

Assessment and Management of the Human Factor Impact on Human Factor Intense Projects – Challenging the Challenge

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Surveys and literature quoted in this paper, lead to the conclusion, that the human factor is the main cause of failure and challenges of IS projects. Authors concede, that motivation is the only feasible instrument in the hands of an IS project manager, to challenge the productivity of team members.

A systematic approach evaluates the motivating and demotivating factors. The four phase model of the IS project management is justified in view of any team members' motivation. The processes of human factor management in IS projects are uniquely classified and described along the L-timer™ project management method. Completeness of processes and simplicity of the timer analogy shall support project manager in the navigation among hundreds of tasks, which he is supposed to pursue. The motivating activities in each process are named. Awareness is awakened where a negative influence on team motivation might happen. Recognition, rewards, useful goals and challenging assignments are named as the most efficient motivators. Consequently the professionalism of the project manager in psychology, team, communication and leadership is considered as important as his IS knowledge. Further research objectives and a comprehensive bibliography close the paper.

Index Terms - Project Management, Human Factor, L-Timer, Motivation.

1. INTRODUCTION

INFORMATION systems (IS) projects mean millions of human decisions every second.

“Humans have only one in common: they all differ one from each other” Robert Zend

More than ten years ago survey organisations like Standish Group Researches documented the performance of IS projects on a broader scale. They confirmed the otherwise known truth, that three out of four IS-projects do not succeed.

Simultaneously several researches pinpointed tremendous variations in the productivity of IS-professionals – from 1 up to 10.

A conservative budget and time schedule of a project, accommodating the worst case risks emerging from the above variation would shoot the manufacturers out of the competitiveness. An obvious alternative is to increase the productivity of an IS-professional. Contrary to the “Modern Times” experience made by Charlie Chaplin, restrictions and stringent work standards did not proved successful in IS-production. The virtually unlimited number of possibilities and thus decisions taken by any IS-architect, programmer, operator and so on, calls for a different approach towards the productivity: by professionally handling individual personal needs and providing suitable methods. Our special attention is

given to multicultural and multinational European and Asian project teams.

This paper deduces the human factor as the decisive challenge in IS-projects and introduces a systematic and integral approach towards successful IS project management.

2. THE CHALLENGE

2.1 State of the art in the IS Project Performance

A project is a temporary endeavour undertaken to create a unique product or service. Temporary means that the project has an end date. Unique means that the project's final result differs from the results delivered so far by the organization. German Standards [14] add to this limited financial, human and other resources as well as a specific organization. There are over 100 definitions in most respectable publications – most including the human factor in IS projects in particular. The variety of behavioural combinations of IS ventures exceeds the boldest expectations for a majority of the projects. This complexity exceeds human imagination and goes far beyond our capability to handle.

The results of Standish Group Researches 1994-2000 [36], which examined 30.000 projects showed that only 20 to 30 per cent of all IS projects succeeded on time and within budget, with all features and functions as was initially specified (Fig. 1).

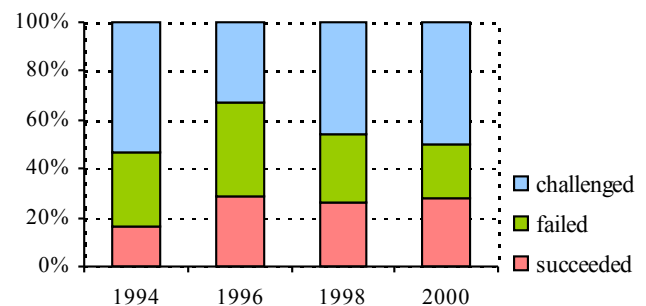


Fig. 1. Project outcomes history (1994 - 2000)

Failed projects were cancelled before completion or never implemented. Challenged projects were completed and operational, but over-budgeted, over the time estimate, and with fewer functions than originally planned.

