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Original Article

Modeling a Unified Virtual Market Platform Using Ontologies and User Characteristics

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Abstract *-- In ecent years the development of ontologies has been moving from the Artificial-Intelligence Laboratories to the desktops and smartphones of domain experts. The four areas that have been prominently responsible for creating the demand for the use of ontologies in computing include; information systems, domain engineering, artificial intelligence and the semantic web. In ontological design processes, factors such as the purpose, intention and domain are very key. Hence, finding a common methodology for engineered ontology is difficult. Consequently, a market domain accommodates different user perspectives such as consumers, retailers, and producers. Ontologies for the different user perspectives need to be included in the design. Therefore, the purpose of this paper is to examine existing designer ontologies for designing virtual Market applications. The study adopted an experimental research design involving inferential data. It also employed cross-sectional survey design targeting designers, consumers and virtual market applications. The study used the purposive sampling technique in selecting designers, consumers and virtual market applications from the sample frame. The data was collected through content analysis, questionnaires, focus group discussion and observation. The major findings were that though many applications are designed to make the virtual market platform a reality, design factors such as payment modes, security and ontology mapping factors are not well addressing the need of the market. The study, therefore, proposes a framework that can simplify the marketing platform and the access to products and usability of various Virtual Market applications.*

Keywords *- Ontologies, Virtual Market Platform, Virtual Applications, user characteristics*

I. INTRODUCTION

History has observed an increasing concern in ontologies in a wide range of computer-related applications for the last few years. The four areas that, historically, have been prominently responsible for creating the demand for the use of ontologies in computing are information systems, domain engineering, artificial intelligence and the semantic web [1]. The term "ontology" has its origin in philosophy and is used to specify a conceptualization. It is the term used to refer to the shared understanding of some domain of interest [2], also defined as a description of concepts and relationships that can exist for an agent or a community of agents [3]. The Webster dictionary [4] defines the word ontology as A branch of metaphysics concerned with the nature and relations of being; a particular theory about the nature of being or the kinds of existents; and a theory concerning the kinds of entities and specifically the kinds of abstract entities that are to be admitted to a language system.

Ontology aims at developing theories about persistence and change, identity, classification and instantiation, causality, among others. Ontological questions include questions such as: what kinds of entities exist? What differentiates objects from events, and how are they related? What are the properties of a thing, and how are they related to the thing itself? What is the essence of an object? Does essence precede existence? Are things bundles of properties? Is an object equal to the sum of its parts? Are there Natural Kinds? Is change possible without a changing thing? These are general but factual questions, only comprehensive rather than specific. They are also fundamental to science regardless of whether to talk about the properties of a thing, if it were to develop theories of physical, mental or social events, or if are to theorize. Ontologies generally represent knowledge that formally specifies agreed-upon concepts and their relationships for an application domain. It can be therefore be thought of as a technique of classifying ideas and concepts for implementation on an application. The study starts by looking at different ontological designs in use, Virtual market platform and finally assess the users' characteristic towards Virtual market products or applications.

II. ONTOLOGY IN COMPUTING

Since the mentioning of the word ontology in a computer-related discipline for the first time [5], ontologies have been applied in a multitude of areas in computer science. The first noticeable growth of interest in the subject in the mid-1990.s was motivated by the need to create principled representations of domain knowledge in

the knowledge sharing and reuse community in AI, which motivated the creation of forums such as the conference series FOIS (Formal Ontology and Information Systems). Nonetheless, an explosion of works related to the subject only happened in the past two years. According to [6], historically, there are three areas mainly responsible for creating a demand for the application of ontologies in computer science, namely, database and information systems; software engineering (in particular, domain engineering) and artificial intelligence.

