Journal of Multidisciplinary Engineering Science Studies (JMESS)
ISSN: 2458-925X
Vol. 4 Issue 11, November - 2018

Local Action Basic -Support System

Theory of System Architecture Development

Amna Ali Nasser Al- Saadi
PhD candidate, Graduate School of Science and Technology, Kumamoto University
8608555, Kumamoto, JAPAN

Riken Homma
Associate Professor, Research Centre for Higher Education, Kumamoto University
8608555, Kumamoto, JAPAN

Kazuhisa Iki
Professor, Graduate School of Science and Technology,
Kumamoto University,
8608555, Kumamoto, JAPAN

***Abstract*— knowledge dissemination is a crucial issue because of the complexity of knowledge generation and transformation among actors. complexity of urban development is a subject undergoing with the same concerns. A system approach has been developed to treat the complication or "messes" of knowledge development. They are structured and rigorous but nonmathematical. This paper aim to present an architecture of policy-making support system for local action which is in role of researchers– Local Action Basic – Support System (LAB-Support System). LAB- Support System use of System Dynamics as a system methodology rather than accepting all the predictions of the original Urban development process. Tow challenges was addressed and improved through development of Dynamic Model in this research. First, task of learning and Knowledge transfer was obtained through human- oriented strategy which is address through SAVE concept in modern Marketing science. Secondly, many stockholders of system dynamic face difficulty because they are not specialists. The paper addresses visualization phase between assessment and enhancement phase during system development to make all stakeholders' information more efficient and accessible. LAB- Support System outcome features are feedback structures, nonlinear relationships, mathematical/ quantifying evaluation and simulation which create objective- decision support tool for policy making to enhance urban quality in the local action level. Finally, LAB-Support System was implementation to hypothesis the problem and structures it for further procedure to support policy formulation and decision making.**

Keywords*— urban Quality; Local Action, knowledge dissemination; System; walkability.

I. INTRODUCTION

The system is defined as a cooperating, and objective coordinated arrangement of set of objects occurring in a domain .The city is a system which can legitimately comprehended and controlled its intuitive responses only if the association between the fundamental urban parts are structured appropriately (1).Developing sustainable city is complex as it requires consideration of interacting diverse factors. The task is made even more difficult by the wide variety of stakeholders (e.g. planners, architects, businesses, communities, individual, etc.) that may be involved in the process. The lack of a common language for all to understand existed knowledge is a critical issue (2). A number of studies (3) (4) (5), present systems approach and an integrated quantitative tools as a key to enhance sustainability in complex urban context.

Since centuries, the scientists have generated basic knowledge and professional find enormous means to apply them. Given attention for the efficiency of science in practice , research studies in decision-support tool need to shift their attention towards the whole configuration of physical urban, sociocultural behavior, contents, and interpersonal processes taking place in the context that dynamic process. They are requested to move from learning Knowledge to usable one in order to be responsive to the flow or developing needs of specialists and at last to the solution of expert and social issues (6).

Complexity nature of urban knowledge dissemination between researchers, practitioners and inhabitant which is continuously change is a call for Dynamic System theory. The latest emerged and developed till it presents approach to use subconsciously appealing and yet use mathematically sophisticated methodologies while undertaking practical systems enquiry (7). From previous facts, Dynamic System theory is suitable to deal with complexity and more facts will be illustrated in the following section. However, there are major concern required to be solved. First, management of knowledge movement and its roles on the behavior of actors. Second, how can that improve decision and policy formulation. Finally, the level of policy intervention that is aimed to be assessed.

For the above mentioned concerns, this paper present architecture of a local Action Basic-Support System (LAB- Support System). Since the authors are interested in neighborhood sustainability and related urban quality, they focus on local action (bottom-up management style). LAB- Support System was

developed with a focus to support objective decision and policy formulation and generate learning and knowledge transform. Address SAVE concepts in the structure of LAB- Support System was important to solve task of learning and Knowledge transfer. SAVE -–which is in modern Marketing science concept - imposed the focus on human development through built environment rather than follow the existed urban innovation. While SAVE concept ,which developed by John P. and his colleagues (8), generated simple common language by creating visualization phase between assessment and enhancement phases. In order to advance with knowledge in practical urban development, all process controlled by researchers. The letter are the main actor to provide Local management by the basic required knowledge to support best action for that it called "LAB" support system.

Following this introduction, Section II will illustrate the relation between Knowledge Transfers and decision making in urban planning Process. fundamental concepts of dynamic system and SAVE concepts will be elaborated in the third section. The system will be structured and its architecture will be presented in Section IV. The last section discusses the advantages and shortfalls of the conducted system to conclude the paper.

II. Formulation of Problem: Knowledge Transfers and Decision Making in Urban Planning Process

Deliberation criteria of planning process generated due to the variety of actors and diversity of their contribution. The actors of planning process can be classified into specialists (practitioner or researcher), policy maker and inhabitants (individual or communities). Planners contribute by bringing research-based expert knowledge into relevant for the planning problem in hand to the planning discussions. Accordingly, Professional planners are important actors in these processes, as process leaders and as knowledge carriers, users and producers (2). However, planners do not necessarily use knowledge (9), which turn attention into the conflict between different interest groups (10). In summery Planners need to be more critical of their own tacit knowledge, and turn more actively to research-based knowledge, simultaneously , researchers need to produce the knowledge planners need in ways that are useful and usable for them.

Cities are built to supply community's needs. The basic need are shelters and transportation but a cross the history of built environment development, cities were enhance other requirement regards geographic location, politic, economic and socio-culture. Since the industrial revolution cities has lost one criteria which is human dimension. The loss of the basic human needs has made a call to engage individual and communities into the development process of cities (11). In fact, human- oriented strategies is the twenty fist century' basic strategy. Accordingly, knowledge of communities must be involved and consider since early stage and over all process of development.

Policy maker and the generator of local action. Their awareness of related urban and built environment knowledge, the inhabitances' real requirements and knowledge and Abilities and creativity of practitioners enhance the productivity of right and most suitable decisions (2).

TABLE I RELATION BETWEEN ACTORS AND KNOWLEDGE.

Actor	Role
Researchers	Generator of basic Knowledge
Planners	Main Carriers of Knowledge
Policy Makers	Main users of Knowledge
Individual/ Community	Observer and Reflector of Knowledge

In conclusion, there is essential need to enhance knowledge transformation and learning process in order to explicitly improve stakeholders communication and support policy making.

III. A Local Action Basic-Support System (LAB-Support System) Approach

This paper present the architecture of Support System for local management. It aims to convert Urban planning process for special development into dynamic qualitative support system. The empirical base for the methodology is SAVE concepts and dynamic system approach. . Since the scientific urban planning cycle is not end with generalization (11), the two approaches were selected to enhance knowledge transformation and learning process in order to explicitly improve stakeholders communication. In fact, the architecture of Local Action Basic- Support System (LAB-- Support System) was designed to strategically treat the urban planning process challenges like, (cost and time consumption, parties communication and lack of knowledge transfer, complexity of the process) in order to support policy decision making.