The results of CHAOS research are the most widely quoted statistics in the IS industry and have had far reaching effects, including major government policy changes. The cumulative research presents a decade of data on why projects succeed or fail – representing over 50.000 completed IS projects (9,236 in 2004 year), plus 450 workshops, focus groups and project group therapy sessions. Fifty-eight percent (58%) of respondents are US-based, 27% are European and the remaining 15% represent the rest of the World. Forty-five percent (45%) of these companies are considered Fortune 1000 type companies; another 35% would be considered mid-range

and 20% are small range. They span a diverse number of vertical industries. 2004 results confirmed earlier statistics obtained by Standish Group Researches. It shows that 29% of all projects succeeded; 53% are challenged; and 18% have failed, as shown in Fig. 2 [37]:

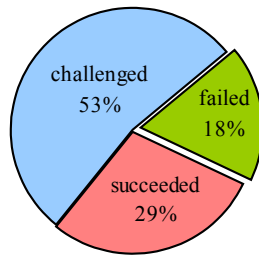


Fig. 2. Projects performance 2004 according to CHAOS

The analysis of projects which succeeded shows an almost linear decrease in the percentage of successful IS projects related to the dimensions of the project: from 46% for projects below 750'000 US \$ to just 2% for ventures over 10 millions dollars, demonstrating the impact of the complexity on all aspects, thus certainly including the human factor, too.

2.2 Impact of human factor on IS project performance

The number of decisions made during the realization of an IS project is virtually unlimited. Thus, not surprisingly the combinations chosen and the speed, with which one moves from one decision to the next, has a much higher impact on IS project performance than in any other discipline. The studies of Software Consortium [35] lend credibility to McConnell's conclusions [25] which we quote with our fullest support:

- Performance differences on the order of 10-to-1 or more between different developments with the same levels of experience ([x6], [x8], [x9], [x13], [x27], [x34], [x39] in [41]).
- Boehm, in a study of 69 projects at TRW, identified that the best teams were at least 4 times as productive as the worst teams [4].
- DeMarco and Lister in a study of 166 programmers from 18 companies identified programmer productivity differences of 5.6 to 1 [12].
- In one study of 7 identical projects, the developers were all professional programmers with several years of experience who were enrolled in a computer science graduate program. The products still ranged in effort by a factor of 3.4 to 1 [5].

Lakhanpal [18] analysed 31 projects to find out the reasons for the above variations. He concluded that the group cohesiveness was factor number one, followed closely by individual performance and experience. All three within the responsibility of the IS project manager.

2.3. Motivation: the main contributor to increase in productivity and team efficiency

Motivation, or willingness to act is defined as a particular internal state that activates behaviour and gives it direction towards goals achievement. It is the driving force behind our activity.

According to Boehm, most productivity studies have found that motivation has a stronger influence on productivity than any other factor [4]. However, motivation alone does not

determine the productivity directly: its' impact is amplified or diminished by the influence of the environment:

$$\text{Productivity} = \text{Environment} * [\text{Motivation} = \text{function}(\text{time})]$$

Environment is built up by material and human resources as well as team atmosphere, communication and other components, determined by the human factor. It has an indirect impact on motivation (extrinsic or secondary motivation) and as such is covered by the later considerations of this paper. Here we conclude only, that the right environment is the responsibility of the IS project manager and focus ourselves on the main contributing factor according to Boehm: the motivation.

Motivation is derived from the fulfilment of the human needs (originating from five areas according to Maslow [23], sixteen following Reiss [32]). It is interesting to notice, that the relationship:

$$\text{Motivation} = ((\text{Capabilities and Skills}) / \text{Challenges}) * \text{Luck Coefficient}$$

holds true whether we shop for bread or solve complex IS issue.

While keeping the balance in matching the capabilities and skills against the challenges we have a good chance in obtaining high motivation of project team staff. Mismatch, as a consequence of personal projection (it went wrong, all will go wrong, causality theory of Heckenhausen [16]) will lower motivation and subsequently productivity. Similarly, unused skills lead to boredom and loss of motivation. When environmental, skill and individual motivators are in place, "flow" [11] or the highest productivity possible is reached (Fig. 3).

