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HOW DOES PROJECT MANAGEMENT METHODOLOGY FIT IN WHEN WORKING WITH CROSS-CULTURAL AND CROSS-DISCIPLINARY SOFTWARE DEVELOPMENT PROJECT TEAMS?

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Abstract: *When it comes to choosing the project management delivery approach and methodology, internationally acknowledged guides agree on one thing: it should be tailored to suit the project. Finding the right method and approach requires considering particularities related to the project type, geography, and culture. Also, the team and stakeholders' characteristics play a crucial role in project tailoring and adaptation. On the other hand, the project team componence and management has been considerably influenced by some of the 2022 global megatrends: digital disruption, labour shortages and diversity and inclusion movement. One of the implications and impact is the increasing need of cross-cultural and cross-disciplinary project teams that deliver IT projects. The aim of this article is to provide a reflection on how agile, traditional(waterfall) and hybrid blends in when managing IT projects with cross-cultural and cross-disciplinary teams. For this purpose, secondary research (literature survey) and primary research, some representative examples and observations based on the author's professional experience will be analyzed. What do we choose and equally important: how do we choose? What role does methodology play in this context when it comes to conflict resolution?*

Keywords: *hybrid project management, cross-cultural, cross-disciplinary, project methodology, conflicts*

1.INTRODUCTION

During the COVID pandemic there was an accelerated expansion of digital technologies that supported remote work and online collaboration. For 2022 six global megatrends are identified and one of them is digital disruption [1]. While "A lot of the attention at the moment is around hybrid working and ensuring we have technologies in place to allow people to work from home securely, which in itself is not necessarily a technology innovation.", shifting to a fully remote working environment during COVID pandemic has influenced the rate at which companies introduce new software. Also, there is an increasing demand to have Artificial Intelligence (AI), Internet of Things (IoT), virtual/augmented/mixed reality projects, that require cross-disciplinary collaboration. On the other hand, to respond to the need of highly specialized personnel and encouraging the discovery of innovative solutions, cross-cultural teams seem to be the approach to take.

In this context, one question that arises is how does project methodology blend in when there is a need to deal with cross-cultural and cross-disciplinary project teams? *There are methods [2] and standards [3] that state they can fit a multitude of project environments, sizes, complexity, team capability and risks (provided a proper tailoring is done). Even frameworks such as scrum [4] emphasize on the value of adaptation. Through inspection and by leveraging on the "collective intelligence of the people using it", it facilitates decision making when it comes to keeping, modifying, or discarding current project management practices. So, the team and stakeholders play a crucial part in project tailoring and adaptation, but* could one pinpoint and say a specific project methodology/standard/framework is more efficient and better suited for this context? Should one choose the linear and predictive approach (waterfall project methodology) or an iterative approach to project management (agile, scrum, kanban etc.)? Or, the answer is somewhere in between: using a hybrid project management approach where the degree of linearity and iterativeness combined is given by the project tailoring done. The value of answering this question lies in the fact that it acknowledges the importance of the project methodology used and its effects on the conflicts generated by cross-cultural and cross-disciplinary complexities.

In this article, these questions will be addressed, by presenting some representative examples and observations based on the author's professional experience. Also, while doing so, aspects and perspectives related to communication, conflict, problem solving, time to market, customer and team satisfaction will be tackled.

In [5] the trend of having an increasing demand for cross-cultural software development project teams is acknowledged. After conducting a qualitative exploratory case study, one of the findings is that language barrier is among top 3 sources of conflict in such project teams. What can be found lacking from the interviews/cases presented is mentioning what project management methodology was used. While there were some cases in which one could deduce it, this is an important aspect that should have been correlated with the conflicts that arise in multicultural teams. The aim of this article is to emphasize and argue that this dimension is mandatory when studying conflicts and their management in the context of cross-cultural IT projects.
On the other hand, when it comes to cross-disciplinary teams, communication can raise challenges because vocabulary is a source of misunderstandings. One of the reasons is that the same word can have different meanings in the context of different functions and even disciplines. Also, specialized terms are used to symbolize the inclusion to a specific group, so from this perspective they can deliberately be more complicated to be understood for someone outside the group [6].

