

CEMENTIDE: A Creativity Enhanced Model for Effective Integration and Technology Implementation in Developing Economies

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Abstract: *This paper introduces the CEMENTIDE (Creativity Enhanced Model for Effective Integration and Technology Implementation in Developing Economies) framework. The concept presented in this paper is part of a larger research thesis and contributes to the ideas on creativity through messaging and communication technologies in the context of developing economies.*

Keywords: *Communication framework, collaboration technique, creativity, technology integration and application, developing economies.*

1. INTRODUCTION

Creativity is on the rise – it may prove to be the biggest (and perhaps the most useful) phenomenon for the third generation of IT. The first generation IT focused on automation of existing business tasks and processes. Typical hurdles were technology unfriendliness - both users and ICTs (Information and Communication Technologies) were new to each other. The ICT designers were trying to transit from ‘specialist’ users to ‘common man’ as user. On the other hand, the users were trying desperately to cope up with the changing informational and communicational technologies of the professional and personal environment (often resulting in techno-phobias). New skill set along with a flexible technological adoptability attitude was the need of this moment. Gradually, as the first generation IT (1980s and early 90s) gave way to the second generation (late 90s to early 2000s) – the digital divide intensified. The world, broadly speaking, split up into the ‘have access to’ and ‘do not have access to’ the Cyberspace.

Digital divide can be discussed at two levels - at the infrastructure level and at psychological (mind set) level. Infrastructure, with respect to information and communication technologies, is (potentially) quite adequately provided for in developed societies – the question that remains (at the level of mind-set) is now choosing to use it appropriately and effectively. However, this luxury of infrastructure is still not completely available in developing or underdeveloped economies. Therefore, digital divide in this case is double – lack of infrastructure; and even if that is available, unavailability of the techno mind-set (that can properly benefit from the ICTs). A factor that helped usher in the third generation of IT (2001 onwards) is the rapid development and commercialization of emerging ICTs [1]. In many cases these ICTs are half-cooked (not fully tested) but delivered

due to severe market pressure. The ICT demand is capital driven rather than consumer driven [2]. In other words, *the desire for profit accumulation is pushing the ICT development rather than genuine consumer need.* The consumer (through intense marketing) is forced to believe that emerging ICT will bring in more profits and utility (whereas the reality, arguably, is that the same consumer has most likely not even recovered the cost of the last ICT implemented).

Now, the advent of creativity phenomenon may prove to be quite useful in bridging this digital divide (probably more directly at the psychological level and indirectly at the infrastructure level) and tackling the instability issues that result from adopting emerging technologies. The research below is an effort in this direction. The technology reviews done in this domain area were presented as a tutorial at IEEE/ACM National Conference on Emerging Technologies (NCET) 2004 in Karachi. The problem of psychological digital divide is addressed by constructing a *Creatively Enhanced Model for Effective Integration and Technology Implementation in Developing Economies* (CEMENTIDE). This paper is a part and section of a larger research thesis.

1.1 Problem domain

The problem domain in this case is the effective adaptation and evolution of the implementation model of ICT. No visionary framework so far adequately addresses the issues resulting from the first generation digital divide both at the individual and organizational level. The ICTs continue to evolve in an unmanaged and ill controlled (rather uncontrolled) way. Certain assumptions are made about the target market and then various ICT products vigorously marketed. Effective integration and adaptability of these ICTs is least of the vendor’s concerns. The apparent glamour of these ICT products may benefit (in the short run) the manufacturers by attracting immediate clients but its ineffective adaptability and integration into the clients’ processes definitely punishes the technology sector in the longer run.

The methodology adopted for the research was evolutionary experimental. Based on the past trends and promised forecasts, a base model has been experimentally constructed to effectively incorporate and implement the ICT advances. The model itself is based on a feedback system and evolves iteratively.

1.2 Research Paradigm

The paradigm presumes a ‘capitalist order’ where technology in the form of techno-science serves to further the cause of accumulation. However, this may not completely be true in the case of the developing economies where efficient accumulation is still not a popular practice. Most economic and development activity still revolves around trying to make basic necessities available to common man.

