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Developing a native ITSM Model for smart schools program applicable in developing countries

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ABSTRACT

This research, provided a proper procedure in order to build up an IT service management Model with the goal of developing a convenient model for the optimized deployment of the IT services in the smart schools plan imposed for the country. To achieve this goal, first, IT service management (ITSM) in general and IBM model in particular are introduced, Later on a generic model is presented for IT service management base on extraction and mapping among IBM model processes and IT services of the smart schools. Finally sample scenarios on administrative components are defined in the line of the strategic plans in order to analyze and evaluate the implementation of the proposed model.

Introduction

ITSM models, which are based on proper processes, lead to efficiency upgrade and performance and also decline risks while providing the IT services and products. In 1980, department of England government computer (OGC) innovated the first ITSM framework as a Infrastructure library of the information technology (ITIL), that is a formal set, the best functions and experiences for IT managers in optimization and management of the IT service representation[2,3,4,5,6].

On April 2008, IBM company printed and published IBM PRM-IT as a reference model or description and implementation of the IT service management processes. This framework provides an integrated set of active processes for optimized use of the IT service in an organization. PRM-IT includes 46 processes categorized by eight main groups [1].As shortly expressed below.

The governance and Management system process category defines a structure of relationships and processes to direct and control the IT undertaking. The Customer Relationships process category gives IT service providers a mechanism to understand, monitor, perform and compete effectively in the marketplace they serve. The Direction process category provides guidance on the external technology marketplace, aligns the IT outcomes to support the business strategy, minimizes risk exposures and IT Portfolio and the realization group process category exists to create solutions that will satisfy the requirements of IT customers and stakeholders. The Transition category of processes exists to support any aspect related to a life cycle status change in solutions and services. The operation category contains the processes that enable daily IT activities by using available infrastructure, applications, and services to meet service level agreements (SLAs) and business objectives. Processes of the resilience category has studied law matching, policies, methods and also the security level definition on IT services and information. The Administration process category brings together the processes that look after many of the nontechnical resources such as people, finances, contracts, skills and pricing [1].

On other hands, the computer development in all fields, leads to the school equipping to appropriate computer facilities. In 1984, David perkiness and his colleagues in Harvard University, works on the smart school plan as a modern experience in education by using ICT. This plan is performed in a few schools and gradually developed [29].

The smart school plan is a basic strategies of the fundamental evolution in the line of the education IT development document in country education system. The smart school is a school designed the deploy all processes such as management, teaching, learning, educational sources, evaluation, clerical affairs and document, their development bases and communications, based on ICT. The smart school plan is one that includes several IT services [29]. Therefore, a proper mapping between ITSM processes and IT services of smart school conducts to develop a model for IT service management that endures to recovery, upgrade, present, support and IT products and services. Section 2 of this paper includes cognition of the formation structure and IT Service of smart schools. In 3section, the proposed model is provided and analyzed based on IBM model in 4 layers. Section 4 also containing evaluated of the proposed model by provided scenarios related to execute components and the last section also includes conclusion and collection.

Identifying IT services of the smart school plan

Three basic committees and departments involved to provide IT products and services according to documents of the smart school plan [29]. ICT committee of education ministry is most steering committee related to IT service of the ministry. This committee Makes decision and guidance in the IT service field based on cultural and educational programs and determines perspectives, policies and strategic plans related to IT. Next lower Committee is ICT committee of smart schools that has the highest rank in dimension level of the smart school for guiding and making decision of these schools IT affairs and directs under supervision of the higher committee. In fact, this committee is responsible to provide and manage IT services for all users and customers of smart schools. In the lowest level, ICT committee of regions and city/state are responsible

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providing all needed IT services operational affairs for the smart schools.

In smart schools plan students, teachers, parent, educational contents, management and communications among schools are the elements that their IT services should be provided.

While students and teachers are the most important components who cultural and learning- teaching processes specially focus on them, the IT services that could be planned for these components are like electronic education and valuation, electronic unit selection and registration, students academic licenses and record card issue, electronic valuation and education.

