

# Humanware: The Key Element in Educational Technology Projects

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**Abstract** — *The aim of this paper is to prove and identify Humanware as the key element in any educational technology project, in the different phases of the development IT lifecycle. We emphasize the definition, design and implementation phases where the human factor determines the success or failure of the project. The notable features of Humanware are beyond those of the traditional technology infrastructure where the Hardware and Software are the cornerstones of IT solutions. This paper discusses the social aspects and the democratization of technology thanks to the integration of the human factor and proposes a social technological model focused on the user.*

**Keywords:** Educational, Humanware, Open source, Social Technology.

## INTRODUCTION

Educational technology projects have been developed in recent years in the Computer Center department of the University Dr. Jose Matias Delgado (UJMD), El Salvador<sup>1</sup>. Different strategies have focused on the user in order to transform and enhance the student experience as well as the experience of the professor. However, we highlight two new elements for the technology infrastructure, 1) Knowledgeware, defined as the know-how of the user and technician. 2) Humanware, the human factor as the dynamic element that establishes the relationship between humans and technology.

Besides the technological infrastructure, there are many other aspects to consider in our projects. It is important to take into account Open Source alternatives; the advantage relies in the support of the community with a cooperative and collaborative work. It is in this way that we become part of a virtual wide world community. Other aspects to evaluate are the financial and technical possibilities with the purpose to level the impact of the tools and systems.

Higher education tools demand strategies focused on the user, with the Humanware starting the understanding of their needs and creating a bond between the participants in the IT<sup>2</sup> project, sharing their knowledge and socializing technology. Those contributions are reflected in our case study for this paper, Conscius<sup>3</sup>.

Conscius has been a rewarding experience for UJMD. The learning platform as a project represents the shift to the socialization of technology. The user is provided with mechanisms of participation that allow them to own the solution. In the context of empowerment of the solution, we highlight its impact within the university community with the indicators of usability and dissemination of the tool.

## I. SOCIO-TECHNOLOGICAL MODEL

Prior to developing any educational technological project based on Hardware and Software, the importance of interaction and functionality of the tool must be evaluated by a

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<sup>1</sup> [www.ujmd.edu.sv/](http://www.ujmd.edu.sv/)

<sup>2</sup> Information Technology

<sup>3</sup> Conscius, Latin word that means, "Sharing Knowledge"

multidisciplinary team of users. This process begins with the definition of the needs, the solution design and the evaluation of alternatives from the perspective of the user. That is how the Humanware acts into this Social - Technological model. (Fig 1). This represents a challenge for IT management; the human factor is incorporated into the project phases in such a way that Human Interaction with technology built a new model and introduced a change into the educational culture.

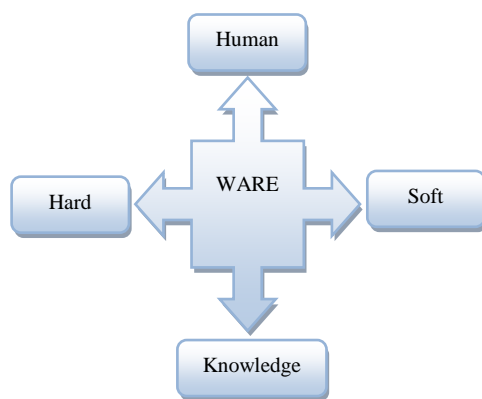


Figure 1. Social - Technological Model

Humanware as a technological concept has not been discussed or studied as the Hardware and Software have [1]. The integration of the human factor may be able to explain the meaning of this interaction and implication in projects oriented towards higher education, where we have a variety of user profiles such as technicians, academics and researchers. The users assumed their role in the process of contribution of knowledge from the social constructive approach<sup>4</sup> of learning.

Human contribution in technology promotes modifications in IT choices and criteria like usability and feasibility. The management and administration of projects are sensible to the human factor, where relationship and interaction with technology generates new actions context and new horizons. Under this context socialization of technology is established, where the relation, collaboration and cooperation of the individuals are reflected in the human factor.

