



Developing Effective Teams in Global Multidiscipline Engineering and Manufacturing Organizations

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Abstract. In today's competitive business environment most activities in global relationships (subsidiaries, outsourcing, joint ventures) are carried out by multi-cultural and multidisciplinary teams which may be collocated or distributed. The members of these teams comprise a variety of experts of diverse cultural, organizational, and professional backgrounds. Within the project life-time they are connected together with time and money constraints for a specific period of time to accomplish certain distinct objectives. The aims of this paper are to report on findings from an extensive literature review regarding multi-cultural and multidiscipline team work and to provide a basis for discussion and analysis of challenges such teams experience. A case study is carried out in a global multidiscipline engineering organization to identify empirical evidence of potential challenges in projects carried out by multicultural and multidisciplinary collaborative teamwork.

Keywords: Multicultural teams · Multidiscipline teams · Process management
TMP · CODE · eSCM

1 Introduction

Recent trends in the world economy, including a highly competitive and rapidly changing global environment, networking as business models and distance mode of working enabled by Information and Communication Technologies (ICTs), have increased the complexity and competition level of organizations [1]. There is a push for organizations to produce innovative products and services for survival, sustainability and growth. At the same time processes need to be innovative and to promote knowledge sharing in order to keep costs down and to improve productivity. In order to increase competitiveness in the global market place distributed teams, such as dispersed knowledge workers of multinational organizations, service providers and clients in outsourcing partnerships and partners of joint ventures need to improve their knowledge to gain competitive advantage.

An increased number of organizations strive to form distributed teams in order to gain access to world class capabilities, to reduce costs and to integrate diverse perspectives [2]. Distributed teams, by their very nature, imply the presence of a group of geographically dispersed individuals often from different cultural, educational and professional backgrounds [3]. They consist of people who primarily interact electronically and collaborate from different locations using ICTs. The team members may meet face-to-face occasionally and in some projects not at all. In a distributed team the team members work interdependently across time and space and often across organizational boundaries towards a shared goal through webs of ICTs [4]. The team members solve problems and make decisions jointly; they are involved in a coordinated undertaking of interrelated activities and are mutually accountable for team results.

Teams are an important part of the functioning of an organization and most managers believe that teams are significant contributors to the effectiveness and success of organizations; they can also cause problems and restrict organizational success [5]. Due to the significance of teamwork in both business and educational environments, teamwork productivity and efficiency appraisal deal with ways to achieve effective collaboration in practice. Every team is different depending on the task the team is going to undertake, and on the social and cultural factors influencing how team members experience the team as a social unit. Team processes are generally concerned with motivation, cognition and socialisation [6].

2 Multi Cultural and Multi Discipline Teams

In the Knowledge Society skills-based work is carried out in low-cost countries, while creative, innovative, and knowledge intensive work remains in the leading organization (*Client* in outsourcing relationships and *Mother Company* in international organizations). However, high quality design requires profound experience and insight in the methodologies and tools used to implement and produce new products and services [2]. In addition, social and complementary skills are needed in today's distributed and networked engineering and production.

2.1 Compositions of Teams and Roles of Team Members

In all organizations there is a hierarchy of assigned positions, which in fact are vertical and horizontal differentiation of social systems [7]. The external and explicit part of the position is described through status symbols, such as company salary, car and office. The internal part, which is the behaviour of the position owner, is defined as the role, or role behaviour. Similarly, Hofstede [8] describes manifestations of cultures as an onion comprising practices, which are layers starting from the surface of the onion and moving inwards, including symbols (superficial and easy to copy), heroes (cultural models for behaviour) and rituals (collective activities carried out for their own sake; considered as socially essential). The core of the onion is the deepest level of values, which are qualities, principles or behaviours, considered morally or intrinsically valuable or desirable. According to Higgs et al. [7] the concept of roles includes behavioural expectations from the environment (management, colleagues etc.) as well

as requirements of the team role, perceptions (dependant on the situational conditions) and attitudes of the position owner. These depend on the owner's personality and previous experiences, talents and education.

The variety in characteristics, skills and experiences of individuals within a team determine the nature and the composition of the team. The success of the individual in meeting a team role depends on how well his/her personal characteristics, skills and experience correlate with the requirements of the team role. Individual well-being in teams emerging from mutual trust and respect, a sense of appreciation and a feeling of belonging promotes an open team culture of honesty that enables team effectiveness, and provides maximum value outcome to its stakeholders (managers, customers etc.).