A. Ontology in Information Systems

According to [7], the term "ontology" in the computer and information science literature appeared for the first time in 1967, in work on the foundations of data modeling by S. H. Mealy, in a passage where he distinguishes three distinct realms in the field of data processing, namely: The real world itself; ideas about it existing in the minds of men and symbols on paper or other storage media. Mealy concludes that things exist in the world regardless of their (possibly) multiple representations, and he claims that this is an issue of ontology or the question of what exists [5]. The conception of both logical and conceptual models by the database and information modeling community was uniquely inspired by the search for better concepts that could be used for building representations of a certain quota of reality. Both the Semantic model and the Entity-Relationship(ER) model were dedicated to a world view and based on the ontological assumption that the structural aspects of the world could be articulated by using the concepts of entity and relationship [1].

B. Ontology in Domain Engineering

Independently of these advances in the information systems community, software engineering began to recognize the importance of what came to be known as domain engineering [8]. This was mainly motivated by the need to reduce the disproportional costs in software maintenance and the need to reinforce software reuse in a higher level of abstraction than merely programming code [9]. In general, a domain engineering process is composed of the following sub-activities: domain analysis and domain design, the latter being further decomposed in infrastructure specification infrastructure implementation [1]. [10]Proposed an ontology-based assembly design (AsD) that serves as a formal, explicit specification of assembly design, so assembly knowledge is both machine-interpretable and shareable. The developed AsD ontology and browser take full advantage of SWRL and OWL technologies. Therefore, it can be utilized in various activities related to assembly design modeling collaboration.

C. Designers Ontologies

Several groupings of ontologies have been presented by [11][12][13]. Each of them concentrated on different dimensions in which ontologies can be classified. These e classification based on the expressivity and formality of the languages used and the scope of the objects described by the ontology include:

a) ***Domain Ontology***

The domain ontology that is required for building competence ontology is a little different than usual domain ontology. The main difference is that this ontology needs to have some resources defined for the concepts of the domain. This characteristic is not usually needed, but because competence is defined by its set of resources, one to add that data in the domain ontology. The domain ontology is also composed of concepts and relationships. The relationships that are considered are "is-a" and "part-of or aggregation. The concepts of the domain ontology are the elements of the domain. These elements have as attributes the competency resources that are attached to them. This ontology takes an object in a specific place or locality to look at its specific characteristics (attributes), behaviour and the set of relationships that exist within these objects in that domain.

b) ***Local Ontologies***

Local or application ontologies are specializations of domain ontologies where there could be no consensus or knowledge sharing. This type of ontology represents the particular model of a domain according to a single viewpoint of a user or a developer. [14], present this kind of ontology as a combination of domain ontology and task ontology in order to fulfil the specific purpose of an application. The task ontology contains knowledge to achieve a task; on the other hand, the domain ontology describes the knowledge where the task is applied. [15], use the Lowry Model of the city in order to have a simplified view of the urban sprawl phenomenon. The Lowry Model is a simplified model of the city that models the relationship between transportation and land use. This model has a Mathematical formulation taking as input values the employment, the population, the residential sector, the travel cost etc. This ontology is domain ontology; it is applicable only to urban morphological evolution.

c) ***The Competence Ontology***

The competence ontology is self-possessed, like the domain ontology, by concepts and relations between them. The concepts of this ontology are competencies. The competence is linked directly to a concept of the domain ontology (as in the CRAI model) and is composed of resources that are directly linked to the concept of the domain ontology or by resources that are close to this concept. The relationships of the competence ontology are based on the sets of resources of each competence, and especially on the inclusion of these sets [16]. A concept can also be defined by the set of instances that belong to it. For example, "Anselemo Peters" is an instance of the concept "person". This last definition is called the extensional definition of a concept, and the three former definitions are called intentional definitions of a concept.

d) ***Core reference ontology***

Core reference ontology is a standard used by a different group of users. This type of ontology is linked to a domain, but it integrates different viewpoints related to a specific group of users. This type of ontology is a result of the integration of several domain ontologies. Core reference ontology is often built to catch the central concepts and relations of the domain. For example, in [17], they present the development of a core reference ontology, untitled hydro ontology describing hydrographic features. This ontology captures different sources of information. These sources are chosen based on their reliability; that is to say, they come from a well-known institution. Their goal is to harmonize all the different representations of a hydrographic phenomenon in order to propose a standard.

