Towards Electronic Learning and Mobile Learning Technologies

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ABSTRACT
In last decades, Electronic Technologies (ET) has been developed and spread around world through using Information and Communication Technologies (ICTs), such as Electronic learning (E-Learning), Mobile Learning (M-Learning), Virtual Labs, Virtual classroom, Virtual University etc. ET is distinguishing by some main properties, for example decreasing of geographical distances, quality, avoiding risks, anytime and anywhere. ET can be used in many fields according to positive or negative trends. E-Learning is considering a powerful technology in many scenarios and offering aplenty of opportunities to learning and training for human or organizations in addition to M-Learning which is considered as a modern form of E-Learning. M-Learning is transformation the delivery of learning and training.

Keywords: Electronic Technologies (ET), Information and Communication Technologies (ICTs), Electronic Learning (E-Learning), Mobile Learning (M-Learning).

I. INTRODUCTION

Currently, it is remarkable that the advancement of computers systems, the web and Information and Communications Technology (ICT) are becoming very large and rapidly increasing. ICT is considering the main factor in appearance of a new age called Information age. ICTs have been useful in many areas such as commerce, education, training, health, military and defense.

ICT is referred to various combinations of technological tool and resources which made the usage to communicate and connect, it also made the usage to generate, distribute, collect and manage information. The rapid development of ICT, particularly the Internet is one of the most magic phenomena that characterizing the Information Age. ICT offering many on-line services in the fields of commerce, culture, entertainment and learning.

Information and Communication Technologies contains of the hardware, software, networks, and media for collection, storage, processing, transmission and display of information (voice, data, text and images). ICTs can be divided into two main parts, Information and Communication Infrastructure (ICI) which refers to physical telecommunications systems and networks (cellular, broadcast, cable, satellite and postal) and the services that utilize those (Internet, voice, mail, radio and television) on one hand, and Information Technology (IT) that refers to the hardware and software of information collection, storage, processing, and display on the other hand. The Information and Communication Technology (ICT) approach prepares and provides a wide perspective on the type and nature of technology, how to use and apply several of technologies and the effect of ICT on individual

,organizations and society[1] .According to UNESCO, ICT is defined as "the combination of informatics technology with other, related technologies, specifically communication technology[2]. We can define ICT as follows:

The technologies including communication, computers and information equipment which are used by person or organizations for many functions or tasks.

Mobiles technologies are related to ICT. Mobile technology is being used in imparting information fast, effective and more facilities. Now, we would like to illustrate the wide spread of ICT in everyday life through the next figure from International Telecommunication Union (ITU). Figure (1) describes the developments of the various components of ICT from 2001 to 2018[3] .

Figure (1): Global ICT developments 2001 to 2018 (ITU)
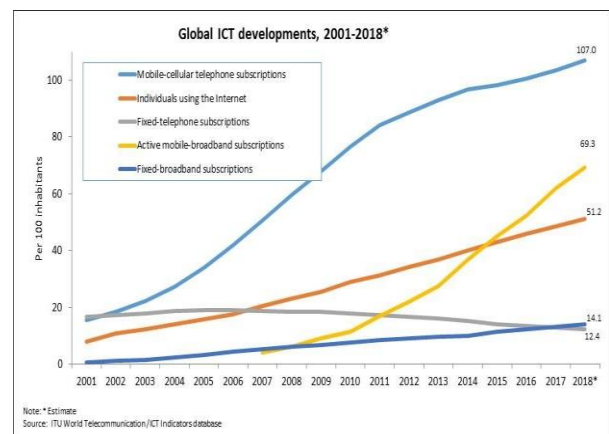
The ICT can be used in education, learning and teaching process at the following trends[4] .

- Teaching
- Psychological Testing
- Virtual Laboratory
- Evaluation
- Diagnostic Testing
- Remedial Teaching
- Online Tutoring
- Instructional Material Development
- Development of Reasoning & Thinking

II. ELECTRONIC TECHNOLOGY

Nowadays, Electronic Technologies (ET) usage trends are becoming very large in all over the world. Smart digital devices, Internet, computers, software and other information and communication technologies are common in training or learning organizations.