2.2 Culture

Hofstede's definition of culture is: 'Culture is the collective programming of the mind, which distinguishes the members of one human group from another' [8]. By this definition, Hofstede emphasises that culture is a collection of characteristics possessed by people who have been conditioned by similar socialisation practices, educational procedures and life experiences. Culture is a system of beliefs and values that shape how people think, act and behave. Hofstede calls this mental programming within people, corresponding to different levels of culture: at a national level according to one's country, at an organizational or corporate level, or at a professional level associated with a certain profession or managerial level [8]. Cultural diversity can be a competitive advantage for the company if dealt with in a proper manner. Cultural constraints determine which strategies are feasible and which are not.

2.3 National Culture

National culture is a major barrier to making global business effective [9]. Different nationalities have different expectations as to how employers and employees should act, as well as ways of expressing agreement and disagreement, different styles of management and participation in decision making, different attitudes toward hierarchy and different approaches to teamwork etc. Regarding software outsourcing there is growing awareness of cultural issues: Recognition of the fact that cross-cultural training is needed both in advance of a project and continuously [10]. Kahn et al. [17] investigated the barriers that have a negative impact on clients in their search and selection process of outsourcing providers and found 16 such factors grouped in three categories: Cultural insensitivity; Process Maturity and External factors.

2.4 Organizational Culture

Deal and Kennedy [11] propose that organizational culture plays an important role regarding the success and sustainability of an enterprise. Organizational culture involves several aspects including the structure of the organizational culture, the form, the type and the function of the organizational culture etc. [12]. In order to create effective teams there are two design factors that significantly influence the process of a project management structure, namely the level of specialisation (technical areas or development focus), and the need for coordination (required to bring unity to the

various elements). Cheng and Kong [12] postulate that organizational culture has an impact on sharing of resources, which are considered to be an effective way to respond to constantly changing market conditions and to minimise market risks. With resource we can understand a source or a supply from which some kind of benefit is produced. Knowledge sharing is inevitably important for effective teamwork, and is influenced by differences in both organizational and national culture [13].

O'Neill et al. [14] propose that organizational culture and organizational structure direct the behaviour of employees. They define structure as centralisation of decision-making, formalisation of rules, authority, communication and compensation, standardisation of work processes and skills, and/or control of output by acceptance of only adequate outcomes. Research has showed that shared values guide the behaviour of the members of a cultural group, and influence the actions and judgments of the group [8]. When the values of individuals match the values of the group consensus and harmony is gained. Wellbeing of the individual participant is increased and the effectiveness of the group is improved.

2.5 Culture and Organization Leadership

Schein [15] asserts that ‘cultures begin with leaders who impose their own values and assumptions on a group. If that group is successful and the assumptions come to be taken for granted, we then have a culture that will define for later generations of members what kinds of leadership are acceptable. The culture now defines leadership. But as the group runs into adaptive difficulties, as its environment changes to the point where some of its assumptions are no longer valid, leadership comes into play once more. Leadership is now the ability to step outside the culture that created the leader and to start evolutionary change processes that are more adaptive. This ability to perceive the limitations of one’s own culture and to evolve the culture adaptively is the essence and ultimate challenge of leadership’.

When organizational culture is aligned to business strategy, the workforce will act and behave in ways that support the achievement of business goals. The leader will uphold the values and beliefs of the organizational culture through their actions and decisions. This, in turn, enables the implementation of the organization’s strategy.

2.6 Communication and Terminology

Good communication is the most fundamental requirement for effective team work. “We are speaking the same language” is a phrase that means we understand each other well because of shared ideas and feelings. Miscommunication inexorably results in misunderstandings among team members which can lead to poor performance, hurt feelings, and lack of motivations concluded by [16] in a teaching case study. They demonstrated that due to miscommunication, different interpretations or misunderstandings, often result in productivity losses, as well as loss of trust.

In management, and in particular in team work, there are often misunderstandings because of ambiguity and subjective understanding, which cause confusion and miscommunication. Thus it is necessary to define and use terms consistently and in a standard method.