With above mentioned approaches, The general structure of LAB-- Support System was developed as illustrate in following A and B sections. It is very important to mention that it is designed to be flexible to adopted any qualitative methods and tools the future researchers will need to use as complex as they extend their projects. Moreover, for the interest of authors, this paper extended the LAB-- Support System to enhance walkability in automobile-oriented communities in hot-arid climate. Because the walkable built environment knowledge is almost absent, there were a series requirement to create LAB-- Support System first in order to accelerate and enhance the learning and knowledge transfer among researchers, inhabitants of community and policy makers. The Implementation example of LAB-- Support System will be discussed in section IV.

A. A Dynamic system

System dynamics is Framework progression for a methodology that explaining, measuring and analyzing the change of complex system over time. The System Dynamics approach consolidates thoughts created in diverse System Theories. Specifically, it is a consequence of combining thoughts from traditional management, cybernetics, and computer simulation (12) System dynamics study the relationship of the diverse factors of a framework, and how issue conduct could be comprehended and anticipated by investigating a framework's hidden structure. It is a theory of structure and behavior system (13). A Dynamic system approach was selected among various system because;

- It presents a clear framework, use mathematically sophisticated methodologies while undertaking practical systems enquiry.

It is applicable in many complex social systems (14), urban systems (15) (16) (17) (18), which deal with socio-economic systems and management.

- It is useful in the development of policy and making decision because It has ability to simulate the effects of alternative, the ease in communicating the model, the results and recommendations (19).
- The systems and problems that are analyzed in system dynamics are built as models on a computer. The computer models can treat complex quantified information and run simulations based on simultaneous calculations. By changing variables, the user can experiment with the model and experience different simulation outcomes (20) (21).
- Since this paper focus on explicit learning and exchange of knowledge among actors during development of policy design for certain urban quality, Dynamic system has its genesis communication between actors to study information and feedback characterizations to show the interaction of structure (20), and is adopted for investigating dynamic behavior of feedback systems (20) (22).
- System dynamics also offer a variety of ways to represent system development, i.e. system behavior, over time by way of simulation. That is to say, simulation results in a narrative laid out on a storyboard that constitutes the foundation for automatic screen writing calling for on-demand multimedia presentations triggered conditionally as the simulation evolves. A simulation may evolve very different if the initial conditions or the interventions applied during the simulation change (12).

B. SAVE Principles

SAVE is a concept which has been illustrated differently in marketing science and urban development research. In both sources It serve the purpose of efficient Knowledge transfer and stakeholders engagement in order to support decision toward sustainability.

1. SAVE Concept in Urban Planning

In urban planning, SAVE concept is developed by David J. Blackwood and his colleagues (8). This paper use their approach only but not the implementation as it proposed another one. SAVE concept achieved sustainability through its components, Assessment , Visualization and Enhancement (Fig. 1).

a) Assessment

"Assessment is the process of documenting, usually in measurable terms, knowledge, skills, attitudes and beliefs" (23).

Assessments can be classified in many different ways. The common distinctions are: formative and summative; objective and subjective; referencing and informal and formal. Despite the approach of assessment, In this paper, assessment tool aims to outline the hypothesis or model by exploratory mode to a void weak or wrong hypothesis. The generated hypothesis or model are then required to be confirmed by subsequent quantitative research. In general, hypothesis address the need of individual and communities rather than vision of researchers. The cooperation with society can be conducts through; encouraging community involvement and informing initiatives ,community meeting, design workshop, focus group, interactive display, interactive model, participatory appraisal, planning and briefing workshops, reference group, scenario building, urban design games (24).

b) *Visualization*

In the heart of the system, visualization phase that has been developed to empower knowledge of all partners, regardless of background or experience, to understand, interact with comprehend, collaborate and influence decisions made. These can be achieved by many means like; Increasing Understanding by; Case Studies, Demonstration Project, Design Centre, Display Model, Interpretive Trail, Media Techniques, Public Display, Research Reports, Urban Design Awards, Urban Design Champion, Urban Design Event, Urban Design Network, Visual Simulation (24). This phase takes the unique approach of combining qualitative-mathematical analysis, 3D simulation and immersive technologies with computer modeling to open the channel of learning among stakeholders.

c) *Enhancement*

After a full comprehension of the ways in which decisions are made on assessment and visualization and needs of stakeholder are understood, enhancement phase take the role. The result of visualization process will be presented to decision maker in order to guarantees that due consideration is given by policy makers to potential impacts on the direction of the assessment indicators at key decisions points throughout the development process.

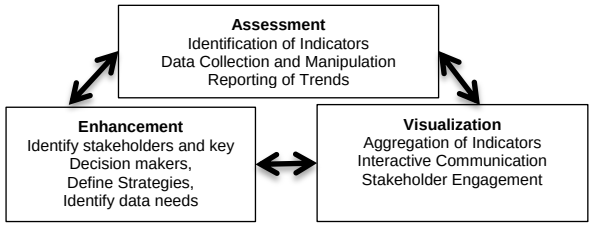

Fig. 1 SAVE framework (25).

2. SAVE in Marketing Science

SAVE concept is a big transform of Marketing Strategies. It creates the base for user -centric strategy. It turn these focus from executing the goal of development –either product or services- to fulfill human requirements. Human -centric strategy is foundation of every sustainable development. Its framework advises focusing on the Solution, Access, Value and Education ;

- Focus on Solution: developers often captivated by the features, functions and technological dominance of their projects over the competition. However, Inhabitants don't care about features of the project or usability if a project fails to solve their problem. It's not about the features developers want their project to have, it is about the problems that residents need to be solved.

- Focus on Access: public outreach and stakeholders communication is a vital component of development process. The key here is not to disseminate home base, but rather to create a cross-channel communication that considers a stakeholders' entire development journey. How available is your team to customers? How receptive are you to customer feedback? How good is your support?

- Focus on Value: When designing community models value proposition is key. Value orientation is vital in directing the drive toward improving a quality and public satisfaction.

- Focus on Education: providing current and potential Inhabitants with information relevant to their interests to create a sense of familiarity and trust a long before a development is even executed. Simply because providing someone with free, and useful information, creates a much stronger bond and connection than any banner ad or press mention ever could (26).

In summary, The S.A.V.E. framework allows System to keep this mindset at the forefront of its operations, acting as the centerpiece for human-oriented strategy.

IV. ARCHITECTURE OF LAP- SUPPORT SYSTEM

Structure of LAB- Support System is cross-fertilization of approaches from Dynamic System, SAVE planning phases and SAVE marketing principles. Dynamic System is the theoretical foundation of the complex process to help the Urban Planners and Managers to meet the challenges of decision-making and policy formulation (7). System is divided into three phases; assessment, visualization and enhancement . These phases satisfied requirement of nonlinear relationship as shown in Fig. 1. They generated ease knowledge flow. As shown in TABLE II, Each SAVE phase controlled part of Dynamic System Process , also, each one built on SAVE marketing principles.

TABLE II THE SYSTEM DYNAMICS APPROACH MERGES IDEAS DEVELOPED IN VARIOUS CONCEPTS.

