# Application of Abelian's Mechanism on Multidimensional Online Analytical Processing(MOLAP) for Decision Support System.

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## Abstract

This research paper focuses and taken care of Abelian's finite group addition Mudulo application over a MOLAP Mechanism to solved the uncertainty, unordered metadata. The proposed Abelian's mechanism is a great contribution over the Product, Location, and Time&others resources to resolve the unordered, uncertainty at the right time in the right way by applying anAbelian's Group addition modulo on the attributes of MOLAP. This attribute of the MOLAP mechanism is the process of communicating, mediating, and transforming every requirement of the Business Process in the field of data science at any time around the clock. The Abelian Model will determine the Business and DSS response as well as qualities of services (QoS) to be invested into a data science frequent pattern mechanisms deciding on the major components of Product, Vendor, Order, Sales, Location, and Time (MOLAP) anywhere of the globe. The attributes of the MOLAP is directly proportional to a set of DSS. The attributes about attributes (Meta Attributes) provides predication of current and future demand of business process in the field of data science. This Abelian Model improve the standardization, optimization, and normalization simultaneously for better decision support system

Keywords: Multidimensional On Line Analytical Processing(MOLAP), Decision support system, Abelian Theorem, Sets Relation, Partial Order Set (POS), Circular Queue.

## 1.Introduction

This proposed research project focuses and taken care of classification, identifications, pattern matching, and optimization of heterogeneous data by applying the Abelian Method. The Abelian Model and Mechanism will be resolve the MIS, EIS, DSS, frequent pattern matching, and optimization, which is a great success in the field of data science. This research proposal facilitating, normalizing, optimizing the MOLAPby implementing Abelian Model & Mechanism to achieve the betterment of DDSS. The data science is resolvingmajors issue of MIS, EIS, and DSS [1-3]

The mathematics and statistics are very important in the field of data science as concepts within mathematical modelling and mechanisms to supports in identifying classification,frequent patterns and assist in generating and developing algorithms. The understanding of various notions of Mathematics, Statistics, Combinatorial Algebra, and Probability Theory are keys areasfor the application in the field of data science and data engineering. It is covering wide range of areas like, Artificial Intelligence, Machine Learning, Neural Network, Data Mining, and BigData. Finally, all of them resolved by Mathematics and Statistics to achieve the decision support system for better management.The present demand seems to be never-ending, with the real world predicted to face a challenges in the

shortage of data science researcher in the near future.The Data Science is undoubtedly becoming one of the high in-demand areas in the rapidly growth of business as well as technology simultaneously.

Beyond the basics of mathematics, statistics, combinometric, calculus, linear algebra, and probability, there is a certain kind of mathematical thinking that comes up pretty often that world is trying to understand about the data about data (Meta Data). Byapplying mathematicalapplication, the researchers are organising, classifying, determining, and identifying the quality of metadata[13-14]. The most of the interesting part quantifying and qualifying somethingby help of mathematics that is called data science.Today data scientists are working hard to develop new solutions to process and store large amount of data using new techniques[37].

1,1 MOLAP

The MOLAP is the subset of data science, which is generating business data for top management. The relation, function, operation, services are working all together on MOLAP to produce quality of metadata. There is much more mathematical application like Abelian's Group, Group & Subgroup, Cyclic group, Partial Order Set, Combinometry, and Cartesian product are great support to achieve required metadata from MOLAP Cube. The major role of Abelian Group, functional dependency, relation, functions , Set, Group, Partial order set, permutation, and combination are generating, classifying, identifying, and frequent pattern matching to achieve the desired metadata for dynamic decision support system. In this following multidimensional cube, the Location(L), Product(P) and Time(T) are organised in X, Y, and Z axis receptively.. The objects, subjects, input, output and domain & range would be mapping orderly to integrating, communicating, transforming & synchronizing among (MOLAP)resources (P, L & T)[7-9].