So, one important point of reflection is: what role does project management methodology play in minimizing or widening the communication gap in such a context (having a cross-cultural and cross-disciplinary IT project team)?

2. EXPERIMENTAL

As part of the primary research (literature survey), a study and analysis were performed on the 12 interviews (cases) presented in [5]: based on the description and the information provided by the participants, the project methodology used was deduced by the author of this article. For the qualitative exploratory case study in [5], data was collected using semi-structured interviews with the population of 12 project managers recruited from the Project Management Institute's credentialed project management professionals LinkedIn group. Based on a study of these interviews an analysis was made, while considering as criteria the guiding principles for each approach. For traditional (waterfall) a synthetization could be as described in [7] "sequential design process in which progress is seen as a gradual flow […] Key elements are fixed order of main activities and a focus on control and documentation". On the other hand, agile is "based on iterative and incremental development process, where requirements and development evolve through collaboration between self-organizing, cross-functional teams that allows rapid delivery of high-quality software to meet customer needs and also accommodate changes in the requirements" as described in [8].

3. RESULTS

3.1 Communication as a source of conflict, the role of project management methodology and other considerations

This deduction was done based on elements mentioned in the interviews from [5] that were clearly pointing to a specific methodology, in some cases where it was lacking or there was not a clear delimitation, the result was "not conclusive". The purpose of this analysis/exercise is to argue the importance of project methodology used in such a study and how it can influence conflict management.

Table 1: Deduced project management methodology from the use cases presented in [5]

Suggestive narrative (extracts from use cases) from [5]	Project methodology used deduced by author
Cultures: India, US **From Case A**: "on an initiative he worked on, he noticed that while US engineers paid careful attention to completing the design on time, Indian developers focused on building a quality software. Time and schedule were trivial to the Indian team members. The delay caused by the Indian team members rippled through the project as the US based testers could not complete their testing on time. This created a lot of conflict between the team members."	**Waterfall** – suggests more a linear approach, waiting for each phase to finish before starting a new one

Suggestive narrative (extracts from use cases) from [5]	Project methodology used deduced by author
Cultures: India, US **From Case B**: "He reported that cross-cultural conflict erupted in his team when a US team member working on a common initiative with Indian team members based in India set up team meetings without consultation with their Indian peers. These meetings were set with only the US team's availability in mind. Conflict resulted when the Indian team members repeatedly failed to attend these off-hour meetings."	**Not conclusive** – it is not very clear from the narrative, but it inclines more towards a waterfall approach (not having common team meetings from the beginning, having strong fixed delivery dates)
Cultures: Muslim, Western **From Case C**: "For example, Participant C found that team members of one culture on his project team perceived team members of another culture as incapable or less qualified to perform certain project tasks. This perception was based solely on the negative stereotypes fuelled by the cultural heritage of the team members perceived as incapable [...] Participant C used his negotiation skills to garner consensus from team members on distributing tasks based on qualification and not stereotypes"	**waterfall** – in agile you don't have task distribution
Cultures: not disclosed **From Case D**: "[...]he found a communication breakdown issue pertaining to the fact that the project team was distributed. [...]This caused miscommunication and tasks delays amongst teams. Teams that depended on deliverables from other teams failed to receive those at an expected time. This then caused delays with the project schedule and caused conflict. Digging into this issue revealed that the problem was that of language barriers."	**Waterfall**- the way the communication is kept flowing (lack of meetings with all team members present), the way delays and schedule are perceived and also in another narrative of participant D is mentioning negotiation with team members to accept tasks that better fit their skillset
Cultures: Dubai, US **From Case E**: "[...]language barriers were another area of challenge that caused conflict in her multicultural team. While the US team members often misunderstood the English Language spoken by the Dubai team members, due to a difference in accents, the Dubai team members, on the other hand, often found offensive and/or inappropriate the choice of words and slang used by the US team members. Tone was another component of language barriers. The US team members often came across as polite, though they appeared to be controlling. The Dubai team member, conversely, came across in their communication as authoritative. This cultural misunderstanding on both sides caused conflict and difficulty on the project."	**Not conclusive**- although the lack of common time spent together inclines towards waterfall, but from the situations described it is not very clear.
Cultures: Australia, Bangladesh, Spain **From Case F**: "Participant F said he also experienced competitive attitudes that resulted from perception on adherence to project schedule, importance of job titles, and gender differences. The first reason for competitive attitudes was time consciousness and adherence to the project schedule. In his explanation of competitive attitudes, Participant F stated that some team members from one culture were more time conscious and adhered strictly to the project schedule while team members from another culture were very lax with time constraints and paid little attention to the project schedule. For example, he reported an experience in which a team member from a culture that was more relaxed failed to deliver a task on time. This delay affected the project tasks of the more time-conscious team member as her tasks depended on the late task. The team members from the time-conscious culture became frustrated and the situation quickly escalated into a conflict as competitive blame surfaced."	**Waterfall** – team members deal with tasks (not stories), also adhering strictly to project schedule is more waterfall approach than agile. Regarding the language issue of one team member, that would have been spotted earlier in an agile mode because he would have had many more opportunities to express himself before finishing a solution (during planning, design and estimation, daily stand-ups etc.)