SAVE Phases	Dynamic system development	Dynamic Process	SAVE Principle
Phase 1: Assessment	Define Problem Describe System Develop Model	Interactive Communication	Access
		Identify Problems and related exited literature and Identify indicators	Solution
		Data Collection and manipulated related to existed needs and future requirements.	Value
		Reporting of Trend	Education
Phase 2: Visualization	Built Confident in the model (Validation for each step) Use Model for public outreach	3 D visualization	Solution
		Interactive Communication	Access
		Engagement of stakeholders	Value
		Aggregation/ Combination of Indicators	Education
Phase 3: Enhancement	Use the model for policy making	Structure the problems	Access
		Evaluate the Priorities	Solution
		Guide stakeholders to final outcome(s).	Value
		Identify Intervention Points, Identify stakeholders and key Decision makers, Define Enhancement Strategies, Identify information needs	Education

1. LAB- Support System Characteristic :

LAB- Support System (*Fig. 2*) offered an analysis of the behavior of the system under investigation that allows us to link the behavior observed to the underlying system structure. The implications are fourfold:

A. Mathematical/ quantifying

enhances comprising methods, techniques and tools for producing interactive learning environments that utilize existing and new qualitative methods, model and simulation software for the purpose of knowledge dissemination particularly in the area of sustainable development.

B. nonlinear relationships,

Dynamic System integrates processes to behave dynamically and the causal relationships that determine specifically how such systems behave. After a number of improvements in Dynamic system, it offers various graphical approaches to represent structure and it shows ability to model soft social and psychological variables. LAP-Support System focus to improve a nonlinear relationships within its structure. The nonlinear relationships is a means by which each relation can be analyzed and evaluate independently and evaluate its effect on the whole system. This provides flexibility to examine alternative policy options (7). Moreover, they allow for efficient navigation within such structures (12).

C. simulation

offer a variety of ways to represent basic knowledge and system development through the advanced simulation technology. The simulation apply over the whole LAB- support system and for each attribute in the system. Simulating the LAB- support system shows that policy intervention come from bottom up which is best management style for local development -community or neighborhood. Simulation allows multi criteria based scenario analyses. Also, the data and analysis representation in 3D simulation program afford understandable language among various actors. Transfer knowledge is a prerequisite for other actors to be able to make informed decisions *(12)*.

D. feedback structures

representation of feedback structure is a key in the LAB- support system as shown in *Fig. 2*. A problems whose behavior is governed by feedback relationships, has a long term time horizon (27), and not suited to one-time decisions. Data and ideas generation have to come from all levels of the organization for the purpose of knowledge dissemination. The latter is the core of LAB- support system and prerequisite to the introduction of urban quality creation and a prerequisite for other actors to be able to make informed decisions (12).

Since the top management chooses from among the ideas which can be implemented, still there is a strategic choice to be made (28). However, a clear development of LAB- support system -which control the feedback data process- , obtains expert Knowledge and public Knowledge as open source for policy maker in the field of urban development.

Over all The top discussed concepts, LAB- support system fulfill the need of urban quality development process to but in structured- objective procedure. Also, the system replace the conventional Decision making process - Define problem- Assist Priorities- Goad and Objective- Develop strategies, build validation, use the model for policy analysis and use the model for public outreach are steps followed in any problem solving process. They are all involved in LAB- support system procedure (29) (27). The most important features is that main carrier of knowledge are researchers as they control the whole process as shown in Fig. 2.

An iterative process and results at any stage can feed back to previous steps (27). Successful strategists appear to continuously use information from the environment to frame mental models of future scenarios which their organizations may face. Strategic alternatives are tested using these models in a simultaneous, relational and holistic simulation as opposed to sequential processing of information.

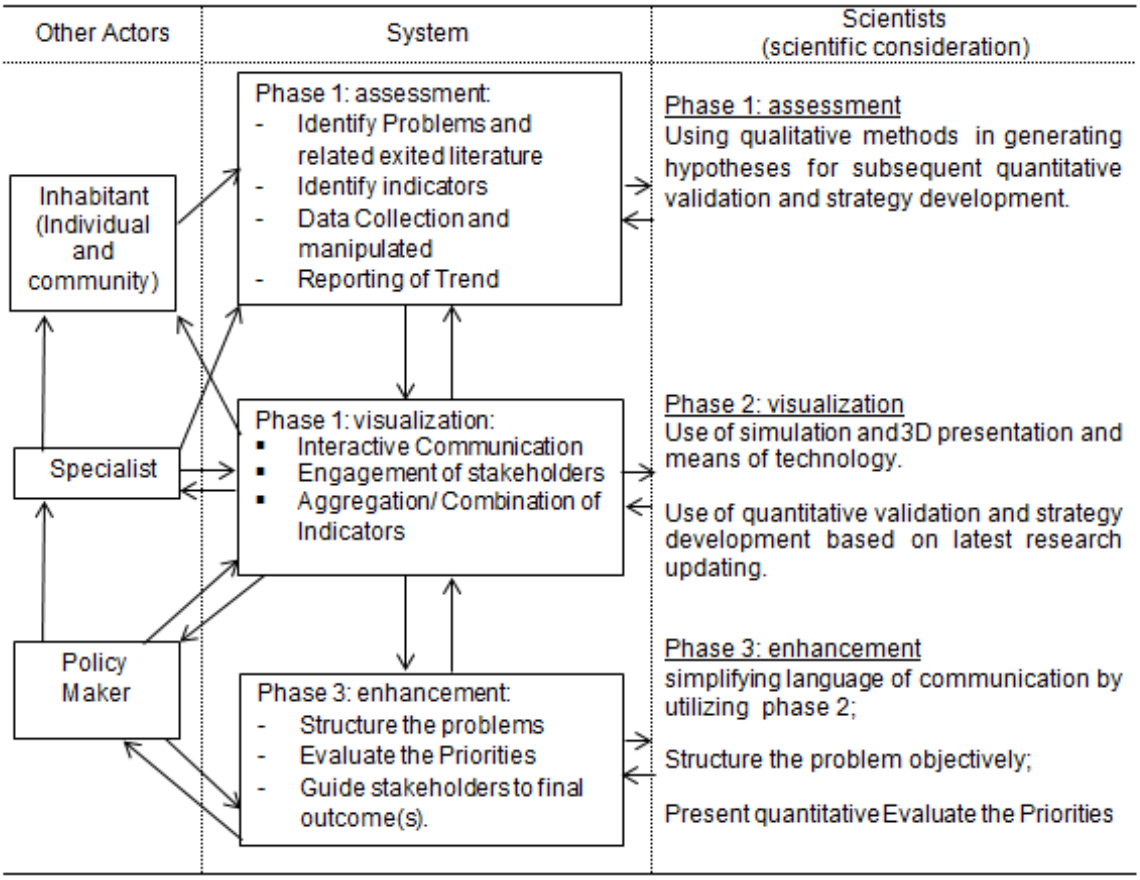

Fig. 2 *Project workflow*.