Furthermore, the ‘creativity thesis’ as proposed by Florida [3] and Pink [4] is primarily meant for developed economies (specifically to maintain American economic and technological hegemony). R-Directed thinking is being re-emphasized for the developed economies which are already presumed to be excellent (but no longer advantaged) at L-Directed thinking. Distilling the R-Directed emphasis and using it in conjunction with L-Directed thinking promises a better and balanced approach to progress for upcoming developing economies like Pakistan. Using the two in harmonious manner could possibly reduce the religio-cultural shocks and crises that the developed economies had to bear when they forced the L-Directed approach to progress during the 19th century Industrial Revolution and the past century. In other words, a solution to the ‘unflatteners’ pointed out by Friedman [5].

2. COLLABORATIVE SOFTWARE AND IT TRENDS

Collaborative software, also known as groupware, is the application software that integrates work on a single project by several concurrent users at separated workstations. In its modern form, it was pioneered by Lotus Software with Lotus Notes application running in connection with Lotus Domino server; some historians argue that groupware was anticipated by earlier monolithic systems. Another example is the wiki software upon which Wikipedia runs. It evolved from a free software philosophy for similar collaborative applications—without the trade limitations of proprietary software or the social limitation of a hierarchy [6].

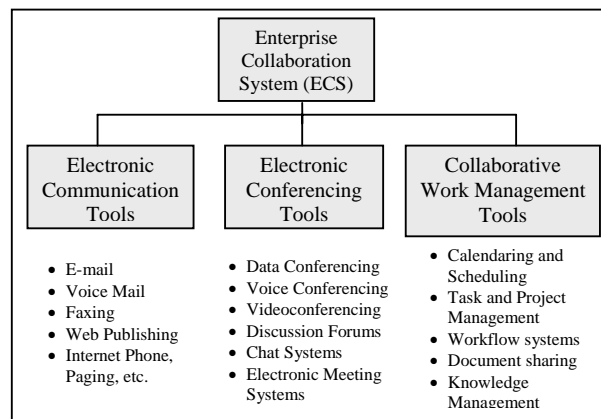


Figure 1 - Enterprise Collaboration System [7]

As per *Metcalfe's Law*, software becomes more valuable when more it is used by more people. For example, calendaring becomes more useful when more people are connected to the same electronic calendar and choose to keep their individual calendars up-to-date. The more general term *social software* applies to systems used outside the workplace, for instance, online dating services and social networks like *Friendster*. The study of computer-supported collaboration includes study of the software and social phenomena associated with it.

Groupware can be divided into three categories depending on the level of collaboration - communication tools, conferencing tools and collaborative management tools. Figure 1 shows the details.

2.1 Problems and Limitations

Coleman and Antila [8] argue that *repository based* collaboration architectures (e.g. Lotus Notes, FileNet, Documentation eRoom and OpenText) are better than *messaging based* collaboration architectures (e.g. Microsoft Exchange/Sharepoint, Novell Groupware). The biggest hurdle in implementing groupware is convincing people to use it. Training is required to make people comfortable using it. Employees should be given incentives to contribute: the rewards could be either financial or psychological. In many cases collaboration is at odds with the company's corporate (or local) culture so implementation will be disruptive. Shifting a corporate culture from being competitive to being cooperative is no small undertaking. It will require changes at all levels of the organization, including the CEO.

2.2 Some Major Trends and Need for Collaboration

The graph in Figure-2 from Wireless World Research Forum predicts the inevitable future of wireless communications. The total number of fixed line subscribers has already exceeded the mobile subscribers worldwide. The next milestone along the same lines would be the mobile internet subscribers surpassing the fixed line internet subscribers. This changing scenario of the information age is not only going to greatly influence the way business is conducted but also how people live their lives in general.

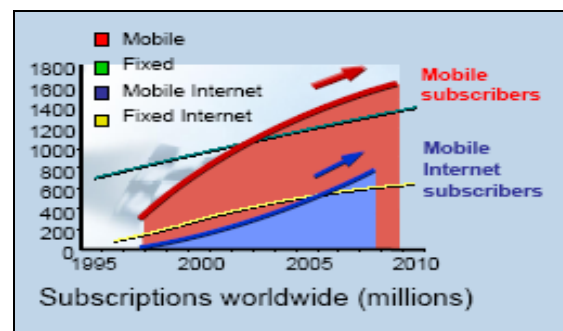


Figure 2 - Mobile and Fixed Subscriptions worldwide [9]

It would open up infinite new personal and corporate opportunities but would also pose a number of difficult challenges to the overall society and the way things are managed. The reported figure for Pakistan of Cellular Subscribers (as of 31st March 2005) was about 9.73 million [10]. Furthermore, these figures are expected to grow exponentially in the next couple of years.