ET can be used in positive and negative trends in learning, training, entertainment, industrial systems, medical, commercial and military environments or in fatal effects, in electronic war and electronic crime etc. By using ET, It is necessary to highlight for positive and negative approaches of ET. In figure (1), we classified and illustrated some examples of most common terms of positive and negative approaches for ET.

Figure (1): Positive and Negative approaches of ET

A. Electronic Learning

Recently, Electronic-Learning (E-Learning) has been widely spread as one of the new technologies in the world. The interest and demand for E-Learning has been growing around world. In Egypt, E-Learning has been greatly supported in the last few years. To support ELT, the Egyptian government has founded the Egyptian University of E-Learning and the Supreme Council of Universities E-Learning project. The term 'E-Learning' can be confusing. Next lines will demystify the term and outline key terminology.

There are many definitions and concepts to describe the new and different aspects of E-Learning technology.

- "E-Learning technology is all forms of electronic supporting learning and teaching, which are procedural in character and aim to affect the construction of knowledge with reference to individual experience, practice and knowledge of the learner. Information and communication systems, whether networked or not, serve as specific media (specific in the sense elaborated previously) to implement the learning process"[5].

- "E-Learning technology is defined as individualized instruction delivered over public (internet) or private (intranet) computer networks. E-Learning is also referred to as online learning, Web-Based Learning (WBL) and the virtual classroom. E-Learning was first called Internet-Based Training (IBT) then Web-Based Training (WBT). Today you will still find these terms being used, along with variations of E-Learning"[6].

- From our point of view, E- Learning Technology is the using of Information and Communications Technology (ICT) in the process of learning or training anytime and anywhere. E-Learning is considering avital phenomenon in many areas.

There are two main types of E-Learning. Synchronous E-Learning and Asynchronous E-Learning[7].
*Synchronous-Learning)*simultaneous method) is considered as participation between instructors and learners in the same time at different places.Synchronous E-Learning takes a variety of methods such as real-time interactive conferencing and multicast.
Asynchronous E-Learning (not simultaneous method) is free of simultaneous manner participation between instructors and learners. It provides more opportunities for learning or training at any time. Asynchronous E-Learning usually takes manners such as collaborative systems for discussion-organization or company Intranets that distribute training to its employees- electronic mail.

In Synchronous E-Learning type, persons feel more interactive and members of learning society. Asynchronous E-Learning type is suitable type in some cases. Persons or organizations can choose between Synchronous E-Learning or Asynchronous E-Learning according to their needs.

B. Mobile Learning

Mobile-Learning (M-Learning) combines E-Learning and mobility [8]. M-Learning is considered as special form and subset of E-Learning in addition to the using of mobile devices and modern mobile technologies-learning changes the manner of learning or training due to its availability, flexibility and interactivity. Figure (2), determines M-Learning and E-Learning[9].
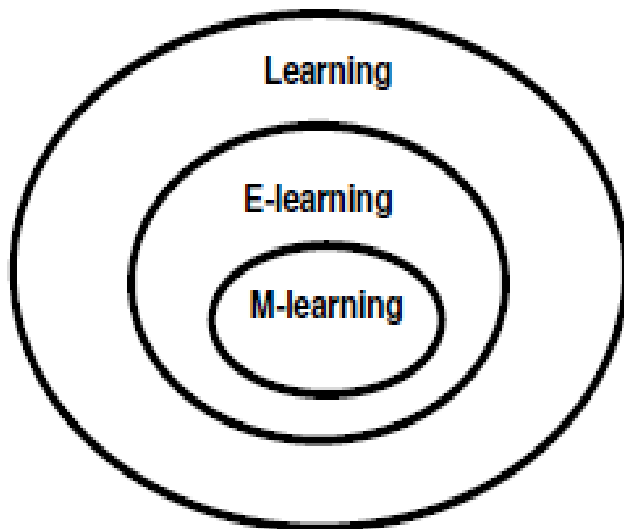

Figure (3): M-Learning is subset of E-Learning

The first researches and studies which are published about M-Learning had started around 2000. M-Learning approach and freely afforded by Mobile devices encourages the person to learn or train without traditional learning methods constraint [10].