Suggestive narrative (extracts from use cases) from [5]	Project methodology used deduced by author
Cultures: not disclosed **From Case G**: "Participant G stated that team members from a more reserved culture found it hard to speak out. They did not trust sharing their opinions, as they were not sure how it would be received or interpreted. According to Participant G, it was even more difficult to get people from reserved cultures to trust speaking out when stronger personalities dominated the conversation in a team meeting. Stronger personalities contributed a great deal towards diminishing team collaboration. [...]The second thing that Participant G did to improve trust and collaboration amongst team members was that he used team retrospectives to smooth the storming phase of team development. In a retrospective session, Participant G facilitated the meeting, making sure that all team members' opinions were heard. A retrospective served the purpose of looking back at the team's work for a set period of time and evaluating how to improve moving forward"	**not conclusive** -however this is the first interview in which a participant is describing an approach that is very similar to agile (he is mentioning retrospectives, something similar to grooming). What is particularly interesting is that these measures are a reaction to a cross-cultural conflict.
Cultures: disclosed in some cases (US, Muslim), not disclosed in others **From Case H**: "In describing the issue of language barriers, he stated that, when English was not the first language of the project team members, communication was misunderstood. This led to misperception that caused frustration and stereotyping, the result of which was interpersonal conflict amongst the team members. According to this participant, team members from different cultures misunderstood and misperceived the use of slang by team members from different cultures. The use of a slang meant several different things to the different people from the various cultures represented on the project team. This was a common source of conflict amongst the team members. In one situation, it caused conflict that hindered collaboration and had a negative effect on the project schedule."	**not conclusive** – the conflicts described don`t contain enough information regarding the delivery model and the project management practices. They describe more team member interactions on a personal level that is affecting collaboration and project results.
Cultures: not disclosed **From Case I** : "Participant I stated that, in her experience, members of some cultures were "yes" oriented, but never produced results or acknowledged when they did not know what to do.[...] She attributed this behaviour to a language barriers and cultural mores.[...]In an example cited by Participant I, she said that in one instance it was difficult to know if the team members in remote locations understood the tasks given to them and were performing the work accordingly, although several regular team meetings had been held. These team members would say "yes" on conference calls but failed to deliver milestones and their associated results on their due dates. "	**waterfall** – in agile you don't have task distribution
Cultures: not disclosed **From Case J**:" [...]The second way Participant J addressed the challenges she faced in her multicultural team was that she ensured the workload was distributed as equitably as possible. Participant J held daily fifteen-minute status calls to make sure that team members were progressing with their tasks and were not piling them up to pass on to another team member when they went on vacation. [...]This participant treated her team members with respect and always acknowledged the particular skillset, which each team member brought to the project. She encouraged a sense of belonging, promoted team spirit by tapping into strengths of the team members, and assigned each team member tasks and responsibilities that increased their strengths.	**Waterfall**- task distribution, discusses about a daily meeting but this meeting is more a status reporting