e) ***General ontologies***

General ontologies are not dedicated to a specific domain or field. They contain general knowledge of a huge area. Example: Cyc technology is a general knowledge base and commonsense reasoning engine. The entire Cyc ontology contains hundreds of thousands of terms, along with millions of assertions relating the terms to each other, forming a general formal ontology whose domain is all of human consensus reality. The Open Cycontology is available in OWL format.

f) ***Information Ontologies***

Information ontologies are composed of diagrams and sketches used to clarify and organize the ideas of collaborators in the development of a project. These ontologies are only used by humans. The characteristics of information ontologies are: Easily modifiable and scalable, synthetic and schematic; they are normally used during a design process of a project: for example, information ontology can be used during the conception phase of an information system development project or during the design of floor plan in an architectural construction project. Information ontologies focus on concepts, instances and their relationships. Their goal is to propose an overview of a current project in order to express the state of this project. The grey colour of the property elements means that properties are not always well defined by information ontologies [16].

D. Virtual Market Platform

In support of the virtual prototyping concept, human simulation has been developed as one of the techniques to design, test and modify manufacturing systems of today. Product Lifecycle Management (PLM) solution companies have developed simulation software to support the creation of industry-specific virtual environments using available Computer-Aided Device (CAD) data and the digital human model (DHM).

a) Management of Manufacturing Knowledge

The range in applications that fall into this category is broad in scope. Examples of these include terminology definitions that are shared across an organization, industry or geographical regions across the globe [16]. The applications are included, which map terminology, language and/or knowledge from one ontology to another and knowledge verification. Examples of applications that utilize the management of manufacturing knowledge include production planning, scheduling, and diagnostic and natural language processing.

b) ***Application for Manufacturing Interoperability***

Application examples in this category include control and interoperability. The Process Specification Language (PSL) is an ontology developed at the National Institute of Standards and Technology (NIST) for a description of basic manufacturing, engineering and business processes. It aims to facilitate the correct and complete exchange of process information among manufacturing systems such as scheduling, process modeling, process planning, production planning and simulation as neutral interchange ontology [16].

c) ***Sharing of Manufacturing Resources***

By utilizing the World Wide Web in conjunction with ontology knowledge bases, better utilization of resources can be achieved by sharing them across a network. Examples of this category include distributed services and collaboration. The Variation Reduction Adviser (VRA) system used within GM is a database containing problems encountered in processes and their possible solutions. [18], show an approach to extract useful information from the VRA database using body shop domain ontology. The ontology-guided approach makes possible the ability to share the problems and the solutions in body shop operations.

Using Semantic Web Paradigm for Product Representation: since the virtual environment is too composite for common agreements on semantic product data exchange, collaboration networks of limited size, with loosely coupled competencies and resources, such as inter-organizational networks, are expected to achieve the feasible and beneficial application of product ontologies. This is particularly the case when some kind of external coordination (business brokers, business architects) of the network is involved. Some of the arguments for the statements above and some resulting design guidelines are listed below:

The scope of the use of ontologies is limited compared to theoretically infinite domains in the virtual market. Therefore, they are much easier to manage. Ontologies can be exposed as a stack of services to authorized network's partners – integral parts of inter-organizational processes;

Extended product ontologies, implementing different product representations are open-access knowledge repositories, valuable for individual operations of network partners; inter-organizational networks can serve a request for proposal for the diversity of products and services, often with unknown design and even purpose at the time of a bid. Structured knowledge about diverse products, as well as technologies for their manufacturing, delivery, maintenance and retirement, accumulated in the process of a bid response and order fulfilment, can be reused in multiple occasions and, therefore, improve overall responsiveness and reduce risks of inaccurate cost-estimations;

Once properly set up, product and service ontologies can be mapped to competence ontology, supporting

infrastructure for an automated response. Also, inverse references of competencies to products and services are a valuable tool for the generation of networks' target market segments; − Concentration and densification of the acquired knowledge on specific product families and complimentary services could serve as the core of future knowledge-based extended enterprise [19].

