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Determination Of Factors That Affect The Process Effectiveness In The Development Of Information Systems

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1. Abstract.

The quality of software is a complex mix of factors (Pressmann, 93).That is why it is extremely difficult to establish a unique, generalized definition for the quality of information systems. Human and social aspects in organizations have been considered up to the present the competency of management, administration and other related areas. Programming and internal design activities are related to product efficiency: requirements analysis and external design activities are related to the effectiveness of the product, project management activities relate to the efficiency of the process and general management activities relate to process effectiveness. Faced with the scarcity of information regarding process effectiveness, the need arises to take information from topics from the field of management. Specifically, part of the topics for organizational behavior and development includes a series of components that determine human and social behavior in organizations; individual behavior, group behavior, leadership, the organizational structure and culture and problems relating to processes of change therein. An association is established for each of these components in the particular context of development of information systems.

2. Process Effectiveness In Developing Information Systems.

To begin with, it can be affirmed that process effectiveness is intimately linked to human relations between the development organization and the users of the system involved throughout the process of developing a system. From the association that the authors establish between process effectiveness and general management activities, it can be inferred that human and social factors play a preponderant role in process effectiveness. Rojas and Pérez (Rojas & Perez, 95) in turn, reinforce this indication by stating the following: *"Systems that generate not only good information with or without holistic systems in a human and social sense must be invented"* (ALEXANDER, 71 [quoted in Rojas y Perez, 95]).

In contrast, the technical field of information systems directs its researches almost exclusively towards technological variables. There is an implicit tendency in systems

developers to concentrate on the tasks and the technology and to ignore the effects on personnel and the organizational structure (Davis & Olson, 89) This is backed by T. Rojas and M. Pérez, stating that *"Opportunities are not being given for the creators of systems to guide their efforts towards effective processes"*.

Currently, there are several authors that recognize the importance of the human and social factors in the development of information systems. Edwards (Edwards et al, 93)indicate that in the development of systems one must be capable of managing multidisciplinary teams that may have serious difficulties in communicating, which is a clear indication of concern over the achievement of process effectiveness. Sommerville in turn, manifests his conviction that the understanding of the persons involved as users, analysts, developers and managers in software engineering is useful for the technical processes of developing systems. With this, the author is relating aspects of process effectiveness to aspects of technical systems development. Therefore, the importance thereof is being implicitly recognized (Sommerville, 92).

3. Process Effectiveness-Related Factors

a.- Individual behavior

Determining factors for **individual behavior** are biographical characteristics such as sex, age, civil status, number of persons dependent and seniority; intellectual as well as physical capacity; personality, learning abilities, perceptions and decision-making style; values; attitudes and motivation (Robbins, 93).

Within the field of systems some authors make reference to human behavioral factors. For instance, R. Fairley(Fairley, 87) mentions productivity in programming as a direct function of the individual capacity and effort of programmers. Sommerville in turn, says that the selection of software engineers based on their personality is not feasible because the personalities are dynamic; that there are different personalities that are appropriate for the various systems development activities such as the analysis, design, systems testing, maintenance, etc. and that intelligent programmers can falsify the tests (Sommerville, 92).

b.- Group behavior

Some factors highlighted in **group behavior** are **conditions external** to the group such as the organizational strategy, authority structures, the company's regulations and resources, personnel selection processes, reward systems, the organizational culture and the physical framework; **the resources contributed by the group members**; **the group structure** implying formal leadership, roles, standards, status, size and composition of the group and lastly **group processes** involving communication patterns followed for the exchange of information, group decision processes, the leader's behavior, the dynamics of power and the handling of conflicts.

Groups under administrative hierarchy described by Fairley(Fairley, 87) are of a mixed nature. Communication within these groups flows among all members of an administrative level through the leader or a formal hierarchy among different levels. The

main advantage resides in the use of communication as really needed. Its disadvantage lies in the promotion of technically competent personnel to administrative positions where their performance leaves a lot to be desired.