3 Acceptance of Process Improvement

3.1 Culture Change

Standard processes promise predictable outcomes. Total Quality Management (TQM) and ISO 9001 certifications rely on Process Improvement approaches, which continuously require improvements in the defined processes, hence changes in the current processes. Khan et al. [17] demonstrated a Software Process Improvement Implementation and Management Model (SPIIMM) that can assist global software organizations to successfully execute Software Process Improvement activities. Successful organizations create a strong organizational culture, but at the same time this can be a barrier to change. People tend to resist change. In global teams there may be many different cultures involved, such as different national, organizational and professional cultures. The team members need to step outside these cultures and for the duration of the project commit to a common team culture.

3.2 Process Maturity

The Software Process Improvement (SPI) manifesto [18] helps organizations to improve their process maturity. In global team work different organizations with different national and organizational cultures need to work together to maintain the basic values of people, business and change.

Cultural awareness and appreciation of a common process improvement initiative is imperative for success of global projects. Emphasis on the processes and their improvement will frame and support the common team culture. The project leader needs, through agreed upon and defined processes, to encourage vigilance and timely reports of delays, ignorance, potential misinterpretations and discrepancies in viewpoints regarding the tasks of different team members.

3.3 Knowledge Sharing

Team work within an organizational culture of knowledge sharing is likely to succeed. In a global context communication and knowledge sharing is considerably much more difficult due to language, terminology, culture, time issues and distance. Teams lacking communication and knowledge sharing will turn into detached groups of uninvolved strangers out of leadership and cooperation [13]. Georgiadou et al. [19] developed the I5P visualisation framework relates the capability maturity levels and knowledge sharing levels. The figure shows that the higher the maturity the better the knowledge sharing. This framework provides the basis, in terms of preparedness and disposition towards knowledge sharing, for estimating and measuring organizational performance. Hence the performance increases dramatically the maturity grows.

3.4 Team Effectiveness

Many previous studies have been carried out regarding teams within organizations and factors that have impact on team performance, however, according to Cacioppe and

Stace [20] these studies are considered somewhat fragmented with respect to enhancing the team effectiveness.

Adams et al. [21] found seven constructs of effective teams, namely: common purpose, quantifiable clearly defined goals, role clarity, team climate, mature communication, productive conflict resolution and accountable interdependence. The main objective of a team is to have a common purpose, which all team members agree upon. There needs to be a clear relationship between the main organizational objective and the team's objectives. In order to maintain the focus on the team's objective, clear and commonly agreed goal statements defining the tasks to be accomplished by the team, need to be described. Clearly defined and quantifiable goals help the team to manage the scope of the tasks, and thus increase the probability of team success. It is also significant that there is a common understanding of each individual's expected role in the team. Each team member's understanding of his/her own role and the roles of the other team members minimizes misunderstandings, role ambiguity and task assignment duplications. Regarding the team climate (team spirit), the team members will be comfortable being themselves in a team where there is interpersonal trust and mutual respect. In a psychologically safe context, team members are likely to affirm each other for specific contributions, thereby encouraging each other to perform effectively, creatively and innovatively. Mature communication indicates that team members are able to articulate ideas concisely and clearly as well as to express compelling reasons for their ideas. Productive conflict resolution involves procedures and actions to be taken by team members when a conflict arises. Examples of conflict resolution are exploration of alternative positions/solutions, involvement of everyone affected by the conflict, increase of cohesion among team members, enhancement of the decision-making process, as well as facilitation of the problem solution. Accountable interdependence regarding the output of the team is the responsibility of each team member. This means that each team member needs to understand the mutual dependence of all team members' responsibility for the quality and quantity of the team's work.

Yang and Choi [22] provided empirical evidence that information, autonomy, responsibility and creativity have positive and significant effects on team performance. [7] also demonstrated that there is a clear relationship between team composition (diversity), complexity of task and team performance. For complex tasks, diversity was found to be positively related to performance while for straightforward tasks negatively related. Team diversity was operationalised by using the Belbin Team Role model [23]).