III. METHODOLOGY

This study adopted a mixed research design involving a case study approach and an Experimental design. The experimental design was used in evaluating the usability of virtual market applications within the sampled population. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident; and in which multiple sources of evidence are used [20].

According to Gupta and Gupta [21], the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. One of the main strengths of experimental research is that it can determine a cause and effect relationship between two variables. The variables of interest for this study are the ontological designs, the usability of applications and virtual markets.

The population for this study included individuals who access the Internet and use virtual market platforms. [22], underscores that it can also be thought of as being the statistical process of selecting a subset of a population of interest for purposes of making observations and statistical inferences. The study adopted the purposive sampling technique. The study, therefore, targeted both the human population, i.e. Virtual market consumers and the non-human population, i.e. Virtual market platform. The study sample was derived using purposive sampling, which is a non-probability sampling procedure that does not afford any basis for estimating the probability that each item in the population has a chance of being included in the sample [23]. The purposive sampling technique was used to select applications and Virtual Market Consumers. The criterion that was used in purposive sampling was based on the ability and frequency of access and use of the virtual market platform.

IV. TOOLS

The study used both structured and unstructured questionnaires. The questions were presented with exactly the same wording and in the same order to all respondents [23]. For the purpose of usability and user, Characteristic assessment, researchers asked test respondents to complete questionnaires during and/or after a usability test as a means of obtaining test data. Pre-test questionnaires were designed and used to assess the participants' prior knowledge about the product before the test, their backgrounds, and their initial impressions of the product. Post-task questionnaires were given out during the test or upon completion of a task. A post-task questionnaire was administered for the following purposes: 1) as a method for data logging, 2) to obtain immediate reactions to the test at critical points, and 3) to obtain a view of how test participants' perceptions change as they spend more time testing the product.

Thinking aloud protocol was a valuable method of data collection in usability testing. It had several variations, but basically, the test participants were asked to verbalize their thoughts while performing the tasks. Comments made by the participants were often valuable complements to the observed behaviours in the test. Thinking aloud protocol enabled participants to communicate what they feel about a product and the problems they encounter while using it.

During the usability test, apart from making the test users verbalize their thoughts as in the thinking aloud protocol, the researcher prompted them by asking direct questions about the product in order to understand how they perceive the (model of the) system, the tasks and where they have trouble understanding and using the system. This is a more natural way than the thinking aloud method, i.e. letting the test users verbalize their thoughts [24]. Provide the test users with the product to be tested (or a prototype of the interface) and a set of tasks to perform. Ask the participants to perform the tasks using the product and to explain what they are thinking about while working with the product's interface.

V. RESULTS

The virtual marketing design and usability techniques identified in this research that was necessary for designing and using virtual market platform were: design, usability and user characteristics factors. For virtual market consumers in marketing and trading products on a virtual display, the researcher identified design-construct (the way of mapping concepts and events on an application) these were security factors, payment and ontology. User characteristics (Measured using the Heuristics) and Usability factors (Ease to Lean, Ease to Use, Usefulness and Satisfaction).

A. Design Factors

For the purpose of ontological design, ontology provides a formal and structured description of the information types managed by the tool, how those types are structured, how data are stored within the tool and the constraints that must be maintained on the types and their structure in an integrated environment in which tools communicate and share information through a neutral medium. Ontology specification is used to automatically integrate the tool into the environment. This construct views design activities as reasoning from a set of needs, requirements and intentions to a new bit of reality, consisting of a (physical) structure and intended use. This process of reasoning is non-deductive: meaning that there is no closed pattern of reasoning to connect the needs, requirements and intentions with a form of an artefact and a mode of use. This openness of a design problem is called the underdetermination of design problems. Ontologies reduce conceptual and terminological confusion by providing a unifying framework within an organization. In this way, ontologies enable shared understanding and

communication between people with deferent needs and viewpoints arising from their particular contexts, i.e. on the virtual platform.