The major trend in the information age today is the rapid advancement of *Internet*. The Internet has become a mass medium and IP the leading network protocol. *Mobile communications* have also gained popularity during the last decade. Communication via mobile radio networks is still increasing enormously. Then came the *bandwidth* revolution. Bandwidth availability is increasing while its price is decreasing dramatically. Following this is also the *convergence* of digital industries. The converging digital industry brings together parts of the consumer electronics, communication, information technology, media and entertainment industries.

Advancements of e-commerce (and soon m-commerce) are also an important trend. E-commerce changes and modifies business processes tremendously. The initial e-commerce experience (during the dot com crash of 2000-2001) had been an unpleasant one. People expected e-commerce to replace the normal commerce. This perception proved to be false (or in a sense too premature). Time showed that B2B type of e-commerce (involving trillions of dollars) is more popular in the corporate world compared to the B2C type of e-commerce (that involves millions of dollars).

Important also are the deregulation and globalization issues that drive the competition and product differentiation. Services and applications are the key factors today and will continue to be even more crucial in the future [11]. The end user is interested in services and applications *only*; the underlying technology is usually not relevant.

Nicholas Carr [12] argues that Information Technology is undergoing a shift from being an asset that companies own (in the form of computers, software and myriad related components) to being a service that they purchase from utility providers. Three technological advances are enabling this change: virtualization, grid computing and Web services. *Virtualization* erases the differences between proprietary computing platforms, enabling applications designed to run on one operating system to be deployed elsewhere. *Grid computing* allows large numbers of hardware components, such as servers or disk drives, to effectively act as a single device, pooling their capacity and allocating it automatically to different jobs. *Web services* standardize the interfaces between applications, turning them into modules that can be assembled and disassembled easily.

All the above developments warrant a strong collaborative tailor-made model that would effectively implement and integrate the progressing ICTs in developing economies.

3. CREATIVE COLLABORATION MODEL

The Creativity Enhanced Model for Effective Integration and Technology Implementation in Developing Economies (CEMENTIDE) has a general framework and a recommendation rationale.

3.1 Creativity in Developing Economies

No doubt the R-brained model for individual creativity (in the form of Design, Symphony, Story, Play, Empathy and Meaning) as promoted by Pink, has its advantages, but it needs to be collaboratively worked out for developing economies. Creativity can be better utilized and profited from, in developing economies, if it is implemented in collective scenarios. The *education* and *culture* of a developing economy are not necessarily cooperative or successful in preparing the people for the world flatteners. Similarly, the attitude towards technology may not be suited for its effective integration and implementation. CEMENTIDE targets towards this problem.

3.1.1 Motivation and Results

The left brain approaches the problem sequentially and expects the solution to follow in predictably repeatable and calculated steps. In this case the sum is always equal to the total of the individual elements (i.e. a mechanical whole). However, the right brain depends more on innovative and unconventional approaches. In this case *creativity* is the motivation and *results* - the guiding principle. Creativity and design result in a sum that is much greater than its parts (i.e. organic whole).

3.1.2 Limiting Factors to Technology Adaptation

Efforts to effectively integrate and implement technology in developing economies are limited by the following factors:

- 1) *Financial restraints*: There is a general shortage or priority allocation of funds. Investing in technology innovation is a luxury that developing economies find difficult to afford. Furthermore, investing in complicated technology seems infeasible as not enough educational expertise and awareness exists to benefit from it.
- 2) *Infrastructure*: The infrastructure of less developed economy is not particularly well suited for smooth adoption of ICTs. Power outages and weak telecommunications networks render ICTs all but effective.
- 3) *Education and awareness*: Education and technomindset is a major factor in adopting and implementing technology. The technical staff required to implement and maintain the cutting edge ICTs is not easily available. Also the customers and consumers on the receiving end of

technology are not comfortable using advanced cutting-edge technologies.