Suggestive narrative (extracts from use cases) from [5]	Project methodology used deduced by author
Cultures: Japan, China, and India **From Case K: there** were distinctions in that Chinese and Japanese team members were very accountable and detail oriented. They asked very specific questions, got straight to the point, and did not talk much. They took the project tasks seriously and delivered them on time with high quality. On the other hand, Indian team members were more sociable, but also effective. Although the team was effective, conflict always erupted when Indian team members wanted to carry on long friendly discussions and Chinese and Japanese team members viewed that as disrespectful. […] First, she said that she would always pick an agile project management methodology over any other. The reason for this is merely that an agile approach allows the team to be co-located. According to her, co-location helps a lot with communication issues within a project team made up of members from different cultures.	**Agile** – communication is identified by the participant as the greatest barrier in multicultural project teams and to address this agile methodology is highlighted as a good choice, mainly due to co-location. Other ways used to address this included promoting the avoidance of ambiguous vocabulary and active listening.
Cultures: not disclosed **From Case L**: "Through experience, Participant L found that sometimes staff working together had the tendency to forget about the remote meeting attendees. [...]Other team members who were multicultural travelled to the customer's location for specific activities, but then worked remotely for most of the tasks. The developers and testers worked at two different locations. The team members had a variety of backgrounds and ages. The origin of competitive attitudes was the religious obligations of one of the team members. They kept him out of work one day a week. No one else on the team had the ability to adjust their schedules similarly, although many competed for such an adjustment"	**not conclusive** – but it could be waterfall as with agile these kinds of issues can be identified earlier because it requires a higher level of interaction within the team. Even if developers and testers work remotely, in agile you would see how this dynamic is working while they are engaged in the first iteration/sprint. In waterfall on the other hand, you typically need to wait for the development to be done and then the testing can start.

3.2. Case study: project managed with linear (waterfall) methodology

Based on the author's experience (significant for IT cross-cultural and cross-functional projects) and observations, let's consider the following case- a software development project that fits the criteria:

- it is cross-disciplinary as the product that needed to be developed consisted in a software application which contained business logic spanning across multiple departments (marketing, sales and financial)
- it is cross-cultural because it involved team members and stakeholders from three sites – Romania, France and Russia
- it is managed with waterfall methodology.

Some other important aspects are that major releases had a fixed go live date and they were typically two or three per year, so a release contained the work of up to six months. Also, in terms of budgeting the project had a fixed-price contract (price was based on initial high-level requirements, development team estimations and previous experience with such types of requests).

The multi-cultural aspect (different languages and communication customs) in combination with waterfall methodology added a major risk during requirements gathering and analysis phase because specifications needed to be very clear and complete by the end of this phase on one hand, but on the other hand it can be difficult to explain and clarify complex business aspects/problems in a non-native language and in a virtual environment (via conference calls).

Some of the risks are however reduced by the fact that in waterfall each phase requires detailed documentation. So, if a misunderstanding occurs, the client can spot it in the business requirements documentation. On the other hand, this works on a several premises:

- The business analysis team does not forget to detail something in the document, and puts emphasis on topics that were difficult/complex to clarify by adding examples, diagrams etc. Given the virtual environment and the difference in native language/culture it might be hard to identify the non-verbal and verbal communication indicators that raise the signal that the topic discussed is potentially important and might be unclear for the client as well.
- The client is very rigorous and reviews thoroughly all the business requirements after they have been documented (so this needs to be part of the culture work ethic)
- The client will raise issues or challenge the documentation each time necessary, before giving the final go-ahead (so this needs to be part of the culture work ethic)
- All business cases/rules are identified (including corner cases and exceptions)

For this project conflict appeared late in the project execution: during the testing phase (Figure 1). The client explained to the project team that they were trying to test a business flow in the application and did not receive the expected result. The project team searched in the specification documentation and did not find any mention of this case, but with the given specification, the result of the steps performed by the client should be the one the application was showing. After pointing out this, the client said they don`t understand why and that the result the application was showing was incorrect and they cannot use it. A couple of virtual meetings were held to clarify this point and raise some key questions.