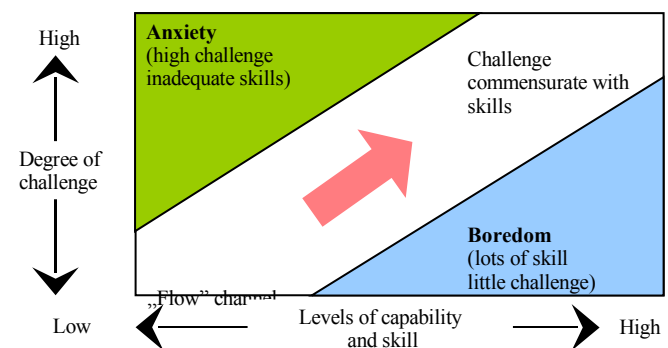


Fig. 3. Productivity "flow" channel

It may be noticed, that Productivity and Motivation are transient in nature: they may change rapidly and thus require permanent care by project management. Challenges, which one faces do not change that rapidly. Here, the longest "time to change" takes the capability improvements and development of skills.

2.4. Cultural and social aspects of human factor management in an IS project

The analysis of the factors, which influence team members' attitude and performance helps to elaborate feasibility methods for prediction and management of human behaviour in an IS project and thus productivity. We distinguish here the extra vertical factors, with limited possibility of one's own influence, and intra vertical factors, nourished by our own efforts.

Torrington [38] defined the Seven C's Theory of extra vertical factors in multinational environments. IS projects by nature of their dynamic development, in most cases, are built up by staff, originating from heterogeneous societies and different *cultures*, bringing often the air of *cosmopolitan* internationality into a project. People, who have to work across political, cultural and organizational boundaries to accommodate the local specific conditions, subdue to impact of a wider range of competences called *consultancy* and *competence* factors. *Coordination* and *communication* are decisive in the perception of attitudes and informal and informal methods of collaboration. Last but not least, the *compensation* (like salary) influences our existence and thus behaviour in most obvious way.

On the side of intra vertical factors literature recognises [2]:

- *Personality*: all aspects of individual behaviour and its changes upon interaction in a team.
- *Capabilities, and intelligence* determine the complexity and nature of actions one can perform.
- *Set of personal patterns of thinking, competence, abilities and skills* elaborated during our daily life.
- *System of values*, resulting in *personal expectations* and *plans* towards their achievement.

3. CHALLENGING OF THE CHALLENGE

“The deepest human need is the need to be appreciated.”
William James

So far we identified the challenges: the vast variation in productivity mainly influenced by motivation. The question is now: what motivates and what demotivates the project staff? Motivating the staff is a cyclic process as shown on Fig. 4.

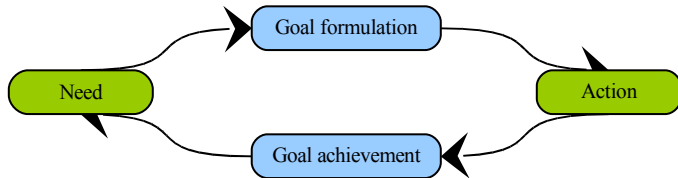


Fig. 4. Motivation process

The personal goals, which emerge consciously or unconsciously from personal needs, stipulate actions. Perspective of reaching the results which in turn might satisfy the needs is a source of motivation. Positive experiences motivate people to formulate new goal and reach for yet more ambitious targets.

Negative experiences leads to loss of confidence in one's own capabilities and a deem projection for future resulting in demotivation.

The motivation process may be stipulated externally. The means to reach it may be split into the means, which has a positive, neutral or negative impact on the motivation.

Motivators and demotivators among project team members has been surveyed by Adamiec Kożusznik [1]. An independent study of the motivation of polish IT-professionals [3] confirmed roughly this picture, however, it extended significantly the group of relatively effective motivators with the materialistic and fringe benefits advantages. Results of both sources are given in Table 1 and Table 2.