The term M-learning includes the feature of mobility and network wireless technologies in addition to be used in the learning, training and education processes [11].

M-Learning is creative and flexible way in learning, education, teaching and training. People can easy access Internet move and travel freely at any location such as club, institute, store, organization, capital city and village. They can learn or train at any place, anytime, single and group.

M- Learning can be defined as "a type of learning that takes place through portable devices which provide its users to meet their needs within seconds in terms of accessing ever changing data and communicating with others without sticking to anything and anywhere".

According to Fatih Project in Education (2006-2010) at Turkey which was supported by Ministry of National Education. In this project, there exists objectives which mentioned in Table (1) and there are organizations such as universities, companies, and institutes have been using some applications about mobile learning. The trend to M-Learning will increase[12] .

Table (1): Objectives of Fatih Project in Education

OBJECTIVES OF FATIH PROJECT IN EDUCATION
To develop life-long learning, make the individuals improve themselves through e-learning, to improve the e-content they use
Every student graduating from a high school should have the ability to use information technology and basic knowledge
By means of using internet effectively, one out of every three should get the benefit of e-education services,
Offering every individual opportunity to use and learn information and communication technology
One out of two should be internet user
To make the internet a safe environment for all the community

In short look, Figure (3) can determines the concept of M-Learning as the using of mobility, mobile devices and mobile technologies at anytime/anywhere for training or learning in addition to M-Learning achieves user friendly. Flexibility from fixed places constraint is a vital property of M-Learning.
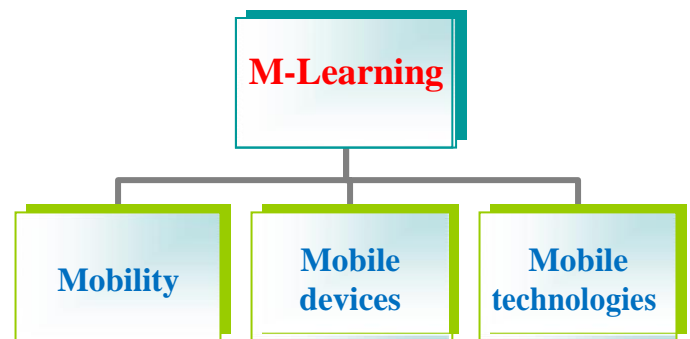

Figure (3): M-Learning concept

M-Learning is extremely widespread multidisciplinary study trend around the world. It has attracted a prominent interest from many researchers who have realized the importance to support and apply mobile technologies to improve learning process.

There are perspectives and theories of mobile learning in addition to some M-Learning practices that are executed in many different trends for instance, university, corporate and military.

Attention of persons about M- Learning is coming due to mobile devices are available to many people, handheld, ubiquitous and flexibility of access. Some scientists describe M- Learning as an expansion of E-Learning[13]. M-Learning can be used in cases for instance challenging disable and injury students, finding a solution for disabling the study process, challenging injury teachers and facing emergency.

III. RELATED TOPICS

A. Electronic Training

The developments of computer systems and information communication technology are lead to the appearance of Electronic-Training (E-Training) which is considered as a form of E-Learning and used in many fields such as organizations and corporate E-Learning (or E-Training). Web-based training and video conferences are types of E-Training. According to previous study, E-Training refers to "any type of training provided in organizations via electronic media which include self-paced learning from Intranet, learning from CD-ROM at work, training provided by instructors live through Webcast, recorded sessions of past webcast trainings available to employees and others"[14].