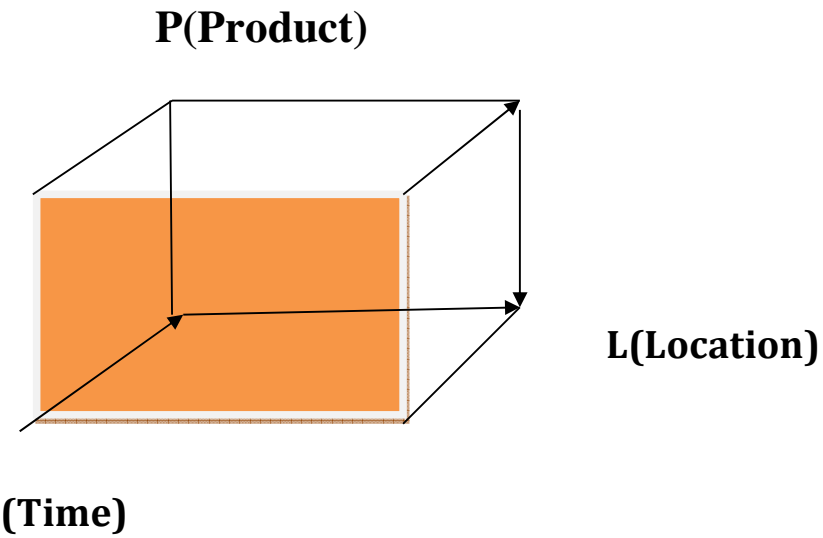


**Figure 1: Multi-dimensional Cube**

## 2. Related Theoretical Work:

The purpose of the multi-dimensional mechanism is to renormalized the data for faster generating, classifying, pattern matching of frequent pattern metadata. The objective of the multi-dimensional mmodeling was developed by Ralph Kimball and consists of "FACT" and "Dimensional" tables. The MOLAP has all possible combinations (Abelian Group, & Combinatorial) of data already stored in a multidimensional array. The MOLAP can access this data directly as per requirement[7-8].

## Mathematical Development for MOLAP

The majors role of Abelian's Group, Cartesian Product, Partial Order Sets are generating, classifying, identifying, and frequent pattern matching to achieve the desired metadata for dynamic decision support system. In this following multidimensional cube, the Location(L), Product(P) and Time(T) are organised in X, Y, and Z axis receptively. The objects, subjects, input, output and domain & range would be mapping orderly to integrating, communicating, transforming & synchronizing among (MOLAP)resources (P, L & T).

## 2.1Cartesian product

The Cartesian Product applied to the sets and relations, database, and co-ordinates geometry The coordinate system we commonly use is called the Cartesian system, after the French mathematician René Descartes (1596-1650), who developed it in the 17th century. but the Cartesian system was not implemented on MOLAP at that time. I am applying this coordinate system theory in to Metadata sets, MOLAP, and DSS. Finally, René Descartes analytic geometrical theory implementing for data science field.

We will use this example to study other types of relations as well.

Let's consider set A as follows:

A = {P,L,T}

If we perform the Cartesian product of set A by itself, then the resulting set would be:

A*A = {(P,P),(P,L),(P,T),(L,P),(L,L),(L,T),(T,L),(T,L),(T,T)}

We could also represent the resulting set as a matrix, as follows:

Table 1: Cartesian product of set A with itself (AxA)

| | P | L | T | X1 | X2 |
|---|---|---|---|---|---|
| P | **PP** | **PL** | **PT** | **LT** | **XZ** |
| L | **LP** | **LL** | **LT** | **PT** | **YZ** |
| T | **TP** | **TL** | **TT** | **LP** | **XY** |

Then the reflexive pairs in A*A would be all the diagonal elements of the matrix, i.e. {(P,P),(L,L,(T,T)} AS EVERY ELEMENT RELATES TO ITSELF. The Cartesian product satisfying the MOLAP business processing for generating meta data sets (PLT)

## 3.Related Literature Survey for MOLAP Analysis

Every organization grows with the demand of business, technology and resources. Now a day, Information and services is a top priority for each and every organization. The data analysis is the most important and helpful scenario to any organization. The management information system and decision supports is a set of business process, procedures, policy, personnel, business and technology applied to the characteristics of Mathematics (Data Science). The necessity of dynamic decision system in any organization has increased because of the changes in logic, structure, programming and type of technology applied into services that generates metadata. Finally, the business increases along with technology, which creates metadata and spread over the business, technology and resources for betterment of management (Ravi, 2006).