The IT processes that related to electronic contents including create, development and sell educational and electronic journals, software and books.

The processes related to the schools management include processes such as information security and management, workforce management, financial management and educational sources management and schools physical equipment.

Connectivity to ministry and smart school portals is an important process that should be considered.

Model and the proposed approach

After recognition of IT services of the smart school plan and mapping with IBM reference model processes, following model is deployed and proposed in four levels.

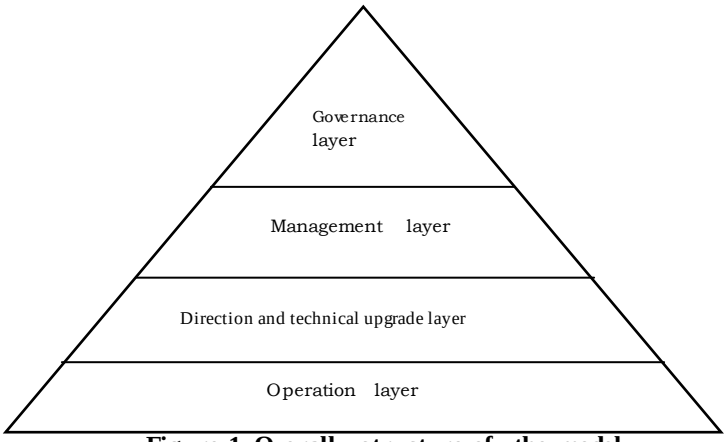

Figure 1. Overall structure of the model

In this paper we introduce and analyze every process of model in each layer.

Figure 2 shows the processes of each layer its implement domain.

Governance layer

Processes placed in this layer are performed in IT level of education ministry. The processes of this layer directs IT purposes and procedures of the smart school. The proposed processes in this layer are:

IT governance framework of education ministry

This process is proposed to create a framework and structure for IT in ministry and supporting it with purposes and education procedures. This proposal process Formulates policies, purposes and governance methods.

IT capabilities of education ministry

This proposed process, create an integrity set of present IT capabilities including IT operational environment, information, organizational, process and governance capabilities of educational ministry. These capabilities are inclusive IT governance structure, roles appointment, decision making processes and also IT quality capabilities.

IT governance operation of education ministry

Aforementioned process is to operate and run the governance and management process to satisfy the overall educational needs. Procurement of IT measurement and control results of education ministry and analysis them is outcome of this process.

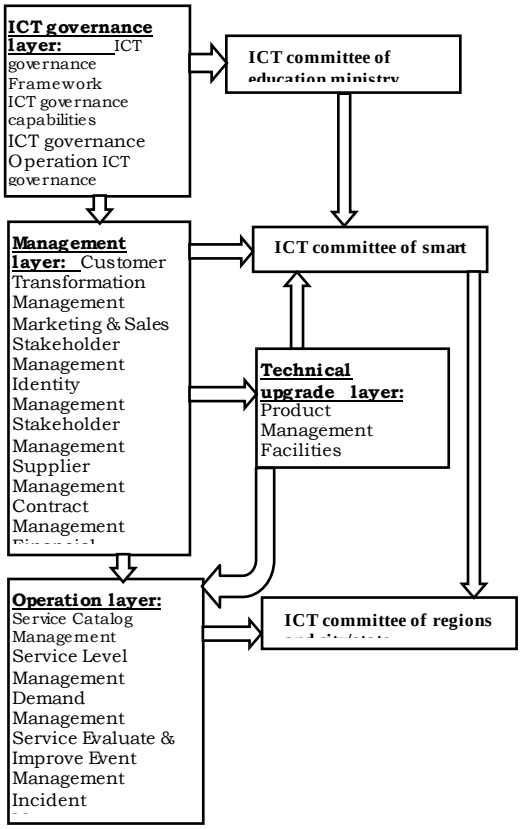

Figure 2. Processes and the relevant domain in implementation

IT governance evaluation of education ministry

This process is to review and assess the execution and implementation of the IT governance and management system, and to identify potential improvements to it.