<sup>4</sup> Theory studied by Lev Semyónovich Vigótsky

Based on this social – technological model, the UJMD’s experience creates the shift from traditional IT projects to projects focused on the user, highlighting the aperture of changes and innovation from higher authorities of the university by supporting and integrating the human factor in its technological and educational infrastructure.

## II. HUMANWARE CONTRIBUTIONS

The integration of Humanware in the model and in the social technological infrastructure brings with it new concepts and challenges. We identify the presence of multidisciplinary teams in the phases of the project as well as the socialization and democratization of the technology.

The socialization starts with the following variables in technology:

- Project management areas.
- Human – Computer Interaction
- Software lifecycle intervention.

These aspects respond to the social approach and highlight several indicators: 1) Design, 2) Interaction, 3) Usability, 4) Adaptability and 5) Security criteria. They are considered for project development and implementation. The success of the model relies in the democratic process of acceptance by the user community extended by a multiplier effect.

### A. Human Know-how

The value and the major contribution from the human factor is knowledge. The know-how belongs to the user and that enriches the logic of the machine. We can call it Knowledgeware, one of the fundamental components in the social – technological model.

There is no doubt that Humanware permeates innovation in the traditional infrastructure and attempts to improve software engineering and hardware capabilities. (Fig. 2).

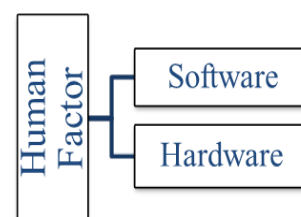


Figure 2. Human Factor relationship

### B. Empowering the user

Own the solution, empower the users and respond to their needs. The process begins with brainstorming meetings in order to build the objectives, scope and functionality of the tool. Once that the goal is clear we start to evaluate software alternatives based on the needs and particular user profiles, in our higher educational context with roles as student, teacher and technicians taken into account for the final solution.

As we can see, technology is sensible to the human element, and a tool's performance depends on the level of compromise from the IT developer and the user.

### III. CONSCIUS, SHARING THE KNOWLEDGE

In educational projects, the development of platforms and eLearning environments demands the introduction of new information and communications techniques, backed by the theory of social constructive learning.

The educational project catalog from UJMD, includes a variety of initiatives oriented to socialize technology and share knowledge among the community. The project Conscius was created under this philosophy in order to provide an eLearning platform with the following characteristics: an Open Source solution supported by an eLearning worldwide community; a low cost financial alternative which permits the reorientation of investment in the human resource for their training and service availability.

Prior to Conscius, UJMD was under the owner platform Learning Space, and it can be mentioned that this tool was implanted as a necessity of the institution for improving the space of learning oriented to all the resources and the investment of hardware and software. The proprietary character of the tool and higher costs of maintenance were the indicators that propelled an attitude of change for IT projects in the educational context. However, one of the reasons for this major incidence was the low adoption within the teacher community.

Conscius made an impact in the history of modernization on educational technological projects UJMD; the human factor was involved

in the different project phases. Fig. 3. The aperture to innovation from the university rectory was a determining element for a series of initiatives focused in the human factor as well the initiative from the Computer Center department.

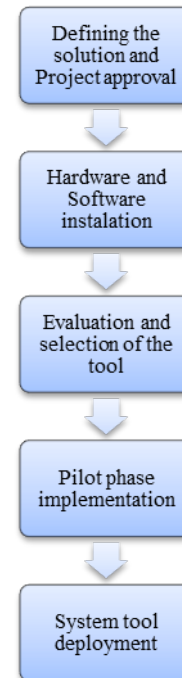


Figure 3. Conscius phases

#### A. Conscius background

The Learning Space platform was implemented in 2000 however, it was not until 2002 when two faculties, Health and Economics, started to use the tool as an educational web base supporting resource. The adoption impact was very discrete but with this initiative an innovator and challenger project started to emerge.