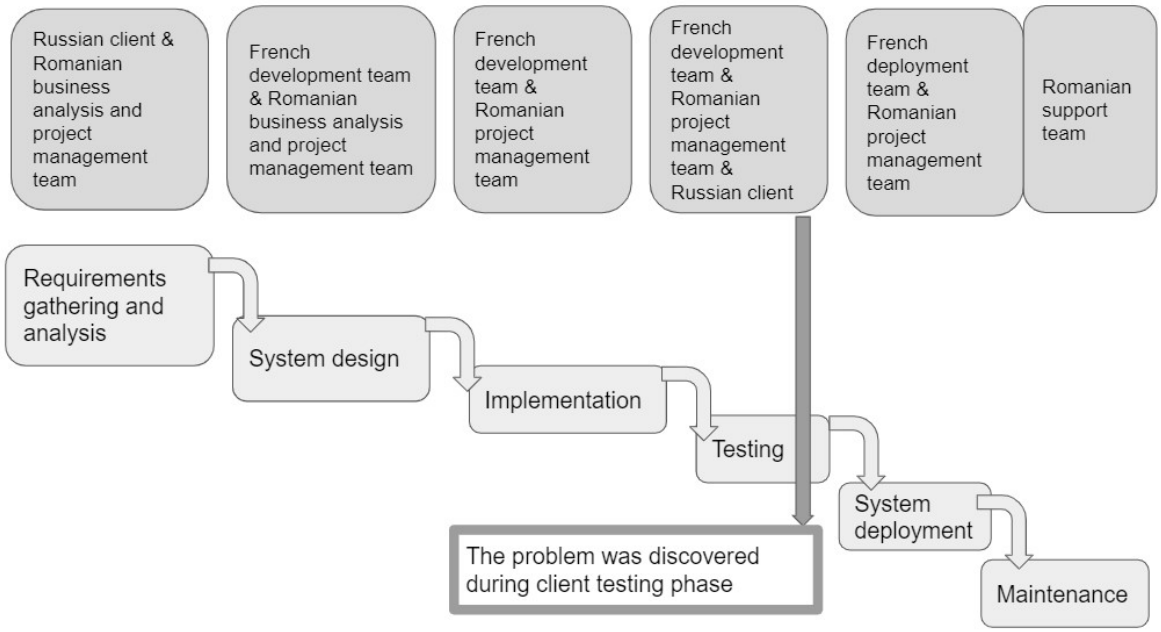

Figure 1: Interactions between different cultures during project phases

Question 1: Why was this business case not mentioned and documented since it was of such importance to the client?
The answer from the client was that the reports needed by the management changed recently and they did not think this would impact how the application was built. But they emphasized again that this was an important business request for them, and it needs to be handled.

Question 2: Why was the result the client was expecting different from the one in the application?
Normally if the business logic implementation would have been correct, the fact that the client was making different steps in the application should not have changed the correctness of the result. After reviewing the business logic on which this case was relaying together with the client, a problem was identified in the prospect and customer referencing model the Russian client was using. It turned out this was a very complex topic as their prospect and customer referencing model was based on multiple external databases and suffered some transformations that were not taken in consideration in the specification documentation.

The information from the specification documentation was correct, but incomplete, so incorrect in the end, as it could give correct results to some business cases and incorrect results on other business cases (like the one the client was testing and needed now).

Question 3: What are the next steps and who is paying?
Change is often costly when using waterfall because usually issues are discovered in late phases of the project. In this case it was discovered during the testing phase. So, after clarifying the specifications with the client, the specifications were given to the development team to analyze and come back with possible solutions and estimations. This change had an impact on project delivery timelines and budget, as it was a modification that needed to be performed on a core concept of the business on which the application relied.