IT financial governance of education ministry

All affairs related to massive financial are performed in the proposed process, consist of survey, approval, total IT budget and accounts control in education ministry level. Implementing this process, would determine the IT financial reports of ministry and IT budget for the smart school.

IT innovation and researches of education ministry

This process is being offered to scrutinize innovation plans and research requests related IT due to goals and strategies of education ministry. This process has accomplished to improve decision making for researches and studies guideline in IT field and also represents a proper procedure in IT projects and programs of the smart schools.

IT strategy of education ministry

The purpose of this process is to set the direction to be achieved by the use of IT, ensuring that it supports the educational strategy to the level desired and funded. With performing this process, its potentials and initiatives and strategy of education ministry are developed.

Compliance management

This process is offered to ensure adherence to regulations, internal policies, procedures and laws in education ministry.

Management layer

All processes of Management layer are defined while related to IT of the smart schools comprising values, plans, customers and stakeholders management and security issues.

Customer transformation management

Identifying customer's requirements of the smart schools must be taken so important in present products and services. There always are requests to provide new products and services due to customers in addition to variety of the smart schools and changing requirements that these processes have identified and determined these requirements.

Products and services sales and marketing

This process is offered to make a better understanding and also better identification of products and services, sales conditions and also effective market presence in that by using facilities and instruments such as developing and implementing of marketing plans, opportunities detection and absorption, sale prediction in IT of the smart school.

Identity and Access management

Due to the wide range of the smart school's users and customers, access possibility to some of IT service of these schools should be controlled and supervised. This process determines supervision information and identity registration by developing and defining access controls on school's user and customers.

Stakeholders requirements management

Regarding the number and variety of stakeholders of smart schools such as students, teachers, managers, parents, related offices and their requirements, this process is offered in order to identify and determine a list of their requirements.

Contracts management

In this proposed process, it is designed to perform all affairs related to contracts and pricing of products and services including pricing information and framework, contracts control and agreements of the providers and also determined reports and pricing of products and services.

Suppliers management

This process is proposed to establish interaction and coordination between the IT committee of smart school and their products and services providers of these schools. Defining this process, in addition to contract requirements, other parts such as systematic contracts, purchase orders and its condition are produced.

Financial management of the smart schools

This proposed process is supposed to accomplish all affairs related to financial problems including approvals, account's control, IT budget and financial decisions in IT committee of the smart school that are determined by financial governance process of the proposed model in governance layer. Performing this process is would determine IT financial reports, costs and suppliers payments.

Workforce management of the smart schools

This process is offered in the smart school in order to detect and define and present efficient and optimum composition of all work forces and lead to make skillful plans and advanced methods and information related to work force management.

Knowledge management of the smart schools

The process is offered to understand and use of obtained information and inherent knowledge in organization of the smart school. Implementation of this process leads to develop knowledge that is the main goal of education ministry.

IT portfolio management

This proposed process is designed for identifying and IT values and service portfolio management of the smart school (including of all designed future and current and old service).

IT projects and program management

The process is built approve to the administration and control an surveillance of approved research projects and programs management and provision in IT field of the smart school due to research decisions and strategies of education ministry. This process leads to projects and programs management improvement and upgrade a proper procedure to implement them in those school.

Data management

This process is to performed all affairs including identification, recording, classification, supervision, support and elimination and other related tasks to all current data in the smart school (such as student information, teachers, lessons' scores, lessons and…) in IT committee of the smart school. Implementation of this process leads to determination, integration and data management of the smart school in throughout their life cycle.

Security Management

This process is proposed in order to develop and implement security controls on all IT service and assets of the smart school for providing security and protection by using and deploying security policies and plans, mitigating resulted risk of external and internal communications in addition to reducing IT service vulnerability are direct achievements of the process utilization.

Direction and technical upgrade layer

The processes in this layer, are defined for all related to technical upgrades in IT organization of the smart school such as sources and physical resources, technical components. This layer is a combination of processes including following processes:

IT product management of the smart schools

The process is to perform all management affairs including identification, proposal, approval, classification, supervision and destroying of all IT products of the smart schools (such as educational sources and electronic contents) across its life cycle.