In this research paper, The Abelian's finite group, Partial order sets, Circular queue, and Cartesian Product are the majors role to resolve the uncertain, unordered meta data sets. We are going to apply these mathematical principle to achieve the data science concepts to resolve business process (Roy, 2003).The major role of the Abelian's Group, functional dependency, relation, function , Set, Group, , Subgroup, Partial order set, permutation, and combination are identifying, generating, classifying, and frequent pattern matching to achieve the desired metadata sets for dynamic decision support system over the MOLAP. In this propose multi-dimensional cube, the Location(L), Product(P) and Time(T) are organised in X, Y, and Z axis receptively to meet the business process.

## 4. Problem Statements

There is a vital issue regarding the resource allocations of the multiple attributesof MOLAP at various level of resources management (Developer, Top, Medium & Lower mgmt.).

We can conclude that the existing literature survey, there are many problems are reflected and unsolvable till now. Therefore the, MIS, OLTP, OLAP and current decision support system are problematic with the following points. The OLTP and MIS data quality are poor, Uncertainty,

disintegration, unstructured, unclassified, unordered, andstatic system is not properly identified and classified as per top management desired manner.

- Large reference Integrity is one of the key dependencies, but theoretically, association, dependency has no life but in composition and aggression have life.
- OLTP, EDP, MIS, EIS, DSS are not supporting frequent multi pattern data analysis.
- The scalability, transformation, integrity, mapping, and reliabilities Issue in data and information.
- Problem in Identification and Classification of Objects & Devices which is not available of traditional database.
- Inconsistency data and information degrade the performance of the large network as well as large operating system.
- Issue on efficiency and effectiveness of data as well as information.
- Dirty data over a OLTP( Unstructured andUnunification issue).
- OLTP Running the business, but OLAP Analysis the Business ( Both operation and analysis are not resolving by OLTP and OLAP)
- Data is rich and information is poor.

## 5. Research Statement

The objective of the Research is that the Abelian Group applied to MOLAP and generates the decision support metadata.We have to make sure that raw data (OLTP) for customer , metadata( MOLAP), and information, operation and services should be help to the top management for all the time and every time. The attributes of MOLAP based datasets, that provides the dynamic decision support to the top management. When datasets are increasing that time the DSS is increasing in the proportionalway We have to focus, taken care and emphasize the frequent generation of metadata (candidate key) and frequent pattern that should be build anti fragile mechanism for DDSS.

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### 5.1 Research Methodology

We have to define, design, develop and deployment the various attributes on MOLAP Mechanism and fix up these attributes at optimal level for better, scalable,reliable and high available operation and services. Meanwhile, we can maintain the mapping and integration by applying relational algebra method & mechanisms on MOLAP to maximize the decision mgmt to achieve the highest business objective.

**Proposed Research Methodology**

We have to move forward to finding alternate solution and algorithm for MIS, EIS, and DSS data analysis based on the Abelian Group and relational algebra. This reliable, transformation, and scalable complex PLT definitely will be resolve our purpose on complex real time analysis for multiple Product, Location, and Time for all the times. We have to design and develop these seven objects is a set of elements as follows: {{ P, L, T, PL, LT, PT, PLT}. This seven objects ordering (Relation & Function) apply to our designing methodology and as per top management decision and requirement of the current and future business.

Prove that the set { 1, 2, 3, 4, 5, 6, 7} = {{ P, L, T, PL, LT, PT, PLT}. is a finite Abelian ( Addition Mudulo) combinatory order& unordered composition. Whereas, S = { 1, 2, 3, 4, 5, 6, 7} = {{ P, L, T, PL, LT, PT, PLT}.