Security factors looked at the safety and, therefore, address the fraudulent activities that currently dominate the virtual platform. Security is viewed as a weakness in design, and therefore design factors need to arrest all possible weaknesses that can subject the virtual application users to unlawful access or cyber assassination. Other hand payment factor was also addressed as core design sub-construct. For the design of a virtual market application to be simple and reliable, it has to be provided with its own payment techniques to allow users to make payment in case such a need is available. The current payment platforms rely on mobile payment such as *M-Pesa*, Airtel money, Orange money, M-banking apps, and other mobile service providers, together with the use of credit cards, are prone to security challenges and threats that make consumers vulnerable to fraud. The payment mode proposed here is an integrated payment that is within the application design and not as a detached payment entity. Table 1: Expert design factor summarizes the design factors, factors as derived from the experts' responses that were conducted through a focused group discussion.

Table 1. Expert Design Factor

Design Factors	Factors
Our virtual application need to have a reliable security mechanism	.507
Payment integration in the applications	.068
Accurate Ontology during the design	.482

Extraction Method. Principal Axis Factoring

The responses to the need for reliable security mechanism on the virtual market has a factor loading of .507, those who supported payment to be integration in the applications has (.068) and accuracy ontology during the designing stage has a factor loading of .482.

B. Usability Factors

The constructs of usability (ability of an application serving the anticipated purpose) usability constructs were: Ease of use, usefulness, Ease of learning and satisfaction. From the analysis of these responses, it was revealed that most of the virtual market applications do not meet the standards of usability factors. This was ascertained through practical use of focus group discussions and task analysis of mixtures of 18 users, including experts. Male consumers dominated the group at 72%. The majority of users complained of wrong and inaccurate mapping of the concept from the problem domain and therefore lacked realism. Some reported that the applications lacked the very basic features, while others complained (captured through the think-aloud protocol) that they could not understand where to go from one interface to another as they navigated through the contents on the platform. The biggest challenge reported by respondents was how to make payments using a very different application. In the case of online marking, the actual delivery of the purchased item seemed to also compromise the transaction potentialities, and some of the consumers wished that payment be made upon delivery of the products. This raised some of the application usability factors. Table 2: expert usability factor loading give a summary of the Usability construct loading factors derived from experts responses.

Table 2. Expert Usability Factor

Usability Factors	Factor
Virtual market applications are Useful	.078
Virtual market applications are Ease to use	.351
Virtual market applications are Easy to learn	.373
Users of Virtual market applications are satisfied with the application	.107

Extraction Method. Principal Axis Factoring

The factor for the usefulness of market applications has factor loading, which is found to be at .078, Ease of use market applications loading factor at .351, Ease of learning market applications at .373 and satisfaction Virtual market applications having a factor loading at.107. This implies that a stable virtual market application must ensure a commonality of weight .078 on usefulness, a weight of .351 on Ease of use, .373 on Ease of learning and .107 on satisfaction on the application usability by the user. These usability factors provided a trend to a dynamic and user-centred application.

C. User Characteristics Factors

The construct for User Characteristics (UC) the factors that were measured includes Natural engagement, compatibility with the user's task, natural expression of action, close coordination, realistic feedback, faithful viewpoints, navigation and orientation support, Clear entry and exit point, Consistent departures, Support for learning, clear turn-taking and Sense of presence. The heuristic was also measured in terms of the experience of interaction with virtual Market platforms and popularly used virtual market applications. The heuristics examined users' personalities as they reason with virtual market applications during the interaction process. Table 3: expert user characteristics factor loading presents the expert user characters factor loading.