- The public outreach comes in early stage and communicate as an active actor in the system.

- The process of creating LAB- support system –with its simulation and visualization- helps clarify the resource management problem and makes modeler assumptions about the way the system works explicitly.

- The most important advantage of LAB-support system is its ability to be used to simulate the effect of proposed actions on the problem and the system as a whole. In this regard, Forrester (1987) noted that this kind of tool is necessary because, while people are good at observing the local structure of the system, they are not good at predicting how the complex and interdependent the system will behave (20).

LAB- support system presented a problem evaluation approach based on the premise that the structure of a system, that is the way essential components are connected, generates its behavior.

2. Partnership role by researchers

LAB-system implemented a number of modeling and simulation technologies. Some of them are geared towards systems analysis, others at knowledge dissemination. LAB-system offers an examination of behavior of the system under investigation that enables linkage between the Knowledge contribution observed and the underlying system structure. The implications are threefold:

Ability to define the fundamental structure components' contribution of knowledge at any time: The system enables researchers to focus explanation to actors regarding systems contribution by referring to the specific underlying structural causes of that contribution.

Ability to interrelate the dynamic behavior of a particular attribute into the whole system. This has two positive sides. First, enables researchers to trace the origin of a particular development back in time or, in the reverse, build a story that leads up to the current state of relationships. This allows policy maker to understand the information passed on at a deeper level and support logical matching subsequent decision.

Ability to highlight accessible points of intervention in the system structure to modify the system behavior. This allows researchers to offer entry point for decision-making and even policy design for the purpose of urban quality management.

LAB- support system utilized system dynamics in the following ways to facilitate the development of interactive system on a variety of actors:

Within the field of system a large body of models has been developed by researchers.

Classic models resulting from expert group modeling can then be drawn upon and modified for other case studies and clients

Existing system dynamics models can contribute with distilled domain expertise in a variety of fields related to sustainable development.

There are many consideration that must be taken. It start with built hypothesis based on exploratory-qualifying tools to avoid wrong or weak define problem. During whole system process, technology and latest research outcome must be updated. Finally, policy decision must be provided by quantifying – readable outcome data and involved all over the process of system.

The following section will discuss a case study of implementation of the process [Inhabitants Feedback- Researchers Assessment- Researchers Visualization] and [visualize knowledge from previous process to Specialist- Specialist Feedback- Researchers Assessment- Researchers Visualization] which is highlighted in Fig. 3.

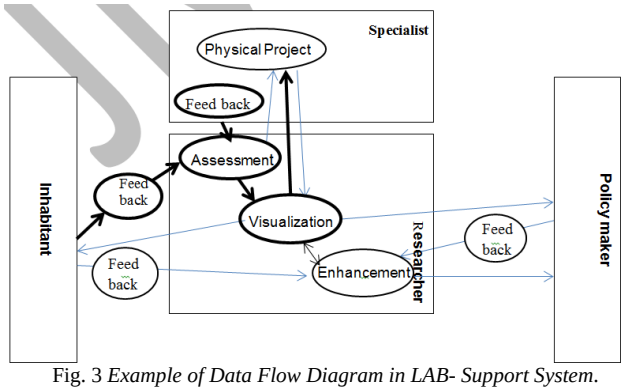

Fig. 3 *Example of Data Flow Diagram in LAB- Support System.*

V. IMPLIMENTATION

Walking is the fundamental way for people to move, of getting from A to B, and to assimilate the urban landscape. It is enabling human body to exercise both physically and mentally (31). Furthermore, walkability is a fundamental criteria of Sustainable city (32). However, walking is an avoidable mode of transport in Sultanate of Oman. during the last decades, as urban areas grew considerably, streets were increasingly dimensioned to accommodate vehicles to the detriment of the pedestrian , and pedestrian access has declined over the past decades over whole Sultanate. Related to the absent of walking, There are many drawback on Omani communities (33). This section is demonstrate the use of LAB-Support System to hypothesis the problem and structure it for further procedure to support policy formulation and decision making.

A. Methodology

This procedure is part of wider research of LAB-support System which develops objectivity of process of planning and design in generating walkability to support decision making and policy formulation. In this part, the procedure presents how to assess problem formulation stage only in LAB- support System. Although, the basic principle of LAB- support System will be highlighted and evaluated. For the purpose of logic and consistency, the targeted site for development was defined. It is Al Khuwair South which is located in the heart of Muscat Governorate. It is attached to the Largest Ministries District. It is commercial hub which faces rapid development. It also has the largest undergraduate Institute (from the number of occupant students point of view), which is Higher College of Technology- HCT. The last important criteria, it was one of the earliest town that has been built base on the existed building regulation code and Urban Planning Manual (34).

Determination of hypothesis of any study is crucial. A pilot study through six focus groups was conducted. The first stage was design to get the inhabitants feedback. For the first four groups, the monitor didn't mention walkability in any stage of discussion. Instead, the focus groups were designed to explore "what people in Muscat – precisely but not executively: in Al Khuwair- South City- "like and dislike about the city!". All groups were selected to be residence of case study area for more than three years. The number of participants vary from 8 to 12 person for each sessions. Two groups were undergraduate students. Some of them live at student dormitory and some live with their families. They were all students at Higher Collage of Technology. Other two groups were the adults of domestic families. Two groups were met in winter and other two were met during summer time to include the effect of weather if any. The focus group speech content has been pointed as "like" and "dislike" ideas. They were recorded and then speech content was converted into writing text. The latter has been analyzed by KH Coder to obtain qualitative data.

The outcome of first stage generated the base for further discussion points which required feedback from specialist stakeholders.

Second stage was conducting the feedback from specialist. A focus group of Academic Instructors from department of Architectural Engineering and Practitioner-Planners was run. The group consist of seven participants, one monitor and two video tape recorders. The discussion covers questions like "Why are Omani Cities car-dependent? what is missing?" and "What are the opportunities and the restrictions for people in Oman to demonstrate walking behavior?" . At the same time, the participants were free to cover all points they would like to add within an hour of time. All conversation converted to text and analyzed by KH Coder to quantitative content analysis of text data.

Content analysis has been extensively employed to analyze qualitative data. In this article, Extract words automatically from data and statistically analyze them to obtain a whole picture and explore the features of the data while avoiding the prejudices of the researcher. The features will be discussed in the following section with reference to the results of the analysis of the following commands:

- Term Frequency:

This command list all words that has been used in the text and accounts the frequency of each one. The program allows researcher to eliminate the unnecessary words if required.

- Term Frequency Distribution

This command creates and displays a frequency distribution table . The command tabulates only target

words for analysis. Therefore, the table is useful for identifying how many types of words will be analyzed .

- Co-Occurrence Network of words

This command enables researcher to draw a network diagram that shows the words with similar appearance Patterns connected by lines (edges). The size of word bubble reflect the term frequency. Given visualization of co-occurrence structures makes it easier to be understood.

- Multi-Dimensional Scaling of words

This command enables researcher to carry out multi-dimensional scaling on the extracted words and to draw the results in 1- to 3-dimensional scatter diagrams. Researcher can use this function for finding combinations or groups of words that have similar appearance patterns.