IT configuration management of the smart schools

This process is offered in order configure management of elements and components in IT field of the smart school, (IT elements inside schools and related offices). This process leads to upgrade and improve of efficiency and use of IT elements of the smart school and compile information, configuration updated package and items.

IT asset management of the smart schools

It is obvious that identification, maintenance and management of all IT assets of the smart school including all hardware, software, other sources) are considered as great importance in service providing to these school.

Facilities management of the smart schools

In this process, all physical sources such as various educational sources in IT field of the smart school, (physical elements inside schools, related offices) are managed and controlled, that lead to upgrade and improve efficiency and usage of the physical sources in IT of the schools.

Operation layer

Processes lay in this layer, are offered and related to IT operational affairs of the smart school including preparation management and presented service, alarms, risks. The processes of this layer are defined in IT committee of regions and city/ state offices and including following processes:

IT service catalogue management

This process is to perform all affairs including identification, definition, maintenance, publication, analysis

and evaluation of the service catalogue that is considered as sources for collected and recorded of the documentary information related to the providing IT service for the smart school.

IT service level management process

The process is utilized in order to make confidence of achievement and delivery of IT service based on agreements in service catalogue, for upgrade and improvement of transparency and meeting customer's expectations of the smart school. IT service access reports, SLA (IT service level agreement), OLA, UCs are defined through this process.

IT service demand management

Definition of this process intends to synchronize IT service demand raised by the smart school (consumption) and IT available capacity in providing service (supply).This process is suggested, because of negative and periodic demands existence of some IT services and also for determine the package of IT service level.

Event management

This process proposed to control, supervise and managing all events namely all kinds of change conditions or warning in present and future IT service on the smart school.

Incident management

It is clear that identification, maintenance, classification, analysis, tracing, problems solving (for all kinds of unavailable IT services or products) related to the smart school is great importance. This process is defined to achieve this purpose.

Problem management

This process designed for identification and analysis the causes of problems and incidents origins and also to offer solutions for elimination of problems and difficulties related to provided IT service in the smart schools and prevention of their repetition.

IT service improvement and evaluation

This process is offered to evaluate and analyze prepared IT services for the smart school and performed by IT committee of regions, city/ state general department intending to improve and upgrade the service. Implementing above process, related to the smart school, qualitative indexes are compiled and is made decision for its improvement.

Capacity management

This process definition creates balance and compares the IT services of the smart school and requirements so that depicts the coverage included in SLA.

IT service availability management

Availability management process is proposed to analyze and upgrade prepared IT produces and services availability to the smart school performed by IT committee of regions and city/ state offices.

IT service continuity management

This process is built to define responsibility and recovery disciplines in IT products and services in the case of critical situations according to agreements considering continuity plans.

Risk management

Identification of risks related to provided IT activities to the smart school (each factor that can cause to damage or lose of services) are in great importance. In this proposed process risk detection, that are related to IT activities, risk measurement and risk plan, are developed.

Structure and connection among the processes of proposed model

Figure below shows relationship between the processes of proposed model in each layer.