4 A Case Study for Identifying Empirical Evidences of Challenges in Team Work

A case study, part of a Finnish research project [24] was designed to address different aspects of the research problem ('how' and 'why' to create effective teams in global multidiscipline engineering and manufacturing organizations), and to confirm and build on earlier findings and development of theoretical proposal from a similar study [13]. The focus of the case study was on contemporary phenomena within real life context and the aims were to explain the causal relationships between effective teams and

successful outcomes. The case study reported in this paper was carried out by interviewing 10 team leaders at four different leading Finnish global multidiscipline engineering and manufacturing organizations to identify empirical evidences of potential challenges in global projects carried out by multicultural and multidisciplinary collaborative teamwork. The global companies, all four with more than 1000 experts globally, either in subsidiaries, joint ventures or outsourcing partners, provide multidiscipline products and services worldwide within the energy sector. They all work systematically with digitalisation and development by incorporating continuous learning into their daily routine. The main focus is on effective project execution in global projects and innovations. Nine of the interviews took place in 2010 and one took place in 2018 in order to validate previous findings and to verify the challenges identified.

The sub sections below are extracts from the face-to-face interviews with experts from 4 large (with over 1,000–150,000 employees), multidiscipline engineering and manufacturing Finnish firms. These extracts reveal the main issues and potential challenges in projects carried out by such teams. The most representative interview extracts are included in this paper.

4.1 Type of Project Collaboration

Currently, most Finnish companies, with a global presence, are primarily engaged in joint ventures. The reason for this is that they view joint ventures as ‘an important form of collaboration for technology transfer to challenging countries. It enables the risks to be shared with a partner who already has customer and supplier network in place. Another important issue is the local knowledge and connections to authorities because in most cases all kinds of permissions are imperative for new start-ups. If we do not manage to sell in certain potential markets we may start to think about other solutions for penetrating the market. We may put up a joint venture that does a part of the production, not necessary the whole production. We prefer joint ventures over outsourcing because we want to retain, and thus have control, of certain key factors. The selection process for choosing partner companies for joint venture is a very challenging task. It depends on the level of know-how and technology they use; what kind of market we are interested in; and how willing the company is to join us. Typically a local person from the sales partner is used as surveillance in new joint ventures to minimise risk. A common quality management system is developed and frequently audited’.

4.2 Culture

‘Our experience informs us that the country culture is stronger than organizational culture. If my company goes to China for example we have to adapt to the Chinese culture, we cannot expect the Chinese to adapt to the culture of our company. I see this very clearly! Particularly in China they have very strong established networks between themselves. When you arrive as a leader you cannot come with your preconceived ideas about how things have to be done. It depends of course on how strong their

personalities are. At first glance it may seem that they do as you want but they do it to please you and as soon as you have left they do as they want.

If we have team members from other countries we try to invite them in the beginning to get to know each other. It takes quite a long time to understand how things work in a new culture and to get to know the people you are going to collaborate with cross-cultural training is provided to some degree, but relatively little, you primarily learn by experience. We use bridging staff (people rooted in our country and in the other country), but mostly we use local people with connections, who know English'.

4.3 Communication and Terminology

'More often than not you do not have the ability to choose the people in your team. If you are going to assemble a new team you need to specify the type of skills you need. Once you establish the team you often find that there are some technical and cultural skill gaps. You have to attempt to fill the gaps. Depending on the gap you can involve some technical experts or shadowing and support staff or send the team members to a course or ask them to read some text on e.g. cultural issues.

It does not matter if the team members are from different nationalities; what does count is the distance. In the beginning we have kick-off meetings where we discuss the objectives, team roles, obligations, milestones etc. These are usually explicitly stated by the team leader. There is not much commitment or input from the other team members. They may air their opinions, but they characteristically do not take part in decision-making. Exception occurs in circumstances where there are some specialised tasks that require addressing. It is here that the specialist will state how things should be done. In such moments a lot of belief is entrusted in the specialist. Experience reveals that distributed (virtual) teams with on-line meetings are ineffective and do not work at all. There may be teleconferencing and discussions, but everybody seems to expect somebody else does the work. Live visits are far more effective and productive, and usually work better. However, the cost involved in international teams meeting face-to-face is prohibitive.

We try to meet at least once per week, all together, in person at the commencement of a project. We have internal and interdisciplinary meetings on different hierarchical levels. The customer often participates in these meetings. The responsibility is shared in a hierarchical manner to safeguard the quality and timeliness of the project. When a new project is created with new team members, the leader is important. The team leader distributes the roles to the team members, keeps the team together and is responsible for making it going. It is quite hierarchical. People instantaneously understand and appreciate if the project leader is interested in their daily small problems and disputes. Development discussions are utilised but the problems are not usually on that level. Communication is very much dependent on the manager and the recognition that everybody is so different. Common terminology is slowly developed according to prevailing partners and customers'.