- 4) *Political instability*: Political instability results in investors losing confidence, corporation non-seriousness and a general sense of futility in the masses. No one is really willing to go the extra mile to make a difference.

CEMENTIDE makes use of *open-source* architecture and application wherever applicable – thereby reducing the financial constraint. It makes use of *wireless/mobile ubiquitous computing technologies* which reduces its dependency on traditional infrastructure. By developing and maintaining its own *collaborative communicative network* it educates and trains human resource into its own paradigm. Finally, by exploiting the *cyberspace networks* that transcends all physical country borderlines, CEMENTIDE is largely unaffected by political instability.

3.2 The CEMENTIDE

The Creative Collaborative model is to have a three faceted focus. The diagrammatic representation below tries to capture the spirit of the model. Within the sphere of creativity are the focused dimensions. None is prior to other or to be sequentially preferred in any L-brain sense of the term. The sphere grows larger with multi-dimensional focuses evolving and adopting accordingly.

The three principal axes are:

- a) Externally Directed Goals and Objectives (X-axis)
- b) Sustainable Collaborative Growth (Y-axis)
- c) Intra-organizational Communication and Coordination (Z-axis)

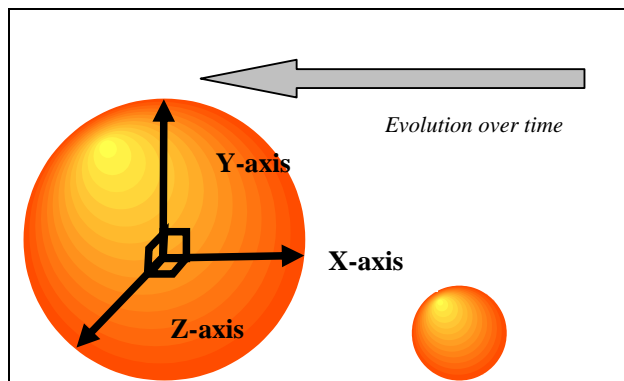


Figure 3 – Three faceted collaborative model (evolving in the sphere of creativity)

It may not practically be possible for all dimensions to grow symmetrically (i.e. the sphere to remain a perfect sphere as it grows). However, efforts need to be made so that the deficient facets are balanced out. This gives rise to the idea of fourth dimension in CEMENTIDE. The fourth dimension is the *audit control mechanism* that reviews

development progress periodically to assess if the spherical shape is being maintained. In case of any distortion (disproportionate development along any of the three axes) this fourth dimension tries to balance out the deficient dimension of progress.

3.2.1 Evolving Externally Directed Goals and Objectives (X-axis)

This facet caters to the deficiency of ‘strategic knowledge and awareness’ inherent in developing economies. In a globalizing technology dominated world, every economy, organization and individual needs to adjust and repeatedly reorient itself with the changing global scenario.

This facet is meant to constantly

- a) review global developments of capitalist order and emerging technologies
- b) then to assess their impact on i) local economy ii) organization and its active projects
- c) finally to revise and reorient the goals and objectives of the organization accordingly

Actual implementation of this facet would involve participants of this model using Internet (and other published academic resources) extensively to glean global developments patterns worldwide and then collaborating to build the *master knowledge-base* for the organization. Creating, contributing and collaborating to build the Global Knowledgebase would be the focus of this facet.

3.2.2 Sustainable Collaborative Growth (Y-axis)

The second facet of this model focuses on developing skills and mindsets of the participants. In a developing economy, highly skilled and technology friendly human resources are very difficult to find and retain. Easily available are employees with a formal degree but they usually lack adequate technology or organizational skills. Also missing in generally is any proper work ethic. Lack of motivation and direction is also a common phenomenon.

Training and enhancing human resource (i.e. inculcating creativity) and developing mind-set through collaboration is the focus of this facet. This would cater to the weaker training and mental development models in developing economies. The growth of the collectivity (or company) is to be collaboratively interwoven into the growth of employee. It is only in this sense that growth can be sustainable and meaningful.