We have to define, design, develop and deployment the large datasets, key parameter, pattern, mechanism, relation, function, operation &services to fix up dynamic, integration, structure, classification, frequent pattern by applying Abelian Algebrabased on MOLAP concepts. Meanwhile, we can maintain the organizational DSS by applying automated method, model, mechanism (M^3) & tools on Real Time system to maximize the decision management to achieve the highest business objective.

This research paper contributes to the define, design, development of an optimization and normalization model that aims and objective to determine the optimal cost, time and maximize the Quality of Service to be implemented into the dynamic DSS model & mechanisms deciding on the measure components of MIS, DSS, EIS, and OLTP as follows.

C = Customer, O=Order, V = Vendor, P=Product, S=Sale, L=Location and T=Time,

Let us take a relation R (C, O, L, V, P, S,T); we have following dependencies for a relation R, and we have checked each for being candidate key. These parameters applied to the Abelian Mechanism to achieve DDSS.

**Define the Abelian System**

- Prove that the set { 1, 2, 3, 4,5,6,7} is finite Abelian Group of order 7 under addition modulo 5 as composition.
- Solution. To test the nature of the system ( G, $+_7$ ) where G = { 1,2,3,4,5,6,7}
- We have the following composition table: The composition is associative and commutative.

Table 2: Implementation of Abelian Group on MOLAP to achieve the Data Science

| $+_7$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 |
| 2 | 3 | 4 | 5 | 6 | 7 | 0 | 1 |
| 3 | 4 | 5 | 6 | 7 | 0 | 1 | 2 |
| 4 | 5 | 6 | 7 | 0 | 1 | 2 | 3 |
| 5 | 6 | 7 | 0 | 1 | 2 | 3 | 4 |
| 6 | 7 | 0 | 1 | 2 | 3 | 3 | 5 |
| 7 | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

Where as, P = Product(Item), L = Location, T= Time, C= Customer, S=Sale, O=Order, V= Vendor

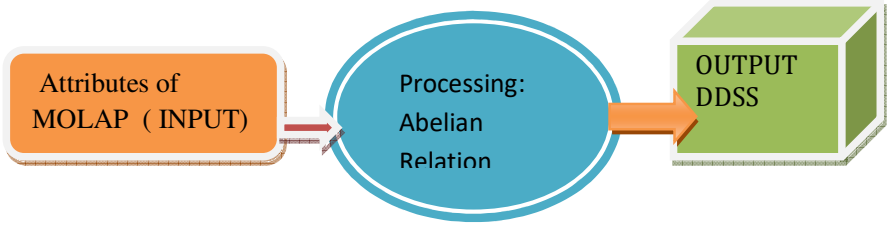


Figure 2: Frame work

The inputs are attributes of MOLAP Mechanism applied to the Abelian Addition Modulo to achieve the Business Pattern & Process. We have to prove that the Abelian Group resolving the various business pattern based on MOLAP mechanism. The Abelian, Addition Modulo, Cartesian product, Circular queue, and partial Order Sets resolving our objective to get the right business pattern for our dynamic decision support system. The Associative, Distributive, and TransitiveLaw very much helping to prove the Abelian's Mechanism for right business patterns.

## Table 3: Design the MOLAP Based on Abelian Model

| +7 | P | L | T | C | S | O | V |
|---|---|---|---|---|---|---|---|
| P | L | T | C | S | O | V | 0 |
| L | T | C | S | O | V | 0 | P |
| T | C | S | O | V | 0 | P | L |
| C | S | O | V | 0 | P | L | T |
| S | O | V | 0 | P | L | T | C |
| O | V | 0 | P | L | T | C | S |
| V | 0 | P | L | T | C | C | O |

## MOLAP Model Based on Abelian Combinational Algebra

The Abelian's Addition Modulo, Cartesian Product, Circular Queue, and partial Order Sets resolving the uncertain, unordered relationshipand achieving the right business pattern for our dynamic decision support system.