- Hierarchical Cluster Analysis of words

This command enables researcher to analyze which combinations or groups of words have similar appearance patterns using hierarchical cluster analysis. The analysis results are displayed in a dendrogram. This command produces results that are easier to interpret than those created using the Multi-Dimensional Scaling command.

B. Results and Discucion

*1) Inhabitants Feedback Analysis:*The contest analysis of inhabitants' focus groups shows high frequency of like and dislike as they were topic of discussion. Among 156 types of words, car, city, parking area and walk obtain the highest rate of frequency with 95 cumulative percent of the whole contest as shown in TABLE III and TABLE IV.

TABLE III. **LIST OF TERM FEQUANCY**

Word	TF	Word	TF
like	29	street	7
dislike	28	available	6
car	16	place	6
city	12	access	4
parking	10	because	4
area	8	feel	4
walk	8	green	4
activities	7	landscape	4
build	7	near	4
crowd	7	people	4
facilities	7	street	7
service	7	available	6

TABLE IV. **TERM FREQUACY DISTRIBUTION**

TF	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	86	55.13	86	55.13
2	34	21.79	120	76.92
3	14	8.97	134	85.90
4	7	4.49	141	90.38
6	2	1.28	143	91.67
7	6	3.85	149	95.51
8	2	1.28	151	96.79
10	1	0.64	152	97.44
12	1	0.64	153	98.08
16	1	0.64	154	98.72
28	1	0.64	155	99.36
29	1	0.64	156	100.00

a) Multidimensional Scaling

Multidimensional Scaling shows four major patterns. Pattern A presents strength points like green city, clean, landscape, nature, culture, connectivity. Also, availability of the services in area. And with analyze how a "services" word was used in the contest, It showed services categorized as restaurants, malls and other commercial services. The word activity/activities are connected to people, park and beach as shown in pattern B. On the other hand, pattern C emphasis three weakness issues in the case study area which are building forms, cars crowdedness, and walk problem. . Pattern D consist of inhabitants' preferences and desires.

The them outcome from Term Frequency Distribution and Multidimensional Scaling showed inhabitant's exhaustive unconscious concerns about car- oriented development as the latter is correlated 90% of word frequency. Multidimensional Scaling presents the same negative impact. It also shows an implicit awareness of pedestrian oriented development as will be explain in the following section.

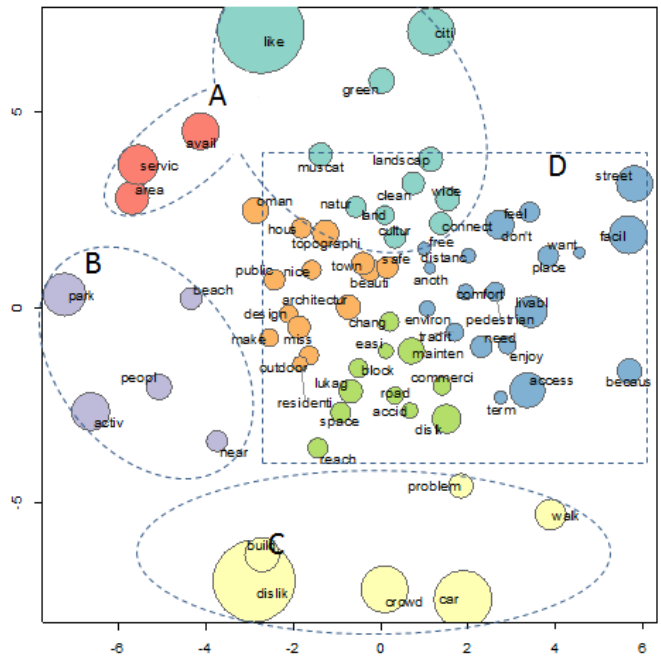

Fig. 4 *Multidimensional Scaling of inhabitants feedback.*

b) Co-occurrence Network of Words

a two-dimensional scatter diagram are presented to visualize the structure of relationships between extracted words as shown in Fig.5 and Fig.7. It present direct proportion between size of node and term frequency. The early stage of analysis highlighted a major urban problem which is car-oriented development. Co-Occurrence Network of words analyses visualize the size of problem “dislike car” compare with whole structure of Inhabitances’ feedback.

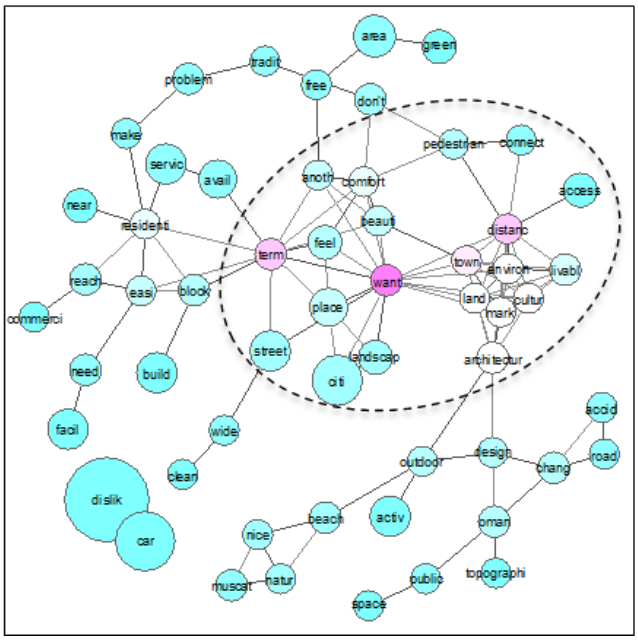

Fig. 5 *Co- occurrence Network of Inhabitants Words: Centrality degree.*

- From Centrality Degree Co-Occurrence Network of words analyses:

a. The centrality associated with words synonym to city which are town and environment. Also, It present high value of *identity* of the city which was expressed by landmark, culture, architecture and livability. It is logic since the topic is a bout the city and its features

b. It emphasizes high degree of centrality for consideration of pedestrians in regards with distance, accessibility and connectivity. It displays important issue related to walkability which is “pedestrians don’t comfortable

c. The perceived quality of urban such as beauty and feel of place got remarkable desire by inhabitance.

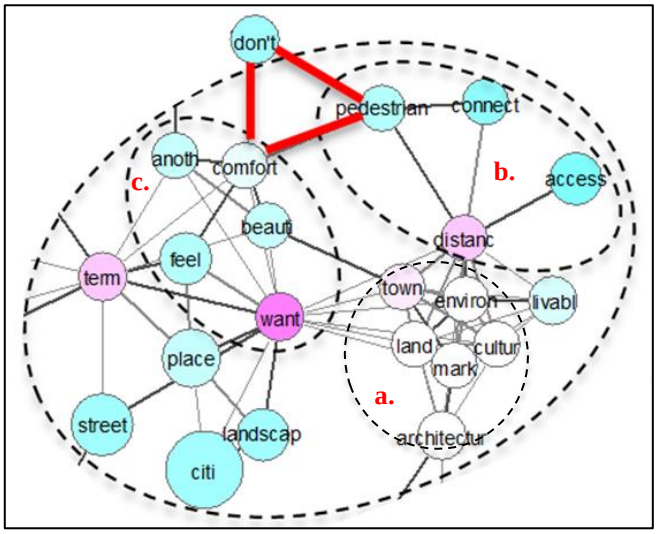

Fig. 6 *Detailed analysis of Co- occurrence Network of Inhabitants Words: Centrality degree*

- From Communities betweenness Co-Occurrence Network of words analyses : Pedestrian is located with central core of identity of city and its precived qualities. And it is related to
  a. Land scapem green area and outdoor activities.
  b. Residential sector and entropy of land use.
  c. The design must consider the beauty of topography in Oman and public space.
  d. Change the design of rood and related accident problem.