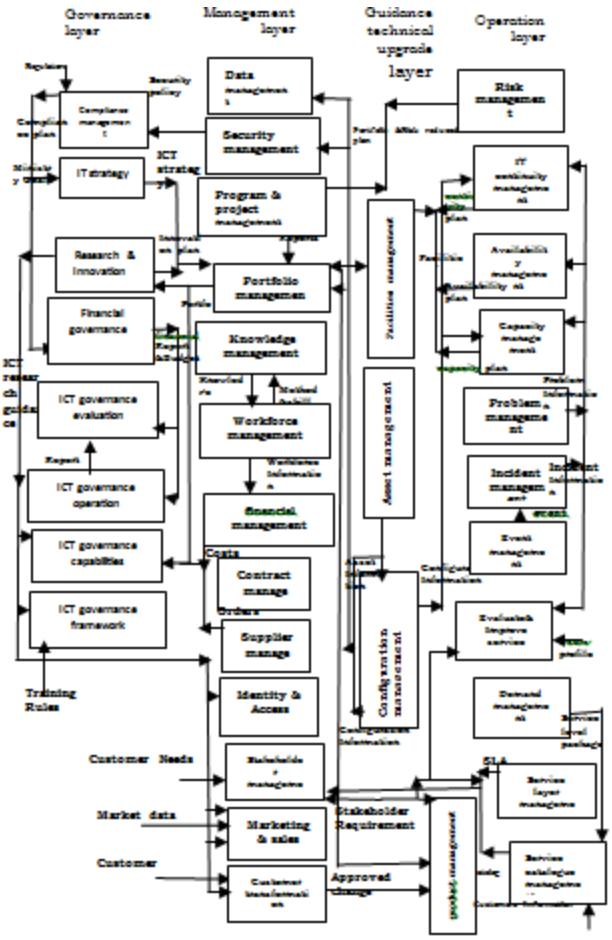

Figure 3. The relationship between the processes of layer in proposed model

Evaluation of the model implemented

Generally, There are two generic standards to evaluate ITSM models that are named services quality and customer satisfaction rate [27].

By reasoning to use of the proposed model based _on ITSM directs the smart school organization toward service and process oriented instead of job oriented, services qualitative features in service oriented architectures (SOA) are utilized in this research[24,25]. Various qualitative features can be considered while some of them includes availability (access services and products), fault tolerance (ability to tolerate and repair present faults), scalability (the proposed model ability for responsibility to increase of active load), flexibility (model capability in order to change implementation in the line of upgrade education and knowledge), security (security policies), reliability(represented storage and defeat control quantity), management capability (possibility quantity of management), agility (ability in each kind of environmental changes in current situation that leads to satisfy customers and staffs), integration (information and data integration quantity and also integration of guideline perspective in proposed model) and also analyzability.

Another dimension of ITSM evaluation is the model evaluation of customer oriented perspective that can consider customer satisfaction (user convenience of the smart school and their satisfaction quantity in use of IT services and products), customer and user management (management activities which encompass entire affairs related to customers and users of the smart school) and products and service support (supporting rank and way of services presented by the proposed model) [27, 28].

Typical scenarios are defined on main components of education in order to analysis and evaluation of the proposed model implementation in smart school plan.

Evaluation of the model implemented in development of IT Infrastructure scenario

One of the components of the smart school plan is establishment and development of network infrastructure upgrade plan. In this component, all network matters including connection type, support, maintenance, administrative, security and management problems are scrutinized. On the other hand, all smart school educational and administrative affairs such as registration affairs, send and receive of letters and circulars of related offices, electronic education, communication with parents should be done by IT and in network deployed.

Due to above cases, IT infrastructure should be in use and managed typically until that reliability in implementation of those mentioned educational and departmental affairs reach the highest of its limit. Below, the extracted chart shows number and model processes in the scenario implemented.

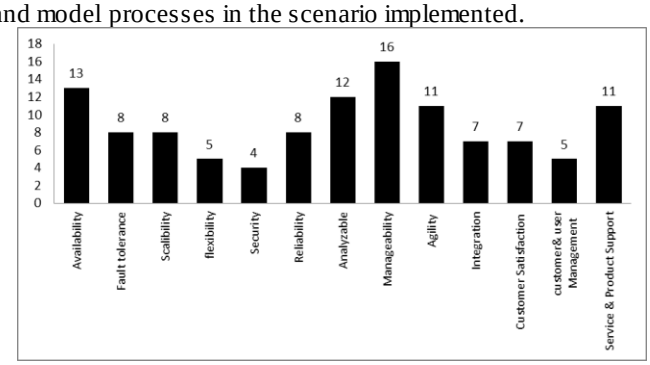

Figure 4. Evaluation chart of IT Infrastructure scenario

Based on above chart one can say, in which sector, the proposed model is strong and effective in implementation of this scenario such as components management, analyzable, service availability, reliability, service support and upgrade requirements and further development in providing flexibility and security features. Criterions such as scalability, fault tolerance and customer needs are also fairly been met by the proposed model. Customers and user management and integration in IT infrastructure development scenario have need to more study and improve.