Table 4: Application of Abelian's Group on MOLAP to achieve the DDSS

| +7 | P | L | T | C | S | O | V |
|---|---|---|---|---|---|---|---|
| P | L | T | C | S | O | V | 0 |
| L | T | C | S | O | V | 0 | P |
| T | C | S | O | V | 0 | P | L |
| C | S | O | V | 0 | P | L | T |
| S | O | V | 0 | P | L | T | C |
| V | V | 0 | P | L | T | C | S |
| | 0 | P | L | T | C | C | O |

**This above table producing right business pattern to resolve the DDSS.**

**Development**

**PLT**: (Product(Item), Location, Time)

Associative Law: (P U L) U T = P U ( L U T) , (P ∩ L) ∩ T = P ∩ (L ∩ T)

Distributive Law: P U (L ∩ T) = (P U L ) ∩ (P U T) , P ∩ ( L U T ) = ( P ∩ L ) U ( P ∩ L)

Transitivity Law: (P, L) € R ) and (L, T ) € R => (P, T) € R.

The above Associative, Distributive, and Transitivity satisfying the attributes of MOLAP for better business pattern for better decision support system.

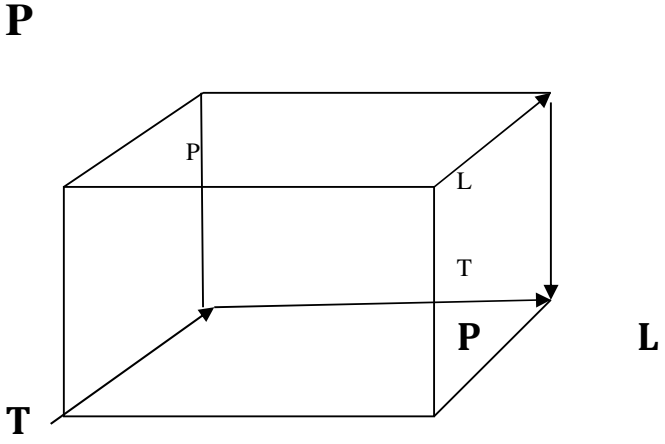



Figure 3 MOLAP Working as per requirement

The inputs are attributes of MOLAP Mechanism applied to the Abelian Addition Modulo to achieve the Business Pattern & Process. We have to prove that the Abelian Group resolving the various business pattern based on MOLAP mechanism. The Abelian, Addition Modulo, Cartesian product, Circular queue, and partial Order Sets resolving our objective to get the right business pattern for our dynamic decision support system. The Associative, Distributive, and Transitive Law very strong supportive to prove the Abelian's Mechanism for right business patterns.

Table 5 Reorganised the a MOLAP

| O | P | L | T | C | S | O | V |
|---|---|---|---|---|---|---|---|
| P | C | S | O | V | P | L | T |
| L | S | O | V | P | L | T | C |
| T | O | V | P | L | T | C | S |
| C | V | P | L | T | C | S | O |
| S | P | L | T | C | S | O | V |
| O | L | T | C | S | O | V | P |
| V | T | C | S | O | C | P | L |

The Abelian's Model will beestablished the Business Process and response as well as qualities of services (QoS) to be invested into the MOLAP frequent pattern mechanisms deciding on the major components of Product, Vendor, Order, Sales, Location, and Time on data science.

## Initialize the Pattern System

Application of Abelian Group on MOLAP to achieve the business pattern of Metadata set like Product, Vendor, Order, Sales, Location, and Time on data science.

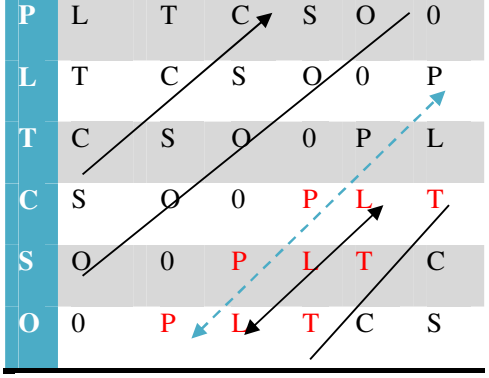
Table 6 MOLAP-Abelian

| | P | L | T | C | S | O | V |
|---|---|---|---|---|---|---|---|
| P | C | S | O | V | P | L | T |
| L | S | O | V | P | L | T | C |
| T | O | V | P | L | T | C | S |
| C | V | P | L | T | C | S | O |
| S | P | L | T | C | S | O | V |
| O | L | T | C | S | O | V | P |
| V | T | C | S | O | C | P | L |

Now, Eliminated the Vendor- Generating the Right Business Pattern – Metadata Sets on MOLAP.