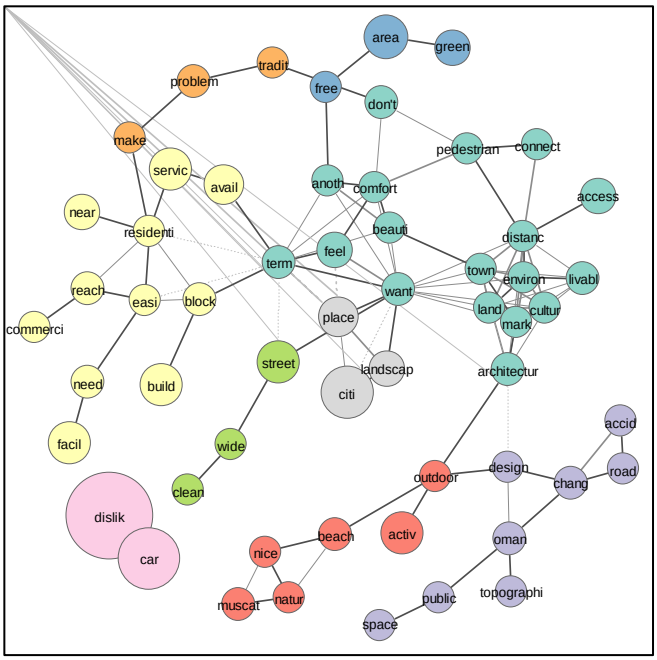

Fig. 7 *Co-occurrence Network of Inhabitants Word: Communities betweennesss.*

c) Hierarchical Cluster Analysis: main aim of category of Hierarchical Cluster Analysis is how to make bedestrian fell comfortabel. All other clustter illustrates the general aim of inhabitances' speech:

- Prevent the car dominancy and related issues.
- Neighborhood design and availability of daily needs in accessible and connected destinations within walking distance
- Focus of the planning and design of landscape and outdoor activities.
- Resolve the code and regulation to consider human scale.
- Enhance the opportunities to enjoy the beautiful nature of the city.

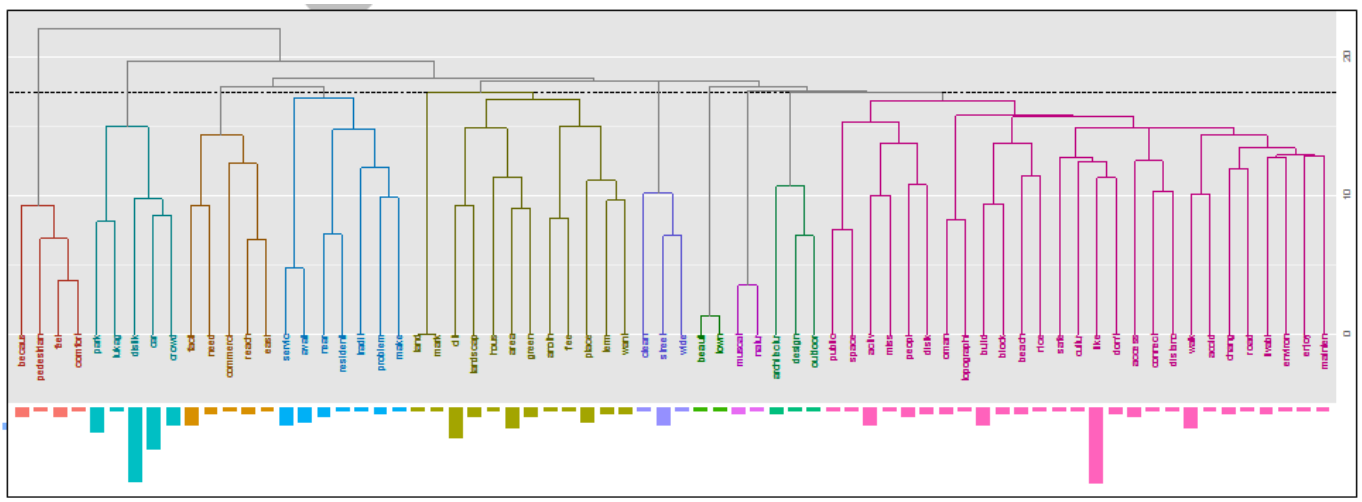

Fig. 8 *Hierarchical Cluster Analysis of Inhabitants.*

2) Academic in Architectior and Planars feedback analysis:

a) Multidimensional Scaling: Multidimensional Scaling categorise speech of specalist in to four categories. First category define the major problem which is development of master plan and related policies. It presents the four type of stackholders; policy makers, specialist and people. It also define two scale of problem solution which are town master plan and neighborhood. Beside the scale and the stacheholders, They categorize the solution into three area which are Social needs, environmental requirement and physical built form solutions as shown in Fig.9.

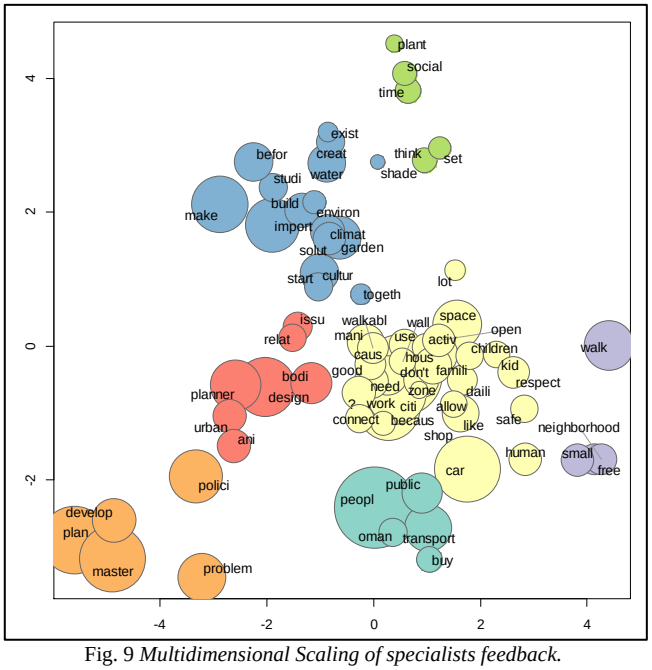

Fig. 9 *Multidimensional Scaling of specialists feedback.*

b) Co-occurrence Network : in Fig.10. the central degree a of Co-occurrence Network analysis emphsis neighborhood as a focul point of development. It must be suported by different modes of transport and active social system.