Figure)4(, shows and illustrates training from E-Learning perspective [15].
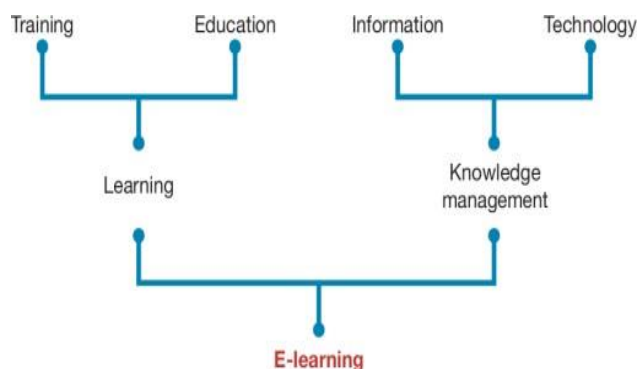

Figure (4): An overview of domains for Thought and Practice Involved in E-learning

It is necessary to describe Training and E-Training concept as follows:

- Training is "an activity that changes people's behaviors in an organization. Increased productivity is meant to be the most important reason for training "]16[.
- E-Training is the process of acquiring the knowledge and increasing of skills through using of technological.
- E-Training has features such as anytime, anywhere, user interaction, reduce cost, low risk, facilities and convenience.
- E-Training is defined as" using technology to deliver knowledge and skills from a trainer (instructor or teacher) to trainees (employee), through a mediator such as the internet, or intranet environment"]17[.

E-Training is considered as a powerful mechanism in eliminating geographical barriers factor between the trainer and trainee in addition to time factor and efforts factor. Person can training at anytime and anywhere without any obstacles. E-Training can contribute to employee training, acquiring skills and human resources fields. It is considered as a powerful tool for drawing and developing the future strategy. E-training styles can be summarized in the next figure (5))[18].

Figure (5): E-Training styles

E-Training is a vital way in particular sectors such as medical fields, nursing fields and engineering fields. Risk experiments field

B. Virtual Lab

Virtual- Lab (V-Lab) is effective trend in many fields and scenarios. V-Lab is a cheaper method the founding of the traditional laboratory [19]. It is worthy to illustrate and describe the concept of V-Lab.

V-Lab can be defined as" an electronic workspace for distance collaboration and experimentation in research or other creative activity, to generate and deliver results using distributed information and communication technologies. In the broadest sense, a VL is a collaboration focused on achieving particular creative and/or decision support objectives. Hence, the VL may encompass almost all spheres of human intellectual endeavours" [20] V-Lab is possible extensions to traditional lab and creates new chances which not available through traditional lab at an inexpensive cost. For example of V-Lab, Figure (6) shows V-Lab in chemistry field with activity of water hardness determination and removal [21].

V-Lab provides a flexible way and user-friendly manner to perform experiments. Especially, V-Lab is effective learning and training tool, suited for E-Learning and E-Training fields.
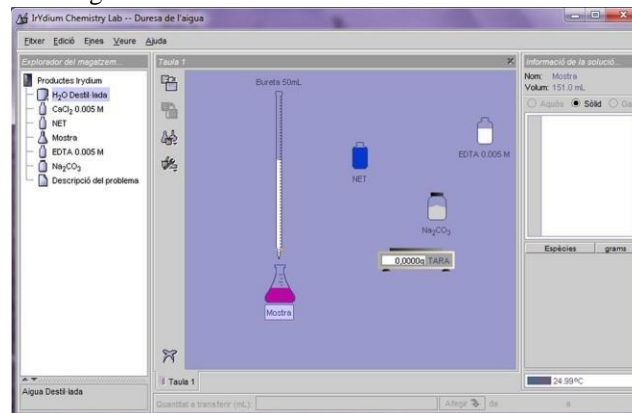

Figure (6): Water hardness determination and removal activity in V-Lab

C. Simulation based E-Learning

Simulation is a useful technique in many fields due to providing a good quality, decrease cost and avoiding risks. The using of simulations technique in E-Learning technology brings the trainees or the learners close to the real life phenomena and situations. The new trend of demand for the next generation of E-Learning is simulation-based E-Learning. Simulation is allowing us to reduce risk by letting us determine the right procedures instead of making wrong procedures. Simulation technique can be defined as follows:

- "The process of designing a model of a real system and conducting experiments with this model for the purpose of understanding the behaviour of the system and /or evaluating various strategies for the operation of the system" [22].

- From our point of view, simulation is constructing a system similar to any phenomenon in the real world and examines or predicts the change in system performance or behavior and views the results. Simulation reduces costs and avoids risks.