Table 7 META DATA-PLT

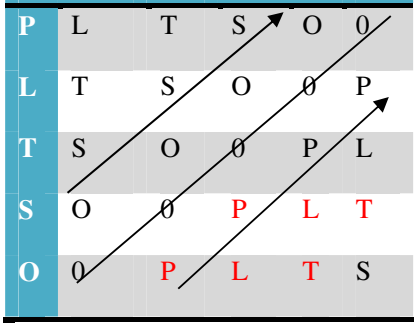
| +6 | P | L | T | C | S | O |
|---|---|---|---|---|---|---|
| P | L | T | C | S | O | 0 |
| L | T | C | S | O | 0 | P |
| T | C | S | O | 0 | P | L |
| C | S | O | 0 | P | L | T |
| S | O | 0 | P | L | T | C |
| O | 0 | P | L | T | C | S |



Generating Primary Pattern (PLT), Secondary Pattern (SCT) & (CLT), CST, CTL, & CSO.Now, Eliminated the Customer- Generating the Right Business Pattern – Metadata Sets on MOLAP

Table 8 META DATA PATTERN

| +5 | P | L | T | S | O |
|---|---|---|---|---|---|
| P | L | T | S | O | 0 |
| L | T | S | O | 0 | P |
| T | S | O | 0 | P | L |
| S | O | 0 | P | L | T |
| O | 0 | P | L | T | S |

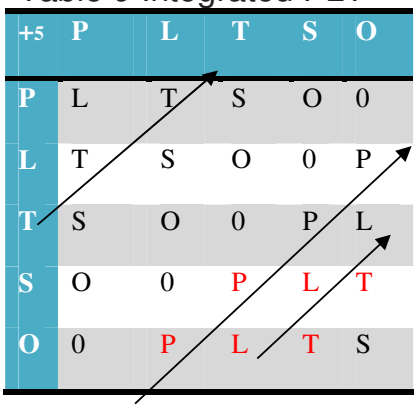


Generating Primary Pattern (PLT), Secondary Pattern (SLT), (SOP), (SOP)& (SOL)

Now Classifying, Optimizing the Better Pattern on MOLAP Related Dynamic Decision support system.

Now, Eliminated the Order- Generating the Right Business Pattern over the Metadata Sets(PLT) on MOLAP.

Table 9 Integrated PLT

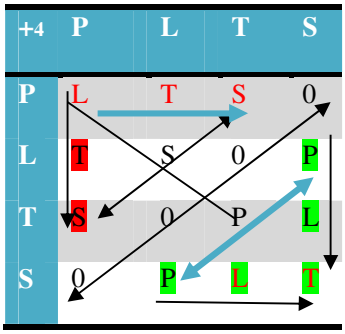


| +5 | P | L | T | S | O |
|---|---|---|---|---|---|
| P | L | T | S | O | 0 |
| L | T | S | O | 0 | P |
| T | S | O | 0 | P | L |
| S | O | 0 | P | L | T |
| O | 0 | P | L | T | S |

The major role of Abelian Group, functional dependency, relation, function , Set, Group, Partial order sets, permutation, and combination are generating, classifying, ordering, identifying, and frequent pattern matching to achieve the desired business pattern (metadata) for dynamic decision support system. In this following multidimensional cube, the Location(L), Product(P) and Time(T) are organised in X, Y, and Z axis receptively. The objects, subjects, input, output and domain & range would be mapping orderly to integrating, communicating, transforming & synchronizing among the various attributes and resources (P, L & T).