4.4 Acceptance of Process Improvement

‘Process changes are very difficult to implement when the existing ones are accepted and deep rooted in the culture of the organization. The change usually is initiated by higher hierarchical levels, all the affected parties’ involvement and acceptance is crucial for a successful implementation. The driver of the change needs to be fully engaged to explain, convince and motivate the affected people to recognise and adopt the change’.

4.5 Team Effectiveness

‘More often than not problems exist within the teams. The Finnish idiom ‘we push with a rope’ concisely and neatly expresses the reality that nothing really happens. The tendency is not to really reflect much but to simply go on with daily duties and do what we have to do. Team cohesion is very difficult but good cohesion is recognised as being important. Using a sports team, as a metaphor, allows us to fully appreciate team effectiveness where everybody needs to understand their parts and know when to pass the ball to the other person. A good team leader is crucial to identify potential gaps in team effectiveness and to support team spirit. Ultimately you have to be very patient!’

5 Proposed Instruments/Tools for Developing Effective Teams

[25] created the Team Process Management (TPM) model, a management process for creating effective and successful teams. The model consists of four steps: (i) Team formation, (ii) Team building activities, (iii) Removal of obstacles and creation harmony and balance, and (iv) Creation of shared values and expectations. Such teams recognise shared ownership among the team members and work effectively towards goals in a selected timeframe. The TPM model was created for use by teams in multicultural and multidisciplinary environments. The model is likely to be particularly useful for improving impact team performance in multicultural and multidisciplinary distributed collaborative teamwork.

The effective management of cultural diversity in a global context is a challenge and a competitive advantage. Managers who are involved in cross-cultural communications and negotiations need to develop characteristics such as cultural sensitivity, flexibility and adaptability and seem to be worried about their own capabilities to be successful in an increasingly complex global context. In order to help service purchasers to search, select and collaborate with service providers we propose the use of the eSCM-SP/eSCM-CL (a capability maturity assessment model).

6 Discussion and Conclusions

Team processes are concerned with motivation, cognition and socialisation. Before articulating the role of leadership in fostering team effectiveness, it is important to understand the nature of team functioning. Teams have to reflect on their performance

and adapt to the changing environment. Methods that support team members to understand their strengths and weaknesses can help in improving the performance of the team and in preventing difficulties in the functioning of the team. Motivating all people involved to work together effectively and efficiently is embodied in Principle 2 of the SPI Manifesto: Motivate all people involved.

The conceptual contemporary Team Process Management (TPM) model that aims to enhance multicultural and multidisciplinary global team performance and effectiveness was developed to support teams and increase performance in order to overcome apparent complexities and contradictions. TPM provides a structure that teams can follow to increase shared ownership and common understanding of objectives, targets, roles and responsibilities.

Limitations of the study concern the leadership style. The model was tested only within an environment of a collaborative leadership style. With other forms of leadership the outcomes may not be similar, particularly in autocratic leadership styles, where not much space is left to initiatives coming from the team members. Lessons learnt from case studies proved that in multicultural and multidisciplinary virtual collaborative teamwork, such as in projects sponsored by the EU, a certain structure is desired by the team members in order to utilise resources in an effective way and to create a team culture of trust, inspiration and high team spirit.

This paper described challenges in assembling and running multi-cultural and multidiscipline teams. A case study was carried out in four Finnish global organizations in order to identify empirical evidence of potential challenges in projects carried out by such teamwork. We proposed the integration of the Team Process Management (TPM) the eSCM-SP/CL, and the CODE assessment model as instruments and tools which can bring added value outcomes for global multidiscipline engineering and manufacturing organizations in their attempts to meet challenges influencing team effectiveness, such as maturity, technology, culture, communication, knowledge sharing and acceptance of process improvement.

Future work will concentrate on field studies for collecting more in depth evidence on effective global teams. Following that we aim to augment the SPI Manifesto with a new principle “Develop awareness of risks arising from conflicts of a multidisciplinary and multicultural nature”. Once recognised risks can be mitigated through the development of customisable process models for the various types and sizes of multidiscipline, multicultural company collaborations such as mergers, acquisitions, franchises.

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