Evaluation of the model implemented in electronic contents scenario

Based on the smart schools design blueprints, all educational activities in these schools must be performed by electronic contents (including educational software, packages and etc) that have prepared by teachers, smart school's IT department and sometimes by external or internal suppliers. In this component, all activities are directed and studied that related to electronic contents and also electronic publication of books, journals and lessons. On the other hand, all educational affairs of the smart schools like teaching, E-learning and so must performed by ICT on the network bed. Figure5.0 represents the coverage ratio of the assessment metrics of proposed process in this scenario.

As it be shown, Criterions such as manageability, analyzable, customer satisfaction, product / service support have so much effective and in average and rather desirable cover flexibility, scalability, integration, activity and reliability dimensions by the proposed processes. Some metrics like customer and user management, fault tolerance and security also are dimensions that have a low level cover by the proposed processes and need to develop.

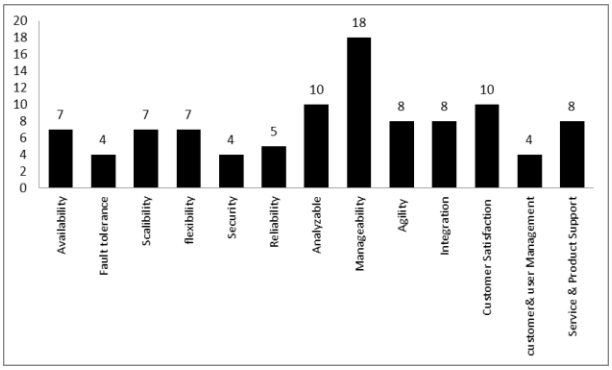

Figure 5. Evaluation chart of electronic contents scenario

Evaluation of the model implemented in Teacher's ICT knowledge upgrade scenario

No doubt that teachers, staffs and managers are corner stones of recent smart schools. On this ground, teachers in particular, must have good skills to deploy electronic contents and to teach and take exams on the network bed. Thus, planning and running ICT courses for the above stakeholders in addition to setup relevant seminars are to be considered as a must to leverage the overall knowledge of them. Therefore, those must be declared as compulsory program and projects in the smart schools mid-long term plans.

Figure 6.0 represents the coverage ratio and also the amount of fulfillment of each assessment factors while implementing the scenario.

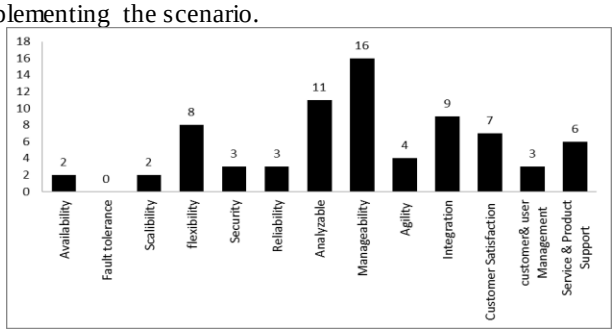

Figure 6. Evaluation chart of teacher's Knowledge scenario

As it be found be the chart, excluding few strongly supported disciplines such as manageability, analyzable, integrity, customer satisfaction, product / service support and etc. Others, are not supported sufficiently among them we may name, agility disciplines, availability, user management and reliability management and so on. Even, the fault tolerance is not supported at all. This means that the model is in need of further analysis and extension in this scenario.

Evaluation of the model implemented in management school scenario

Based on smart schools design blueprints, the most significant part of this design is the capability of ICT to manage all school's activities. By the way, all processes and activities raised by stakeholders must be recorded and stored in a way the later on be available for the access of all stakeholders such as students, teachers, staffs, managers and so on. Most administrative activities such as staffs and students management, external and internal resources management, contact management and etc, must be applicable by ICT.

Figure 7.0 represents the coverage ratio of the assessment metrics by the proposed process.