Table 3. Expert User Characteristics Factor Loading

User Characteristic factor	Factors
Natural engagement and compatibility with the user's task	.766
The natural expression of action and Close coordination	.581
Realistic feedback and Faithful viewpoints	.025
navigation and orientation support	.840
Clear entry and exit point and Consistent departures	.278
Support for learning and Clear turn-taking and Sense of presence.	.422

Extraction Method. Principal Axis Factoring

The findings indicated that user characteristic factors could be integrated. Natural engagement and compatibility with the user's task can be integrated with a factor at .766,

natural expression of action and close coordination at .581, realistic feedback and faithful viewpoints at .025, navigation and orientation support at .840, Clear entry and exit point and consistent departures at .278 and support for learning and clear turn-taking and Sense of presence at .422. This implies that the user characteristic factor can be inter-linked together as per the stated factors.

D. Measurement of the Constructs

The framework in Figure 4: proposed unified virtual market platform framework (UVMPF), which is made up of three main constructs, namely design factors (DF), user characteristics factors (UCF) and usability factors (UF). Out of the Eighteen experts that were invited, thirteen Were used to help investigators represent a large number of relationships among interval-level variables in a simpler (more parsimonious) way. EFA was used to identify complex interrelationships among items and group items that are part of unified concepts. There were no prior assumptions about relationships among factors. A related approach, confirmatory factor analysis, in which one tests very specific models of how variables are related to underlying constructs [25].

Factor analysis, thus, seeks to resolve a large set of measured variables in terms of relatively few categories, known as factors. This technique allows the study to group variables into factors (based on the correlation between variables), and the factors so derived may be treated as new variables (latent variables) and their value derived by summing the values of the original variables which have been grouped into the factor [23]. Table 4 loading constructs experts loading factors summarizes the three construct factor loading.

Table 4. Loading Constructs Experts Loading Factors

Constructs	Sub Constructs	Factor
Design Factors	Security	.717
	Ontology	.797
	Payment	.755
User characteristic factor	Heuristics	.813
Usability factor	Usefulness	.550
	Ease of Use	.445
	Ease of Learning	.721
	Satisfied	.581

Extraction Method. Principal Axis Factoring

Factor loadings or Commonality is the square of standardized outer loading of an item. Analogous to Pearson's r, the squared factor loading is the per cent of the variance in that indicator variable explained by the factor. These constructs, sub-constructs and their respective factor loading as in Table 4 interrelate. These constructs were further used as a basis for the development of the framework in section 5.3 based on the commonalities of factor analysis in Table 4.

turned up for the focus group discussion representing a response rate of 72%. They were asked to give their level of agreement to the inclusion of each construct in the framework for design and applications usability that facilitates a unified virtual market Platform. The levels of agreement were measured on a nominal five-point scale of 1=Not at all, 2=to a small Extent, 3=to a considerable Extent, 4= to a good Extent and 5= To a Great Extent. In order to establish whether the three constructs were reliable for inclusion in the framework, the study analyzed the experts' intuitions about the three constructs by performing a reliability test run on them. Exploratory factor analysis (EFA) and principal components analysis (PCA) both are methods that

E. Unified Virtual Market Platform Framework (UVMPF)

The technique for developing applications is based on the concept/the idea modelled from a given domain. Grounded theory is adequate for framework building due also to its primary characteristics as it builds a "context-based, process-oriented description and explanation of the phenomenon, rather than an objective, static description expressed strictly in terms of causality. In this research finding, the ideas about design were collected using content analysis, their respective usability, competence and trends were collected using questionnaire and focus group discussion supported by think-aloud protocol and questioning protocol.