Table 1. Motivators

Most effective	Relatively effective	Less effective
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good working climate, being entrusted with responsibility, recognition by superior, good work organisation, possibility of further personal development, measurable effects of own work, recognition of co-workers, perception of a purpose of own activities, success of own work, perception of impact and usefulness of own work, possibility of further personal development, broadening of competences.	personal improvements, mastering of new areas, clear objectives, perception of affiliation with a project concept, trust of superiors, participation in important events of the project, desire of a success in project and identification with this, materialistic effects and fringe benefits (computer, internet, car, flat, telephone, cash).	good collaboration with the management, taking the employee's opinion into account, nonmaterialistic rewards, tasks bringing clear advantages, the authority of a chief, international project, well defined goals, proper control by superior.
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The factors which were identified as having negative impact on motivation are:

Table 2. Demotivators

Most effective	Relatively effective	Less effective
missing recognition by superiors, missing the effects of own work, missing the possibility of influencing the decisions related to own work unuseful, unjustified tasks without any effect.	missing the active contribution and engagement of co-workers, lousiness, demolition of the results of own work, missing information about the difficulties in a project, superfluous and rudiment evaluation of work by superiors, missing clear competence regulation, frequent changes of goals, unrealistic planning, incompetent superiors, unable to set the right priorities, wrong project organization, missing collaboration, insecurity regarding the company ownership.	frequent intervention of superiors beyond their field of competences, wrong assignment of resources in a project, authoritarian management of project finances, negligence, missing discipline and loyalty of co-workers, being omitted in assignment of responsible and important tasks, inappropriate and vulgar behavior of superior, dishonest freedom of decision, conflicts and misunderstanding with superiors, missing competent coworkers, external factors.

3.2. Four Phase Model of the IS Project Management: Role of Human Factor

In search of answers, how to challenge efficiently great variations in productivity (5.6 to 1, see above) and team efficiency (10 to 1) by effective use of motivators and avoidance of demotivating factors, we deploy the analytical, process-based approach. This approach builds-up chains of activities exercised by a project manager during the project life cycle. The temporary nature of project, from the build-up of a

certain endeavor to its culmination in delivery and termination suggests a process oriented approach towards analysis and management of human factor impact.

We identify four phases in an IS project [17], [20], [30]. They differ in the goals within each phase and subsequently in the type of activities performed by teams in each phase:

1. An initial phase (preparation)
2. Planning and design phase (detailed elaboration, changes)
3. Realization (execution and delivery)
4. Closing (integration, evaluation, securing service and documentation).

In literature you may also find the schemes ranging from three to seven phases. Examples:

- three: initial - intermediate – final [31],
- five: concept/vision - feasibility - design/development - production - phase out [10] and
- seven: pre-feasibility - feasibility - design - contract - implementation - putting into operation - hand - over and take - over commissioning and project finish [7].

You may observe that the variations come from the differentiation between the project initialization and project planning, and/or the distinction of two sub phases past realization.

The four phase model is not new. When Julius Gaius Caesar, passed the river Rubicon, at the time of roman empire civil war against Rome, he knew he had reached the point of no return (Alea iacta est! eng. "as much as in me lies" - he said). Every soldier of his legions was aware that there was no way back and yet they were fully motivated to follow the leader. How had Caesar done that?

Julius Gaius Caesar motivated his legions by applying the following four phase model:

- evaluate if reasonable to act
- plan
- act and
- evaluate the results.

During the first phase, through an objective evaluation, strong intentions to conquer Rome were engendered among the legionnaires. During the planning, goal oriented subjective thinking dominated. Once Julius Gaius Caesar passed Rubicon (= acting), he did care to keep the intention of all his soldiers constantly high. This motivation concept is known as Rubicon Model in the behavioural theory of Heckenhausen [16].

In conclusion: we have all good reasons to follow a four phase model in any IS project management, too.

Considering now the life cycle of an IS project, it is advantageous, according to the Rubicon Model, to involve most of the prospect team members in the early stages (initiation) of a project, in order to gain high motivation in later phases. By identifying and involving future "Chiefs" in this phase, who will carry on later the motivation along their duties within a project, we secure the most effective dissemination of the motivators among our legions. Joint planning increases the probability of correct understanding and keeps motivation high.

