes the clooca editor and clooca workbench both are used to design and generate corresponding metamodel and generate the programming code for easier use.

7 DSM TOOL COMPARISON

Domain-specific modelling languages represent a powerful way to designing abilities of expert developers, previously DSM was largely only applicable to a small area. [30]The current improvements, advantages in metaCASE equipment significantly increase the range of applicability to perform the related task easier for this approach. The up-to-date methodology of metaCASE environment for evolving application which can reduce the time and effort required to develop a Domain-Specific Modeling technique project, along with its tool support and code generation. Industrial applications of this approach show remarkable improvements in productivity and designing time, comparing to others product became ten times faster in both cases. [11]The benefits to industry of such a growth in output productivity are clear, mainly in areas of fast growing technological model development and tiny product lifetime. In an area of rapid change and high employee turnover, the value of greatly reduced training and generation periods is also very considerable. Domain-Specific Modelling also provides a better role for expert developer's side for the application development.

Table. 3

Comparison for different metamodeling DSM tools

DSM TOOLS

GME	MetaEdit	EMF	CLOOCA
GME 14 is the latest version. In every version GME is improving to meet challenges not freeware	Metaedit 5 is not free ware however evolution version is available for research work last version came in 2005	IBM company introduced. Hence it is lack in many recent developments	Clooca is a freeware platform founded in July 2013, it used to generate android based application so on.
Objects diagrams are available we can utilize it for modelling	For each model we have to draw own object and relation this will be time taking	Some extend object diagram are available we can draw new object diagram also.	Extended object diagram remains exists, we can use it
Data Dictionary is available	Data Dictionary is available	Shelf for application Data Dictionary for framework are available	Data Dictionary is available
Not available it is one of the formal design document	Not available it is one of the formal design document	Available it is one of the formal design document	Not Available it have default design model.
UML	UML OOAD OOD OMT OOSA SAD	Java , Eclipse IDE	Nodeca, Java, XML, NXT
Final code can be generated in C++	C++, Smalltalk, CORBA IDL, Java, and Delphi	JAVA	C++,Java,C
It is some range user friendly	More user friendly all helps are available to make operation easy	It is some extent user friendly	It is some extent user friendly.
Once Domain expert arrive a meta model easy to reuse it	Once Domain expert arrive a meta model easy to reuse it	A Domain expert can handle a meta model data and they can reuse it for	Once Domain expert arrive a meta model easy to

Example Watch Model	other model.	reuse it	
Reverse Engineering is not available To be improved	Reverse Engineering is not available To be improved	Since it is not improved after 1995 most of the recent feature is not available	Not existing
Not existing	Commit and abandon are available no roll back Mechanism existing	Not existing	Available
No Security measure available	In Meta Edit Startup Launcher Provide Security	No Security measure available	Yes Security is available like, public, protected.
Windows NT/95/98	Windows NT/95/98 & Unix	Linux, Windows NT/95/98, UNIX & Mac OS	High Speed Internet with Latest web browser.

8 CONCLUSION

One of the first popular profitable tools in DSM area creation was Meta-CASE is MetaEdit+. The tool MetaEdit+ allows to creating a well-defined Domain Specific Language as separate Metamodel from the selected data warehouse. It also have the ability to specify graphical representation for the DSML constructs as well as defined semantic on the created or imported metamodel, which can be later used for validation purposes, and specifying a code generator. The code generator will convert the user designed or imported model into the code model and the generate code. It can be tested in the MetaEdit+ tool itself for decrease human finished faults. The created models have more widespread framework called GOPPRR is available in MetaEdit+ data Warehouse place, organized with GMF and GMT projects. It can also be used for achieving analogs results as with the MetaEdit+ tool. Eclipse offers the Ecore metamodel which is actually alight version of MOF for building DSML the GMF structure for model variations and alteration Microsoft DSL tools offers an another option for the creation of DSL. It offers a lightweight and time saving technique approach for the application development.
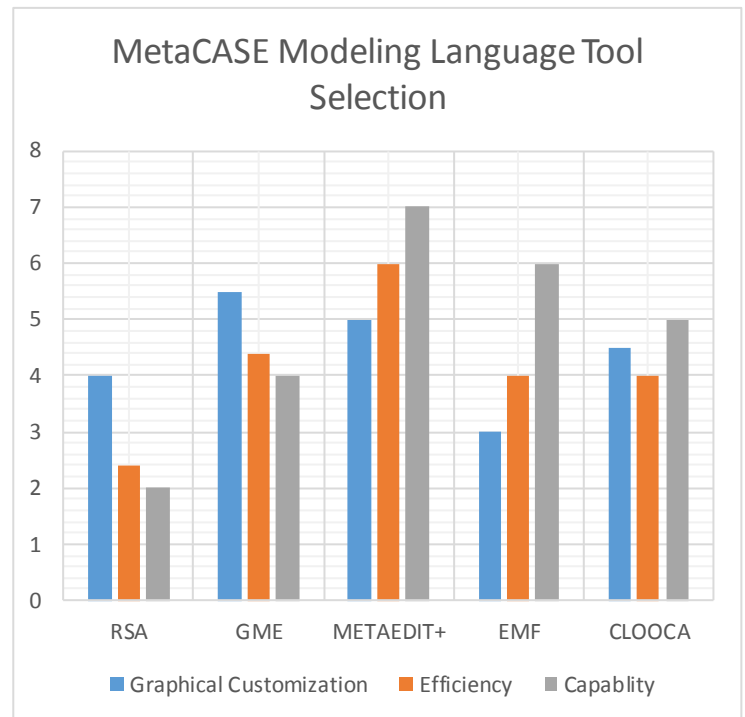
MetaCASE Modeling Language Tool Selection

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