This section thus provided the architecture of the proposed framework. It offers a unified approach for designing and using a Virtual market platform. Factor-loadings are those values that explain how closely the variables are related to each one of the factors discovered. They are also known as factor-variable correlations. In fact, factor-loadings worked as key to understanding what the factors mean. It is the absolute size (Rather than the signs, plus or minus) of the loadings that are important in the interpretation of a factor [23]. From there, it was noted that virtual market applications need to provide a realistic platform for product vendors to display and sell their products to the consumers. This study identified ontologies and user characteristics that evaluate a virtual market platform. Fig. 1: proposed unified virtual market platform framework (UVMPF) giving the relationship of the constructs discussed in part 5.4 herein

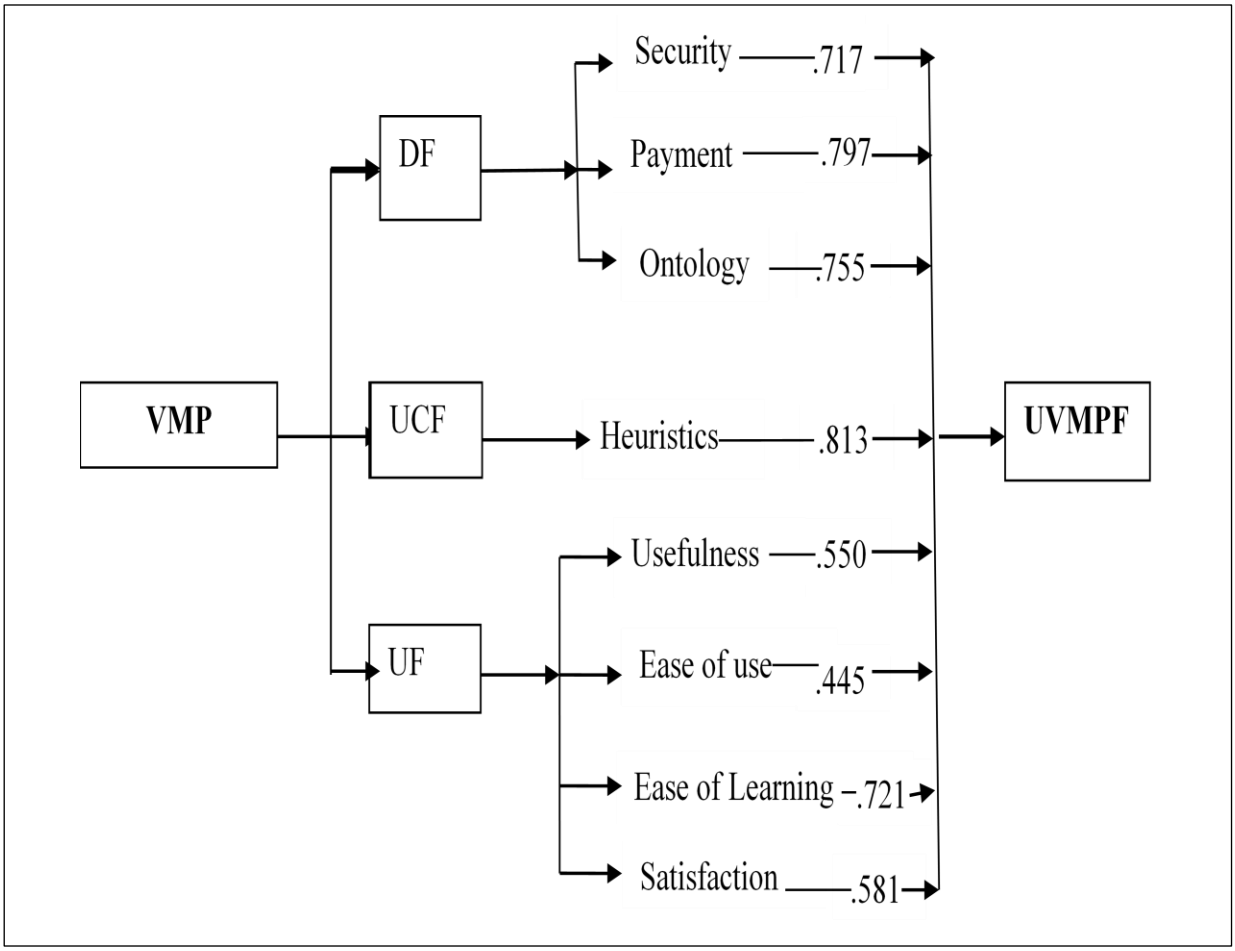

Fig.1 Unified Virtual Market Platform Frameworks (UVMPF)