Now, Eliminated the Order- Generating the Right Business Pattern over the Metadata Sets(PLT) on MOLAP

Table 10 OPTIMAL PLT



| +4 | P | L | T | S |
|---|---|---|---|---|
| P | L | T | S | 0 |
| L | T | S | 0 | P |
| T | S | 0 | P | L |
| S | 0 | P | L | T |

Best Pattern, generating three dimensional pattern(PLT, SLT)

Generating Primary Pattern (PLT)=> PLT is forming Right Triangle which is satisfying to the MOLAP, Secondary Pattern (SLT) also forming Right Triangle which is also satisfying MOLAP. Product Pattern & Sales Pattern is maintaining balance now.
Product, Sales, & Location is the best pattern on MOLAP.

Sales, Location, & Time is the best pattern on MOLAP. Now proved it for PLT Pattern for MOLAP.

Now, Eliminated the Sales- Generating the Right Business Pattern over the Metadata Sets(PLT) on MOLAP.

Table 11 Two Dimensional Pattern

| +4 | P | L | T |
|---|---|---|---|
| P | L | T | 0 |
| L | T | 0 | P |
| T | 0 | P | L |

Now Generating two dimensional pattern, not much useful.

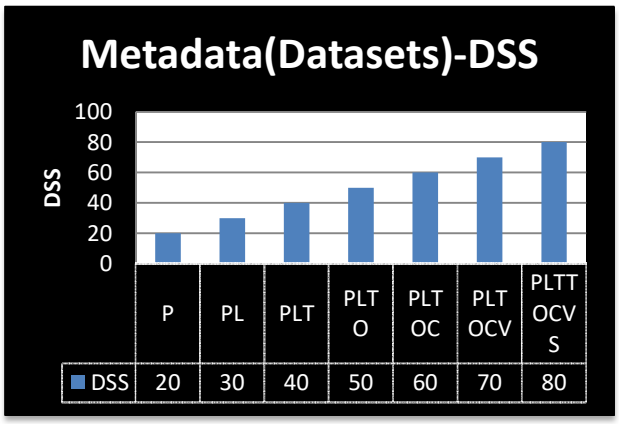
Now Generating two dimensional pattern, not much useful for DSS.

**Result Analysis.**

Now this proposed research paper improving the dynamic decision support system as well as maximize the data sets (DSS) system and optimized the cost as well as risk. The cost analysis and Risk will be optimized, when maximize the decision support system(Metadata). The maximum and stronger generation, classification of the attributes of MOLAP and frequent pattern establishing the Anti-Fragile relationships for business process for top management. We can apply the Fuzzy's system in optimization**.**Therefore,Abelian's finite group, Cartesian product and Circular Queue are applied to the MOLAP dataset evaluate the relationship among the various business process.

- Improve the meta data sets, order, sequence, classification, and patterns on MOLAP.Improve the metadata sets as well as quality of information.
- Improve the operation & services for DDSS.
- Improve the Business Pattern and Process.
- Faster reporting, analysis or planning for top management.
- More accurate reporting, analysis of current and future business forecasting.
- Better as well as stronger business decisions.
- Improve the visualization of Datasets for business forecasting
- Improved customer relationship and satisfaction.

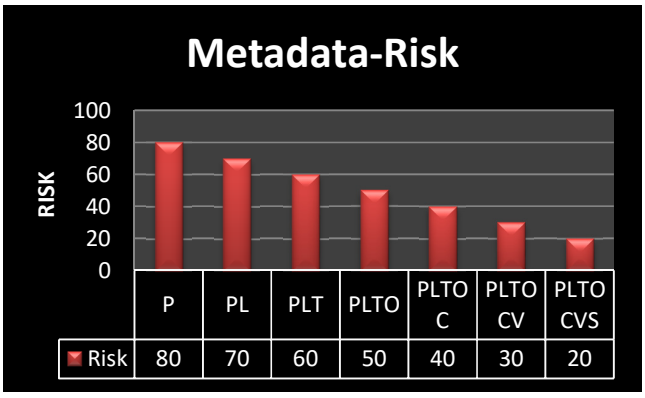
Graph-I




The Metadata(datasets) is directly proportional to the DSS%.