Wysocky and Young in turn, have pronounced themselves regarding the ideal composition of systems development groups by stressing the desirability of an adequate combination of the abilities required. In the case of a strong participation and intervention of users in a systems project, they indicate the need for interpersonal and communication skills (Wysocky and Young, 90).

Regarding this subject, Sommerville begins by underlining the group nature of software development and tries to establish how group organization and structural factors affect the development of software. The first point he stresses is the same as Wysocky and Young: the correct combination of technical skills and personalities. The author adds that more attention has to be paid to the complementary nature of the personalities than to technical skills.

c.- Leadership

On the subject of leadership it has been observed that the traditional theories of leadership conceive it as a process of influence whereas more recent theories take on a more restricted definition in conceiving it as a process of influence by non-coercive methods (Kotter, 88). Among these theories, the theory of transformational vs. transactional leadership can be highlighted. Transformational leadership has a closer relationship with lower turnover, greater performance and work satisfaction than transactional leadership.

d.- Organizational structure

The presence of the **structure** in the various existing organizational models and the frequent inclusion of structural aspects in the bibliography on administration is a clear indication of the importance thereof. An organizational structure comprises three parts: complexity, formalism and centralism (Robbins, 93).

Davis and Olson establish a relationship between the concepts of hierarchy, centralization and information systems. According to the authors, vertical hierarchies with small control spans can mean that more formal control information is required than for flat hierarchies with broad control spans (Davis & Olson, 89). The organization's specialization affects the specialization of systems requirements; information systems are a means to increase formalization and these should be designed based on the degree of centralization.

Wysocky and Young state two basic options for the organization of a systems department: centralized and decentralized. The centralized approach offers greater professional development opportunities and work variety. In the decentralized approach, the development personnel responds better to users' needs and conflicts due to resources typical in centralized organizations are avoided(Wysocky and Young, 90).

e.- Organizational Culture

Another extremely important component in organizations is **the organizational culture** that consists of a set of learned beliefs and values and characteristic behavior patterns existing in organizations. The culture of organizations is not uniform (Margulies & Wallace, 89). On the contrary, organizations in general present cultural diversity (Robbins, 93).

Davis and Olson establish a relationship between culture and information systems when stating as cultural characteristics the value granted to data and information or the importance given to the precision of the information, but as in the case of the organizational structure, this relationship is focused towards information systems as products and not towards the development process spans (Davis & Olson, 89). These authors also underline the existence of a distinctive culture of systems professionals.

f.- The Development of Information Systems as a Process of Organizational Change

The dynamism characteristic of the current world, the world of business and human values has motivated an in-depth study of organizational change as one way in which the organizations adapt to their environment. Any process of change can be conceptualized in three stages: unfreezing, change and refreezing (Rashford & Coghlan, 94).

Information systems have been characterized by altering the way employees work in an organization. Davis and Olson state that the implementation phase of an information systems implies a process of change within an organization and they add that if the analysts, apart from fulfilling their technical work, act as agents of change, the risk of failure in the systems could be diminished (Davis & Olson, 89). They also indicate the aspects that they consider could increase the probability of success in an information system. Said aspects are:

. Getting management and the user to become committed with the project.

. Obtaining the user's commitment for any of the changes brought about by the new system.

. Ensuring that the project is well defined and that the plans are clearly specified.

4. Conclusions

The literature reviewed leads towards the consideration of a set of human, social and organizational aspects that could somehow affect the effectiveness of the process of developing systems. More specifically, the foregoing theoretical framework suggests that human behavior aspects in organizations, especially in work groups, structural aspects, the leadership factor, cultural differences between users and analysts and the problems implicit in organizational change processes could possibly have an effect on process effectiveness.

Finally, a more precise identification of these factors shall enable systems managers to have a clearer vision of the aspects they should pay closer attention to, in order to achieve more effective software development processes. It is therefore thought that the obtention of more specific data that could contribute empirical evidence on the theory expounded shall arise from the observation and analysis of real-life information systems development organizations.

References available upon request from T. Rojas.