Where:
DF- Design Factors
UCF- User Characteristics Factors
UF- Usability Factory
VMP - Virtual Market Platform and;
UVMP- Unified Virtual Market Platform Framework

In Fig.1 a summary of the indicators and their corresponding loading/factors/weights are provided. For a unified Virtual market to be realized, the unified virtual market platform framework (UVMPF) framework needs to incorporate three main constructs that are design factors (DF) which manage how well the application needs to be designed to meet the necessary condition for virtual reality the sub-constructs such as security with a factor of 0.717, ontology with a factor of 0.797 and payment with a factor of 0.755. The second construct addresses the consumers or users characteristics Factors (UCF) which assist the quality of individual users in order to enjoy the virtual reality with a factor of 0.813 and finally, the Usability Factors (UF) the applications should possess to serve the users/ consumers to enable them access and manage the contents on virtual market usefulness with a factor of 0.550, Ease of Use with a factor of 0.445, Ease of Learning with a factor of 0.721 and satisfaction with a factor of 0.581. The three constructs and their sub-constructs are finally combined to provide a Unified Virtual Market Platform (UVMP). These factors interrelate with the network element, which is also a key construct but was not an objective of this study.

The study also validated the framework. The question of concern was whether the developed framework and its concepts make Sense not only to the researchers but also to other scholars and practitioners and whether the framework presents a reasonable theory for scholars studying the phenomenon from different disciplines? Validating a theoretical framework is a process that starts with the researcher, who then seeks validation among "outsiders". Presenting an evolving theory at a conference, a seminar and different academic frameworks provided an in-depth and excellent opportunity for researchers to discuss and receive feedback. The concept of validation ascertains that the research participants determine the researcher's interpretation of the meaning and events with

their own. The method was used to check on business and the quality of research [25]. The researcher involved Expert invalidation and sharing findings with other experts in the research phenomenon. The validation was through collaboration with other research on a similar population. It was necessary to detail how the researcher went about collecting, handling, analyzing and interpreting the research results. Validation techniques were done through prototyping (and domain expert evaluation. This research adopted the domain expert evaluation to validate the framework.

The guiding questions here were, "Is the framework a representation of the real world?" scored a mean of 1.00 and an Std. Deviation 0.00. This indicates that all the sampled experts agreed with the framework representation. The question "Is it an accurate representation of the concepts under the study?" also recorded a mean of 1.00 with an std. Deviation of 0.00. Responses at a mean of 1.15 with an std. Deviation of .376 confirmed that the framework was easy to apply to the real world. It was also recorded that most respondents had no issues with framework constructs. This implies that the experts agreed with the framework.

VI. CONCLUSION

The design factor is concerned with the mapping of the concepts and product ideas on the application. The design addresses the payment modes, security and ontology for designing. The user characteristics address the experience of the application user as depicted from the focused group analysis. The usability metrics are Ease of use, usefulness, Ease of learning and satisfaction. The constructs measurement was done to come up with desired constructs and their appropriate factor loading. The framework architecture is also provided to demonstrate how the constructs for the proposed framework relates, how the framework work and the validated results for the framework are discussed. The framework was presented to the experts for validation and the level of acceptance. Virtual Market Platforms are more concerned about delivery times, delivery charges and delivery return policy. If these concerns are made easier, quicker and reliable, consumers stand to enjoy an online Marketing experience. Thus, making online shopping trendy given the demographics of the users of this platform. It is the hope of the researcher that the proposed framework will go a long way in addressing the challenges faced by most consumers accessing content and products on a virtual market platform

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