Because these aspects were not in the specification document signed-off by the client at the end of the "Requirements gathering and analysis phase", it could be argued that the client should pay for the development and agree with the project delivery delay. At this point, sometimes what happens is a blame game. When there is such a misunderstanding, you go back to the signed-off specifications, point out who did the mistake, and that one should be the bearer of the costs.

However, obviously this is not really the best approach, as it affects customer satisfaction and the probability of that client to choose another contract with you.

Question 4: So still, in the end who should pay?
For this case specifically, after discussing with the development team a workaround was found. They could do some changes at a low cost with little impact on the delivery date, but this would only fix the specific business case the client needed, not all of the business logic. So, in the future if the client might try different business cases, then the ones identified in the business specifications, there would be a risk they might not return correct results. The alternative would have been to fix the business logic, but this would have implied big changes at many levels in the application, big costs, and delays.

The client decided to go for the compromise workaround. The top management of the project team decided to cover the extra budget since it was not very big and in balance with customer satisfaction, reputation impact and future contracts, they decided it was worth it.

To conclude, for this case and in this context of a cross-cultural and cross-disciplinary team, the communication gap is widened by using waterfall methodology. It is difficult to identify and clarify all complex topics (cross-disciplinary), especially in non-native languages and while working in virtual environments. On the other hand, for a waterfall model to be successfully applied, specifications need to be stable, clear and detailed enough. Ideally, they should not be changed during other phases because that could prove to be very costly and could influence the project's success (waterfall is a rigid model from this point of view). Instead of allocating so much time and effort initially only on specification definition, some iteration and working on the actual software might help to identify different understanding and possible issues.

Secondly, conflicts are harder to manage in this context and waterfall only adds more pressure with its rigidity in terms of timeline and budgets. Some of its possible pitfalls are to push the focus on who should pay for a misunderstanding rather than solving the issue, affecting both customer and project team satisfaction. Finding the right balance and compromise on top of difficult verbal and non-verbal communication is a tricky task and a situation that should be prevented by more flexibility and earlier discovery of possible problems.

3.3. Case study: project managed with agile methodology

Let's now take an example and consider the following scenario (inspired from my experience as a project manager), referred as "Analytic solution for online shop":

1) For an online shop (with a magnitude such as emag.ro), a product owner would like to have the information of number of clicks per product for all its customers on an hourly basis in an internal analytic application.
2) A month ago, he requested to have in a financial application (for the purpose of billing) the number of clicks per product for all its customers on a monthly basis. This change required adding a field in the database and took a few days to implement.
3) When discussing with the development team of the analytics application they estimated this change would take much more time to implement.
4) Based on the previous experience, the product owner inclines to mistrust the given estimations and challenge the analytics team.
5) In order to solve divergence, the product owner needs to understand that in this case, even if conceptually there is not so much difference between the operations, because we are talking about a much bigger data volume (hourly vs. monthly), the technologies used to manipulate the changes differ and implicitly so does the implementation time.

However, at this point in the scenario, it is already somehow late for tackling the conflict because on top of the communication reason, mistrust is introduced as well. What could have been done to prevent this to escalate so far and even so, what can be done at this point to address the conflict? What could have helped in avoiding the conflict is giving the product owner an initial presentation that would get him familiar with: what the project team does (mission, goals) ,a simplified architecture of the application if case, the cycle of development if case and a restricted area of terms from the team vocabulary (as it will be described later in this article) , particularly those that are foreseen to be used for the purpose of the change he requested (in this case could be velocity, veracity, pipelines etc).

This is in line with the issues identified in [9] for Bancolombia Communities big data and analytics project. On one hand, it is highlighted that the lack of a clear shared definition and view on what "big data" meant was a source of project implementation and delivery delays. On the other hand, there were communication issues that just as in the scenario described above led to mistrust. The project members worked in different teams (split based on their discipline) and there was an isolation in their work that led to decisions being made by some teams or team members and not communicated to others. This affected the cooperation and nurtured a general feeling of mistrust.