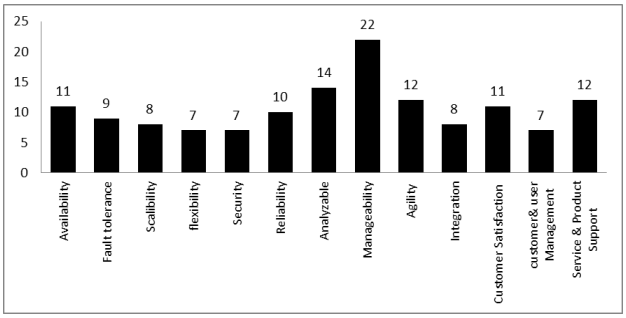

Figure 7. Evaluation chart of management schools scenario

As it be shown, nearly all of the metrics are covered by the process while a few of them are strongly supported such as manageability, analyzable, product / service support and reliability, while the others are fairly supported in a way that are acceptable.

Evaluation of the model implemented in communications scenario

The last but not the least scenario is the communication scenario between schools. Platforms should be designed in a way that been easily used by the systems. Data including a wide range of electronic contents, education, health, culture and other information must be shared in proper standard template. This may capable interoperability between schools whilst also assist to deploy training and office automation systems in the schools. The communication between schools must be accomplished by state/ regions offices, the smart schools and education ministry portal.

Figure 8.0 represents the coverage ratio of the assessment metrics by the proposed process.

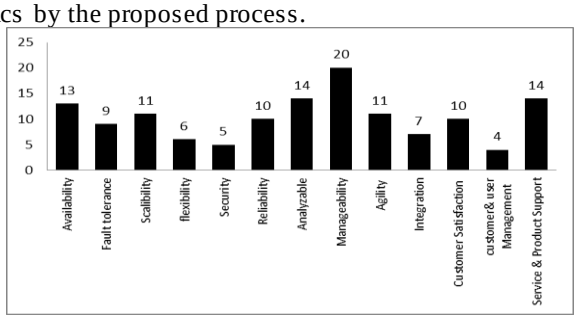

Figure 8. Evaluation chart of communications scenario

As it be shown, Most of the metrics are covered by the process while a few of them are strongly supported such as manageability, analyzable, product and service support and service available while the others are fairly supported in a way that are acceptable such as fault to tolerance, scalability, integration, customer satisfaction, activity, reliability. But still few such as flexibility, communication security and customers and user management, are still poor and subject of further development.

Conclusions

ITSM models, while based on proper processes, then together lead to efficiency, upgrade, performance and also decline risks while providing the IT services and products.

Since the Smart School plan, is generally based on IT services, using models of ITSM, conducts to upgrade and improvement of the provided IT products and services. Therefore to achieve this purpose, the proposed model in section 3 is designed.

By observing and analyzing the processes and charts prepared for the evaluation of the model, it can be concluded that proposed model is constructed by a number of processes, and the performance concluded is acceptable. For example, it was promising that the evaluation of selective factors in implementing of the schools management scenario, communications among schools and its offices are fully admirable and also the output for the electronic contents scenario is acceptable.

The proposed model in implementation of leveraging teacher's knowledge scenario of the smart school is fairly poor and subject of further development in providing some of the evaluation standards and appropriate features.

According above study can be say that the model needs to improve and more work in teacher' s knowledge of smart schools scenario.

Figure 9.0 represents the coverage ratio for of the assessment metrics in terms of each of the five scenarios described.

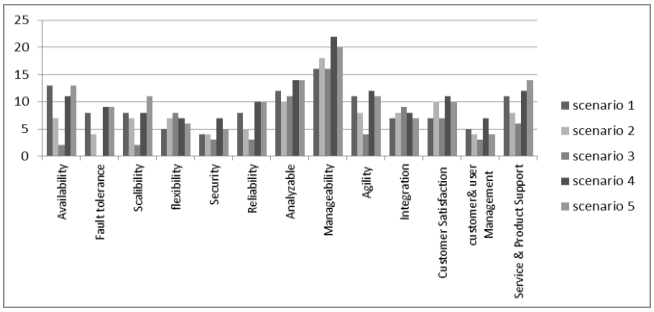

Figure 9. Comparison of Scenarios

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