When a large datasets increases, meanwhile the classification, identification, sequencing, ordering, and business pattern matching and forming batter to butter and the decision support system will be increases.

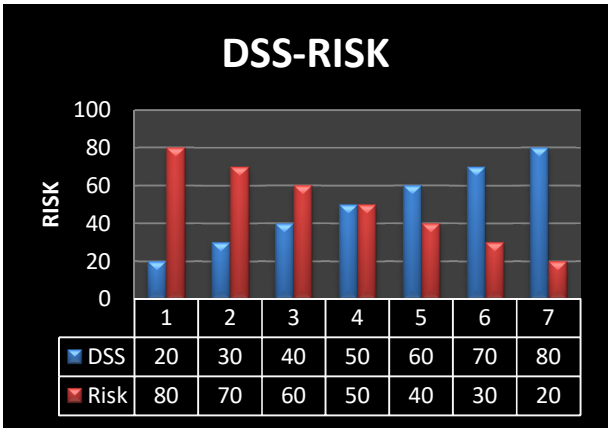
Graph-II




The Metadata(datasets) is inversely proportional to the RISK.

When a large datasets increases, meanwhile the classification, identification, sequencing, ordering, and business pattern matching and forming batter to butter and the Risk will be decreases.

Graph-III




The DSS is directly inversely proportional to the RISK%

When a large datasets increases, meanwhile the classification, identification, sequencing, ordering, and business pattern matching forming batter to butter and the Risk will be decreases and DSS will be increases.

## Benefits of MOLAP

- The relation, function, operation, and services are great contribution over the MOLAP for DDSS, which is great demand to top management.
- The MOLAP mechanism is generating and processing business pattern at the level of group and sub-group summarizing.
- The MOLAP metadata sets remove complexities of designing a relational database to store meta data for visual analysis.
- The MOLAP model implements two level of storage representation to manage dense and sparse data sets.
- The storage utilization can be low if the meta data sets are sparse.
- The Facts are stored in multi-dimensional array and dimensions used to query them for decision support system.
- The utilities of MOLAP:- Identify, classify, maximize, optimize the Business Process data as per desired manner.
- Identify the Grain, dimensions, fact, schema at the right time and right ways.
- The Metadata is pre-computed, re-summarized, and stored in a MOLAP.
- It helps in data visualization.

## Discussion

- The Scalability of MOLAP is a highly scalable framework for metadata sets.
- The Flexibility of MOLAP metadata programming enables customers to access new sources of metadata sets.
- **Top management and customer:**Cost-effective solution of meta data model
- Faster and better way analysis of metadata.
- Simpler meta data model of python programming.

- Supporting Parallel and distributed programming.
- High Availability, scalabilities, reliabilities, integration and resilient nature.

**Conclusion**

This proposed Abelian's Mechanism on MOLAP generating, classifying, frequent pattern mechanism&analysis providing the better and faster decision support system. This mechanism is accomplished through Real Time System that regenerate business process for dynamic decision support for top management. This business patterns are high availability, reliability, scalability, integration, and integrity are in the part of MOLAP. This research paper is more practical idea & less in theoretical approach as well as available in both analytical & graphical methods. The attributes of MOLAP (meta data) patterns are providing Dynamic decision support system based on business requirement. The attributes of theDSS that applied to the dynamic unordered, unsetup and uncertainty. In this way, we can achieve the operational and service goal and finally maintain the better services to top management.The frequent pattern is very helpful to the present dependable technology to co-op with the Abelian Algebra, Circular queues, Cartesian Product, and Combinational Algebra resolving to the unordered, uncertain environment as well as dynamic and self-autonomy system for Data Science for all the time on every times. This Abelian Mechanism highly resolving the DSS for top management to improve the business process, Quality of Service, scalability, reliability and availability for all the time.

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