It is useful to illustrate an example through E-Learning via simulation such as teaching the Selection sort Algorithm for students in effective way. There are two methods of Selection sort Algorithm. First is ascending method and the second is descending method.

Figure (7), illustrates Graphical User Interface (GUI) of selection sort algorithm which is providing easy understanding of the learning content in more fluent and effective trend [23]. Selection sort Algorithm can be

illustrated in Figure (8) as follows (Ascending method):

```
(Selection Sort)  SELECTION (A, N)
This algorithm sorts the array A with N elements.
    1. Repeat Steps 2 to 3 for K=1,2 ,............, N-1
    2.      Call MIN (A, K, N, LOC).
    3.      [Interchange A [K] and A [LOC].]
            Set TEMP: = A [K], A [K]:=A [LOC] and A [LOC]:=TEMP.
            [End of step  1  loop.]
    4. EXIT.
```

Figure (8): Selection sort Algorithm

To describe the action of Selection sort algorithm, assume an array **A** contains 8 elements as follows:

7 7 , 3 3 , 4 4 , 1 1 , 8 8 , 2 2 , 6 6 , 5 5

By applying the selection Sort algorithm to **A.** The result can be illustrated in Figure (9)

Pass or step	A[1]	A[2]	A[3]	A[4]	A[5]	A[6]	A[7]	A[8]
K=1,LOC=4	77	33	44	11	88	22	66	55
K=2,LOC=6	11	33	44	77	88	22	66	55
K=3,LOC=6	11	22	44	77	88	33	66	55
K=4,LOC=6	11	22	33	77	88	44	66	55
K=5,LOC=8	11	22	33	44	88	77	66	55
K=6,LOC=7	11	22	33	44	55	77	66	88
K=7,LOC=7	11	22	33	44	55	66	77	88
Sorted:	11	22	33	44	55	66	77	88

Figure (9): An example of applying Selection sort Algorithm

First step, get the smallest element in the list and replace it with the first position. Second step, get the second smallest element in the list and replace it with the second position .And so on[24].
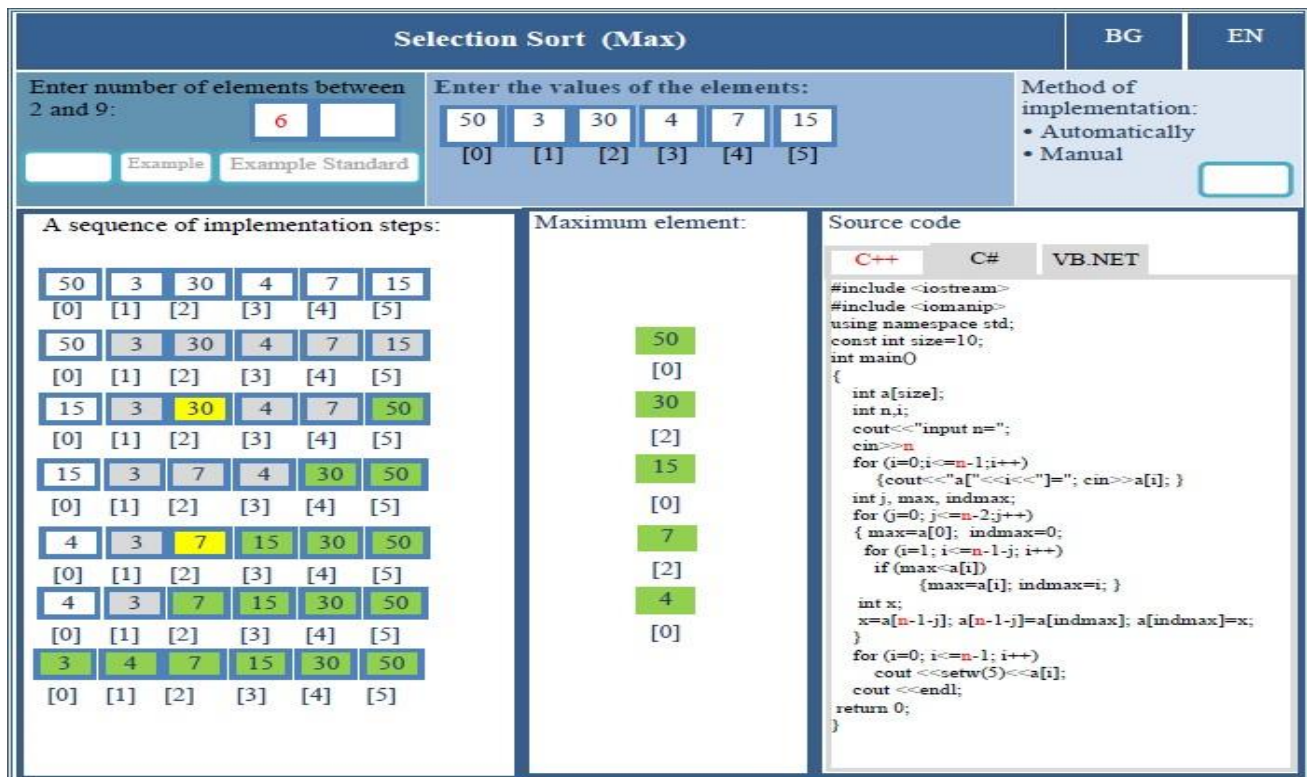