4. DISCUSSION

In the analysis performed in section 3.1, it was deduced that at least 50% of the projects described (cross-cultural, with emerging conflicts) where using waterfall methodology and in fact based on the description of some of the conflicts, using agile might have addressed the conflict's sources. On the other hand, as it can be seen in section 3.3, using agile methodology alone does not address all the challenges. So, in the end it is about addressing each project specificity and combining elements from multiple methodologies to tailor the approach. Traditional (waterfall) might seem more rigid and sometimes communication and collaboration might be given a smaller weight (not so much importance given to co-location, meetings and opportunities for all team members to share opinions and be aligned etc.) while a lot of management work is focused on very detailed planning, monitoring, control and documentation. On the other hand, lack of documentation and predictability that are sometimes associated with agile [10] can also cause confusions and team misalignment, even if this approach favours communication and rapid delivery.

Taking a hybrid approach, combining elements from both traditional and agile project management, and keeping a strong focus on the cross-cultural and cross-disciplinary character while doing the selection could be a more proper answer.

Of course, such a combination can come with challenges of its own since on top of having team members pertaining to different national cultures, we also bring together elements, methods, techniques, and practices corresponding to two software development approaches with their own cultures [11]. In [7], while looking at hybrid organisations (considered in this paper to be the ones that combine agile and traditional development approaches) and trying to identify the risks and problems at the interface of these two approaches that impact coordination and cooperation, three issues are identified in the category "Culture and management style". It is however important here to make a distinction between national culture, organisational culture and culture corresponding to the two software development approaches. In this article we have put emphasis on the national culture as in [12] it is identified as being a deep culture, while the latter can be seen as "superficial" cultures that can be subject to change.

In [7] and [13] it is acknowledged the importance of the relationship of the organisational culture and agile/traditional cultures, for successful implementations. This is a line of research that can be further explored by adding to the dynamic also the relationships with national cultures.

5. CONCLUSION

This article aims to clarify the following question: what project management methodology is best suited to use in case of cross-cultural and cross-disciplinary IT teams? The answer is not straight forward, but what seems to be important is to acknowledge these project characteristics from the inception and to take them into account while doing the tailoring of the project management methodology.

Considering the analysis from section 3.1 for the twelve use cases where conflicts emerge due to the cross-cultural team componence, based on the project methodology deduced the split is:

- six projects were using traditional approach;
- one project agile;
- for the rest (five) it was not conclusive, as it could not be labelled just based on the details given in the interviews.

For the two examples/case studies from section 3.2 for projects with cross-cultural and cross-disciplinary teams, conflicts arise both when using waterfall and agile methodology. One difference is that while in the case of "project managed with linear (waterfall) methodology" the source of the conflict is strongly linked to communication, for "project managed with agile methodology" ("Analytic solution for online shop") the source is mistrust which can also to linked with the context of communication in that set-up.

Looking at the results from the analysis done in 3.1 section, six projects (50%) were labelled as using waterfall methodology and only one (8.3%) could be labelled as agile. The idea of corelating emerging conflicts and project approach was also fundamented on the fact that some of the solutions (to the described conflicts) identified by the project managers would have been already embedded in the agile approach. For example, for Case A, the identified solution was through effective communication, ensured by "bringing the team members together at least once a week in a face-to-face meeting where they interacted on a personal basis". This also facilitated the recognition of team members differences and helped establish a common goal. While looking at a comparation between traditional and agile approach, in terms of management, agile is people centric with emphasis on leaderships and collaboration while the traditional way is process-centric, more oriented on control. Another aspect is that the heavy and detailed

documentation specific to traditional approach is replaced by face-to-face communication, light documentation, and tacit knowledge. The team is pre-structured and plan-oriented in the traditional approach, while in agile there are self-organized teams collaborative and collocated. A line of further research could be to determine if for cross-cultural IT teams more conflicts emerge in case waterfall methodology compared to using agile. Looking at the examples from 3.2 and results, for future studies we should look not only at how many conflicts emerge but also at the sources, as even if a main theme is identified such as "communication", there could be multiple nuances.

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