The real trial comes during the realisation phase – once, the Rubicon is crossed-over.

Subsequent considerations are devoted to this phase.

3.3. Human Factor related Processes in the IS Project Management

Project management processes may be split into two groups:

- measurable, "classical" project administration processes like planning, controlling, change management, risk and
- human factor related processes, where management impact is yet to be quantified.

Both groups are bound into the management system of L-Timer [20], [21]. The analysis of motivators and demotivators identifies factors from both areas. However, motivators (and demotivators as well) like for example "sufficient project goal definition" are considered to be basic for the general achievement of the project objectives and not specifically as a motivation action. Therefore, hereafter, we concentrate on the activities dedicated specifically to the motivation and productivity within human factor processes.

3.3.1. HRM: Human Resource Management

HRM is the first of four processes which deal with the external interrelations between team members.

In HRM processes, project managers select team members and assign them to formal and informal roles according to their skills and experience. Promotion of the personal further development of all team members in accordance with the enterprise strategy, classified above to be one of the most effective motivators and care about the working environment are parts of this process. Proactively HRM initiates and carries through the countermeasures against the occurrences with negative impact on individual motivation [1].

Table 3. Countermeasures against demotivation

Most frequent answer of interviewed persons	Less frequent answers
<ul style="list-style-type: none"> ▪ Fair, honest and open critics from the superiors, support, efficient exchange of information, good communication 	<ul style="list-style-type: none"> ▪ Creating the potential for personal development of team ▪ Precise regulation of duties and rights ▪ Constructive criticism
<ul style="list-style-type: none"> ▪ Entrusting employees with responsibility ▪ Involvement of team members in management decisions, full disclosure of information, consultation of decisions ▪ Removing incompetent persons from the managerial positions ▪ Extension of competence and decision making 	<ul style="list-style-type: none"> ▪ Implementing correct system of employee assessment ▪ Justified selection of targets, consequent realisation of tasks ▪ Good information flow between all management levels in a group ▪ Recognition by superiors ▪ Better knowledge of the workplace specifics by superiors ▪ Easier access to superiors ▪ Perception of financial security ▪ Personal setting of more ambitious goals by the superiors for themselves ▪ Superiors striving to be an example for their employees.

3.3.2. TM: Team Management

The goal of team management process is to ensure the best possible efficiency of the complete project team measured against yielded performances, staff commitment, client satisfaction and process improvement.

The efficiency is determined by mutual trust, built on knowledge of the personalities and smallest details of daily life of each team member. It is achieved in the process of group integration. Luft [22] defined - what is now known as Johari Window – four combinations of a person’s perception, built from the characteristics which are known by one himself and which are not known, the particularities, which other persons know about someone and an area which remains unknown to everybody. An integration process shall maximise the area of commonly known characteristics of all team members (Fig. 5).

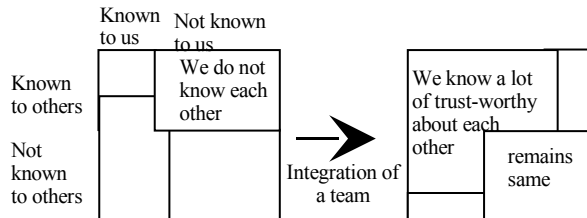


Fig. 5. Integration process

The team management process deploys the motivators as given in Table 1. Particular situations with negative impact on a team, listed hereafter, shall be eliminated:

- “not invented here”-syndrome: rejecting all from outside
- “gatekeeper” – all information flows through one person, even if it is not justified,
- “filtering” – selective control of information exchange between team and outside world,
- “nops” – persons permanently saying “no” to everything,
- “extractors” - exclude individuals socially, use mobbing.

3.3.3. CFM: Conflict Management

There is no team where sooner or later a conflict situation does not occur. Conflict dramatically reduces the efficiency of a team up to the point where a real crisis (no one believe in positive outcome any more) reduces the productivity to practical zero.

Project managers shall identify potentials of conflict in project teams and between team members and persons relevant to the project from the outside, further undertake actions to solve conflicts with suitable methods and technologies and finally secure the sustainability of the solution.