Figure (7): The Graphical User Interface (GUI) of selection sort algorithm

VII. RECOMMENDATIONS (HINTS AND TIPS)

In particular, the progress and growth in technologies and techniques such as E-Learning, M-Learning, E-Training, V-Lab and Simulation are become noteworthy. We recommend for extremely using of these technologies and techniques due to its features to achieving the next significant trends and terms .We try to show the most of these features, trends and terms which can be stated as follows.

- Anytime
- Anywhere
- Avoid risk
- Affordable cost
- Good quality
- Ubiquitous
- Creative method
- Creating new opportunities
- Breaking geographical barriers
- Appropriate Manner
- Acquire knowledge
- Improve personal skills
- Developing organizations
- Employee training
- Reduce isolation
- Electronic means
- User-friendly
- Safety training
- Research progress
- Eliminate digital literacy
- The world of smart citizens
- Certified Certificates
- World small village
- Alternative solution
- Solution for disabling the study process
- No critical circumstances
- No crises cases
- No disasters cases
- No emergencies cases
- Fluent and efficient
- Facilities and convenience
- Smart citizen
- Technology mediator
- Handhelds
- User interaction
- Problem management
- Human resources
- Profound impact
- Immediate
- An omnipresent
- Trusted contents
- Progress and achievements
- Interactive Scientific cooperation
- Encouragement
- No boredom
- Open common channels between countries
- Challenging disable and injury students
- Good performance
- Reduce efforts of traveling
- Information age
- Future generation

The technologies and techniques such as E-Learning, M-Learning, E-Training, V-Lab and simulation are **F**ive. The significant trends and terms are **Fifty**. These may be summarized by means of an acronym **F**ifty **f**or **F**ive (**FFF**).