In 2004 Conscius, Fig 4, was launched as the eLearning platform based on Moodle<sup>5</sup>, well known as a learning management system. This tool helped teachers to upload educational content in any digital format, enhance communication, facilitate cooperation and create a collaborative environment.

<sup>5</sup> <http://moodle.org/>



Fig. 4. <http://www.conscius.ujmd.edu.sv/login/index.php>  
Conscius platform 2004

TABLE I. COMPARATIVE INDICATORS 2004

Indicators	Learning Space	Moodle
Courses	45	149
<b>Students</b>	<b>545</b>	<b>2137</b>
Teachers	52	81
investment	\$ 200,100	\$6,800

Conscius has incorporated the human factor since the very early project phases. Some indicators, Table I, show the user impact in acceptance and use for their courses. Their approval was apparent for two reasons: 1) availability of learning platform licenses and 2) The easy use of the tool.

There is no doubt that including a multidisciplinary team brings benefits, highlighting the participation and collaboration of the users from their profiles and know-how in the teaching - learning process. User participation was delivered in workshops that identified and defined their needs according their profiles. Learning platforms were evaluated establishing the criteria for the following aspects:

- Design and Interaction.
- Navigation.
- Curricular adaptation.
- Security.
- Availability
- Flexibility in the edition of contents.

The promotion process and dissemination of the tool was provided by the teachers involved in the evaluation and use of Conscius, acting as knowledge channels of transference. Currently, Conscius is the Learning platform use by UJMD, with 6500 users annually and an

estimated 330 teachers using the tool for their different courses.

### B. After Conscius

After Conscius's release, Conscius Satellite entered our projects, Fig. 5. This project was oriented to deliver Conscius's content offline. This was another Open Source solution where financial and technical advantages are taken into account. However, the impact was very subtle and it didn't reach the previous success because the human factor was not a priority in the definition and evaluation of the tool. Humanware's absence resulted in low levels of acceptance of the tool. Previous experiences discussed in the paper affirm the value and contribution of human factors in implementing solutions, and determining the success of the tools.



Figure 5. Conscius Satellite

Other kinds of projects have been implemented in UJMD Computer Center, including: university entrepreneurship; open source clubs and an Educational Informatics Network for future research lines. They all have in common the main goal, involving the human factor in technology and sharing knowledge.

## IV. CONCLUSIONS

Each of the initiatives mentioned in the paper take into consideration technological, financial and human factors in order to provide real solutions for the user, in our case the student and teacher members of the UJMD community. Our audience defines the type of interaction and provides a profile classification.

There are three key elements responsible for Conscius' success:

- 1) Acceptance of the change of attitude towards open source alternatives.
- 2) Investment in Humanware.
- 3) The incorporation of the social–technological model, focusing on the user perspective.

Based on our experience, the support and determination from higher authorities in Educational Technological Projects are the beginning of this change of attitude and wide deployment of IT initiatives that improve the student achievement and enhance the teaching–learning experience for everyone.

We emphasize as a priority the Humanware in any Educational Technological project; we have learned the importance of the multidisciplinary team and the establishment of a collaborative network among the users. In the future we expect to create a wide Educational Information Network, with the primary goal of sharing knowledge.

- [4] Mahesh Gupta; Heather Holladay and Mark J. Mahoney, The Human Factor in JIT implementation a case study of ambrake corporation. Production and Inventory Management Journal. Fourth Quarter. APIS. 2000.

#### REFERENCES

- [1] H. Shimada, Technology and Productivity. The Challenge for Economic Projects. OECD. Humanware Technology Industrial Relations. Keio University. Paris 1991.
- [2] Goel Kahen & Catherine Griffiths, A quantitative Model for Technological Risk Assessment in the Process of Information Technology Transfer. IC-Parc, Imperial College, University of London, London SW7 2AZ UK.
- [3] Ben Sniderman. Science 2.0. Science vol. 319 march 7, 2008. <http://www.cs.umd.edu/~ben/Science%20%200-AAAS-3-7-2008.pdf>