The analysis of specialists Communities betweennesss of Co-occurrence Network showed four patterns (Fig. 11). The largest pattern introduce the iintegration of different mode of transport in related to neighborhood design. The green and red pattern concentrate on social life. The yellow and purpole pattern give attention for environmental issues. The master plan has specific important in development of walkability.

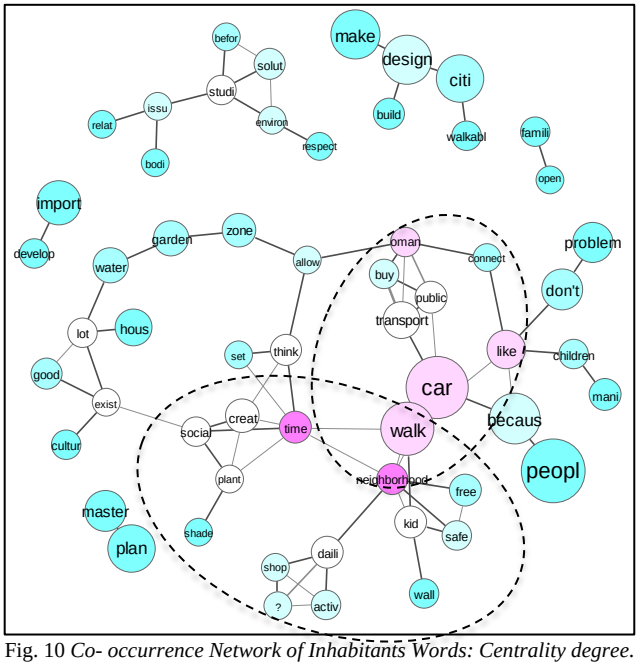

Fig. 10 *Co- occurrence Network of Inhabitants Words: Centrality degree.*

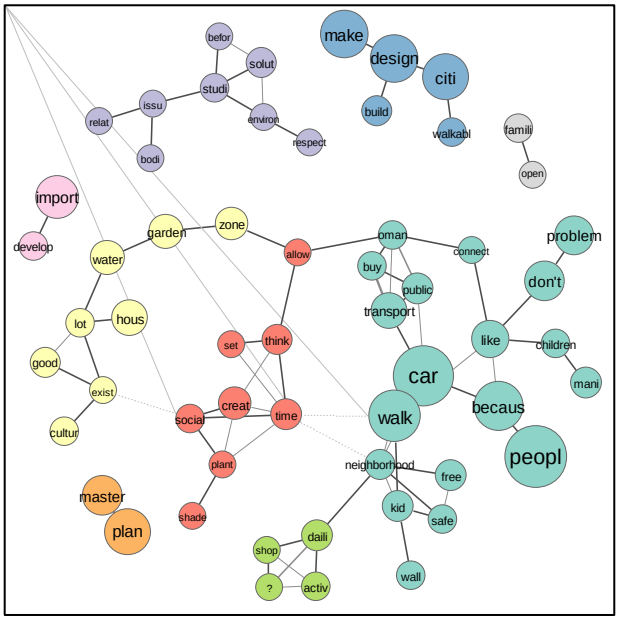

Fig. 11 *Co-occurrence Network of specialists Word: Communities betweennesss.*

c) Hierarchical Cluster Analysis: The outcome of text mining is consistant with the existed Literature in walkability development area (Fig.12). Howevere, It puts structure a according to required perioriteies for existed situation in Muscat. It generated the Analytic Hierarchy Structure which will be used in Analytic Hierarchy Process for the following process in LAB-Support System as shown in Fig13.

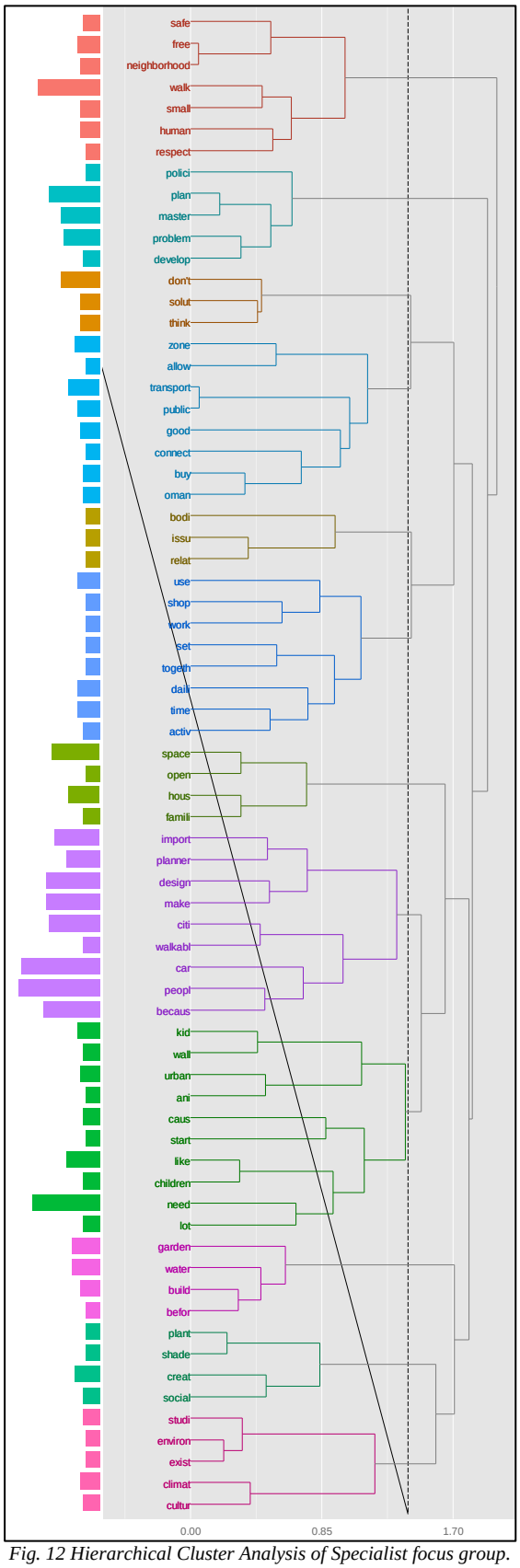

Fig. 12 Hierarchical Cluster Analysis of Specialist focus group.