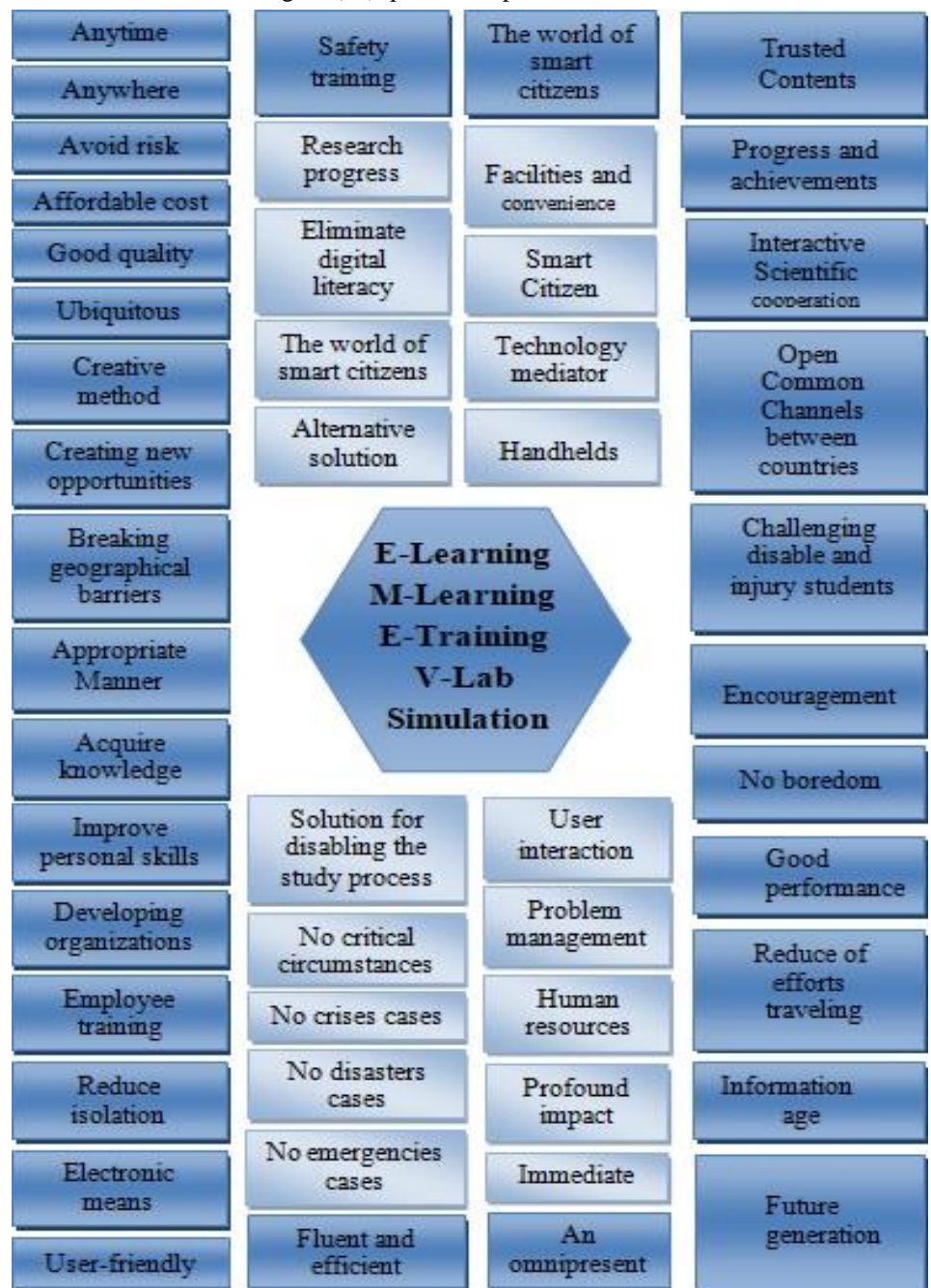Figure (10), provides a pictorial form of **FFF.**

Figure (10): FFF Form

V-Lab has none of the restrictions faced in traditional laboratories, due to flexibility of access to lab resources and decreasing budget constraints.

E-Learning and M-Learning are appropriate solution to continue study process in critical circumstances or locations such as rural areas, distant places and the events in Palestinian which impact on the learning process at academic institutions

Remote experimentation is suitable, flexible and alternative solution for avoiding some problems for instance unique or expensive equipment/materials.

This study shows that modern technologies and techniques can be applied to eliminate geographical locations between countries.

VIII. CONCLUSION

Certainly, Information and Communication Technology (ICT) is vital field and can provide appropriate solutions in many sectors. Electronic Technology (ET) has positive and negative approaches. It is necessary to avoid the bad approach of ET.The features of technologies and techniques of such as E-Learning, M-Learning, E-Training, V-Lab and Simulation such as anytime/anywhere are beneficial trends for digital transformation in technological revolution and Information age.

E-Learning is the core of M-Learning and E-Training. E-Learning is a magic mechanism to lifelong or remote education. In Egypt, there is an initiative from the president about digital transformation in the new information age. E-Learning is creative method has broken the monotony, cost-effective, timely content and access flexibility. V-Lab is a proper technique for provide safety approach instead of expensive cost of material and decrease risk of some experiments and hazardous materials

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