3.2.3 Intra-organizational Communication and Coordination (Z-axis)

The focus of this facet is to inculcate the attitude of tolerance and understanding while synergizing the efforts to achieve sustainable collaborative growth. It is expected that there would be obvious frictions in building the *Knowledgebase* and inducting participants into a sustainable collaborative growth paradigm. The major cause of most of the ‘frictions’ is either unavailability to

timely and accurate information or incorrect interpretation of an unfamiliar scenario. This facet would cater to these frictions by *information* counseling – whereby the exposure of timely information and interpretation are expected to reduce misunderstandings and build trust. Technology help-lines and coordinating day to day operations would be a major component of this facet.

3.2.4 Participants in CEMENTIDE

All members of the developing economies are to be part of the general CEMENTIDE. However, due to the prescriptive nature of the model, there would be people involved with it in different capacities. These capacities would evolve naturally as the level of the individual's participation increases and the learning process takes affect.

The most general capacity would be the *Participant*. A participant is one who is either consciously not initiated into the model or is still struggling to understand its nature. *Facilitators* are the more experienced participants who have a better understanding of the model. They help plan, organize, facilitate and review activities of the participants. They could be administrators of function specific activities of CEMENTIDE. Audit procedures would be appended to all administrative responsibilities.

Finally, the core of the CEMENTIDE would be controlled by the *Creative Facilitators*. The body of Creative Facilitators would be responsible for enhancing and cultivating the creativity culture and directing it to effective implementation and adaptation of suitable technologies. The head of Creative Facilitators would be *Chief Creative Facilitator (CCF)*, which could be CEO of the company (or an elected office for a specific number of years).

3.2.5 Review, Audit and Control (RAC)

Review, Audit and Control are the three components of the fourth dimension in CEMENTIDE that help keep the overall evolution of the model framework balanced and on track. *Reviews* are done periodically to document progress and assess: a) additions to Knowledgebase b) growth of participants and within participants c) evolution in CEMENTIDE framework. Reviews can be performed at all levels by participants.

Audit procedures are carried out by Facilitators as against their set targets and planned procedures. Furthermore, the reviews are classified for their added value to the CEMENTIDE framework, thereby making recommendations for rewards in the form of promotions and advances.

Control is to be exercised at the level of Creative Facilitators whereby the creativity component of the entire model is reviewed, audited and planned for technology adaptation and implementation.

3.2.6 Implementation

Ideal implementation for CEMENTIDE would require a ubiquitous collaborative environment based on multipurpose mobile devices. The knowledge constitutive flow of information and collaborative understanding would be the focus of technical implementation. Ideally the implementation should be using

- a) GECKO devices
- b) 3G/4G Networks
- c) Creativity Enhancing Collaborative Software

The GECKO devices would overcome compatibility and rapid upgrade/obsolescence issues. 3G/4G networks would enable multimedia form of communication and knowledge transfer possible at more than enough speeds. The Enterprise Collaborative Software would incorporate the creativity enhanced techniques.

But as the proposed above are not yet commercially available – a solution based existing technologies is shown in the block diagram in Figure 4.

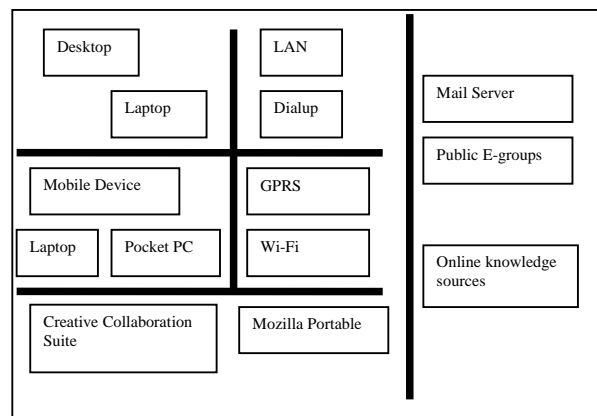


Figure 4 – Implementation block diagram

4. CONCLUSION

CEMENTIDE will hold relevance, as long as there exists distinction between the developed and developing economies. Culture specific technology adaptation and implementation will remain important topics of such discussions. The idea of (R-brain intensive) creativity, it is hoped, would bridge the psychological divide that exists in adapting a techno-mindset. The developing economies are mostly not individualistic in terms of culture – rather there exist natural collaborative networks (for example extended families and friends). By focusing on social passions rather than material affluence the developing economies can more meaningfully work their way through the onslaught of technology, progress and development.

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