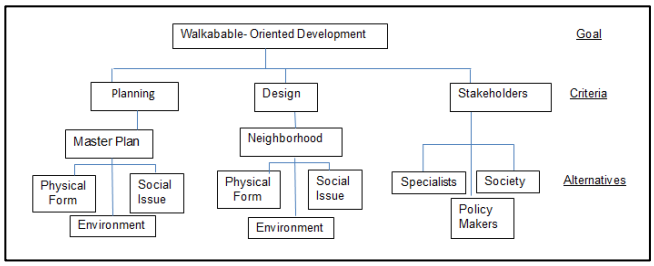

Fig. 13 Analytic Hierarchy Structure

CONCLUSION

This paper synthesis the architecture of system development to convert urban planning process for special development into dynamic qualitative support system. The empirical base for the methodology was SAVE approaches and Dynamic system approach. . Since the scientific urban planning cycle is not end with generalization, the two approaches were selected to enhance knowledge transformation and learning process in order to explicitly improve stakeholders communication. The second reason was generating human-oriented System. The paper suggested rolling of system by researchers and explained the benefits of their major contributions. The benefit of that automated functions can bring knowledge engineering technique to an objective common language with policy-maker and public. In sub-system, each can be large and central to the system according to the needs. The system is flexible to include method that grants control to an expert to specify what test cases should be generated and therefore potentially increases a result quality. Other benefit of the system are that the component of each subsystem is independent and can be used or improved separately if required. Also, the obtained expert Knowledge and public Knowledge are reusable which considered as open source for researcher in the field of urban development .

FUTURE WORK

For the previous implementation, conducting focus group discussions consume a lot of time and effort, yet, they were limited to a small samples. For the purpose of efficiency, the researcher is working to translate processes that involved in LAB- support system into webpages. It is hoped that the generated website will be accessible by all stockholders and the feedback will be in texting chat board which can be automatically quantified . The outcomes also will be visualized in the website.

REFERENCES

[1] The Use of Systems Thinking And System Dynamics in Urban Planning and Education. ERKUT, Gülden. Istanbul, Turkey : Conference Proceedings of the 15th International Conference of System Dynamic Society, August 19-22, 1997. Systems Approach to Learning and Education into the 21st Century. http//www.systemdynamics.org/conferences/1997/erkut.htm.

[2] How planners' use and non-use of expert knowledge affect the goal achievement potential of plans: Experiences from strategic land-use and transport planning processes in three Scandinavian cities. Aud Tennoy, Lisa Hansson, Enza Lissandrello, Petter Naess. Progress in Planning 1–32- 109 (2016), s.l. : Elsevier Ltd., 2015, Vol. http://dx.doi.org/10.1016/j.progress.2015.05.002. 0305-9006@2015.

[3] Huang, S.-L., Chen, C.W. A system dynamics approach to the simulation of urban sustainability. [book auth.] J.L. Uso. Ecosystems and Sustainable Development II. In: Brebbia, C.A. : WIT Press, Southampton, 1999.

[4] Rothman, D.S., Robinson, J.B., Bigg, D. Signs of Life: Linking Indicators and Models in the Context of QUEST. [book auth.] Baranzini, H. Implementing Sustainable Development—Integrated Assessment and Participatory Decision-Making Processe. In: Abaza : Edward Elgar, Cheltenham, UK, 2002.

[5] Rotmans, J., van Asset, M. Integrated Assessment: current practices and challenges for the future. [book auth.] Baranzini H. Implementing Sustainable Development—Integrated Assessment and Participatory Decision-Making Processes. In: Abaza : Edward Elgar, Cheltenham,UK, 2002.

[6] C, Richey R. The pursuit of useable knowledge in instructional technology Educational Technology Research and Development . 1998. pp. 7–22. 46 (4).

[7] A SYSTEM DYNAMIC APPROACH - URBAN SPRAWL. G, Sonar Sanjay Kumar. Dalian : Congress Report, 44th ISOCARP Congress, 2008 . /CHN (CD-Box).

[8] Sustainability Assessment & Enhancement Through Novel Visualisation. Sustainability AsJohn P., Stojanovic Vladeta, McCreadie Chris , Falconer Ruth E., Gilmour Daniel J., Blackwood David J. Berlin : Isaaes, 2013.

[9] Owens, S., Rayner, T., & Bina, O. New agendas for appraisal: Reflections on theory, practice and research. Environmental Planning A. 36, 2004, 1943-1959.

[10] Næss, P., Hansson, L., Richardson, T., & Tennøy, A. Knowledge-based land use and transport planning? Consistency and gap between "state-of-the-art"knowledge claims in planning documents in three Scandinavian city regions. Planning Theory & Practice. 14, 2013, Vol. 4, 470-491.

[11] Gehi, Jan. Cities for People. Washington|Covelo| London : Island Press, 2013.

[12] Joseph, Healey and. Statistics: A tool for Social Reasearch. New York : Wadsworth Publishing Company, 1999.

[13] Hanne- Lovise, Skartveitveit, Katherine Goodnow and Magnhild Viste. Visualized System Dynamics Models as Information and Planning Tools. [InSITE- "Where Parallels Intersect"] s.l. : Information Science, June 2003.

[14] Forrester, J. W. Principles of Systems. Cambridge : M. A. Productivity Press. Mass, 1968.

[15] Dynamics, Management System. Coyle, R. G. . London : John Weiley and Sons, 1977.

[16] Chadwick, G. F. A System View of Planning. New York : Pergamon Press, 1971. pp. p.36-37.

[17] Checkland, P. System Thinking and System Practice. Chichester : John Weiley and Sons, 1981.

[18] Forrester, J. World Dynamics. Cambridge : M. A. Wright- Allen Press, 1971.

[19] Lee, C. Models in Planning. New York : Pergamon Press, 1973.

[20] Mohapatra, P. K. J, Mandal, P. and Bora, M. C. Introduction to System Dynamics Modelling. Hyderabad : University Press (India), 1994.

[21] Forrester, J. W. Industrial dynamics. New York : John Wiley and Sons, 1961.

[22] Sterman, J. D. Business dynamics: Systems thinking and modeling for a complex world. Boston : Irwin McGraw-Hill, 2000.

[23] Goodman, M. R. Study Notes in System Dynamics. Portland : Productivity Press, 1974.

[24] Steve Brennan. http://www.selfgrowth.com/articles/Definition_Assessment_Tools.html. Self Growth. [Online] Wikipedia, the free encyclopedia © 2001-2006.

[25] Ministry for the Environment. Urban Design Toolkit . Wellington, New Zealand : Ministry for the Environment, 2006. ISBN: 0-478-25947-6.

[26] Blackwood, D., Isaacs, J., Gilmour, D., & Falconer, R. Supporting Sustainable Water Sensitive Urban Design through Dynamic Visualisation & Modelling. 2012.

[27] Widrich, Leo. Have the 4P's of Marketing Become Outdated? Help Scout Int. . [Online] GREGORY CIOTTI , JUNE 23, 2016. https://www.helpscout.net/blog/new-4ps-of-marketing/.

[28] Venix, J. Group Model Building: Facilitating Team Learning Using System Dynamics. New York : Wiley, 1996. p. 297.

[29] Lawrence, Eton. Strategic Thinking : A Discussion Paper. s.l. : PersonnelDevelopment and Resourcing Group Research Directorate, Policy, Research andCommunications Branch, Public Service Commission of Canada, 1999.

[30] Ford, A. Modelling the Environment. An Introduction to System DynamicModelling of Environmental Systems. Washington D. C. : Island Press, 1999. p. 401.