Conflict solution means weighting up possible strategies: shall I behave cooperatively or go militantly towards a confrontation? With the same possibilities for other conflicting party we get four combinations commonly deployed and known in gaming theory.

It is our strongest conviction that only a cooperation strategy for both parties is effective in IS project management. Due to the vast number of possibilities a looser can pay back in IS project, the final outcome of the conflict might be a Pyres win if we choose a confrontation course.

3.3.4. COM: Communication

Effective communication is one of the key motivators in a

project. It comprises project marketing and unsolicited information, exchanged ambiguously within the project team as well as with the outside world, which is relevant to achieving project goals.

Sending a message does not necessarily means that the other side understood us exactly the way we wanted. Beside, the interpretation of the message in a context, which is often unknown to the sending party, may result in a complete adverse picture compared to that, what was originally sent.

It is our particular experience, that just the “Information Systems”-Professionals who apply this trivial knowledge on a daily basis in practice, completely neglect this, when it comes to the interpersonal communication. So our appeal is: be an IS-professional also with your friends!

Most of the problems in communication can be solved this way. The rest will get solved, because we can communicate.

3.3.5. SM: Personality development

Personality development (SM for Self- Management) is the first one of two equally important introvertical processes, targeting the personal contribution towards reaching the project objectives. SM is dedicated to the development of a personality, personal attitude, capability and objectives, work and life balance. It is a personal process of project managers, and shall be a process of each team member, too.

If we can handle our own resources well: time, health, intellectual capability, we can be expected to handle the complexity of a project. The emotional stability: a balance between the social and personal views on one side and positioning between the perception and behaviour on the other one, is decisive for trust of other team members. A positive attitude: I am ok – you are ok, helps to preserve the balance and deploy efficiently the motivators, to the benefit of the project.

3.3.6. L: Leadership

Leadership is a particular process where skilful and conscious control of the behaviour of team members has an objective of causing actions towards the achievement of the project goals.

Motivating people is a key activity of a leader. According to Nash [29] leaders distinguish themselves by:

- strong will to win,
- focus on achieving the results,
- establishing the culture of readiness for changes,
- creating an atmosphere of trust.

The above characteristics are among the strongest motivators for the team. Average people, who never worked together and accidentally joined a project, being well motivated behave like gifted, uncommon geniuses, building the well functioning team together. This so called Pygmalion effect [26] found its best exemplifications during soccer world championship in Korea and European Championship in Portugal few years ago: unsuspected Koreans reached their performance peak, sympathetic Greek team with a small budget became the Winner of the European Championship.

There are two sources of motivation: the internal one (intrinsic) and the one applied from the outside (extrinsic one). In the first case team members generate their motivation from their own personal need and goals and exercise the whole

motivation process without the external involvement. Project managers stipulate this type of self-motivation by continuous exposition of the direct relation between personal goals and project objectives („path-goal theory” according to [15]). The effects of intrinsic motivation are durable: leaders address here the born-in characteristics of team members. Non-materialistic rewards and motivators are highly effective for this purpose. On the other side, leader can use money as a source of extrinsic motivation – this however, with limited impact...

3. THE CHALLENGE CONCLUSIONS AND FURTHER RESEARCH OBJECTIVES

Human factor has major impact on IS project performance, posing a challenge for project management. Productivity, in clear function of motivation, is decisive to goal achievement.

An analysis of motivators and demotivators let us conclude, that the success key lies in human interaction. Recognition, rewards, useful goals and challenging assignments are the most efficient factors. Thus, not surprisingly, competence in psychology, communication, team, personality development and leadership contributes substantially to the project goals achievement. IS project managers have to master those competences and pursue the corresponding processes in at least the same way they design the system architecture and make the project planning or quality control. We have to provide them with the methodology and practical tips in handling the human factor the same way we expect project managers to be an IS-professional. In an ongoing research we try to answer and quantify the impact of human factor on the IS project management, taking in particular the multinational and multicultural influences into account. Several incentives bind our European and Asian joint ventures.

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