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Abstract

In 1968 Melvin Conway [5] stated “organizations which design systems are constrained to produce designs which are copies of the communication structures of these organizations.”, later in 2011, MacCormack et Al. rephrased it as ”Communication between teams mirrors the quality of the product they build” [10]. This means, if the communication processes within a team are weak, then the product they build also be weak.

Conway also said that “... an organization is not completely flexible in its communication structure, that organization will stamp out an image of itself in every design it produces”. Communication processes are also influenced not only by organizational culture, but also by national culture. When the members of an organization are spread over different countries, or has multiple cultural backgrounds, those cultural differences might tend to hinder the team relationships by affecting the way team members communicate. If those communication processes are being reflected in the quality of the product we are building in our teams, then learning how to overcome those differences becomes more relevant for software engineers, moreover when the software teams become more and more globalized.

What this paper is about and what it is not about

The goal of this paper is to explain the problem described above and its causes, also to provide tips to enhance the way we communicate with others. It doesn't propose ideas or technological to improve communication processes, neither suggests the one process which can be implemented by a managerial team. The nature of exact solutions is highly dependant on the project setup, type of product being built, cultures of the team members and other specific circumstances of each project.

The tips given here might be used in any organizational scale, however, the bigger the organization, and the more processes the organization has, the more difficult might become the introduction of possible solution alternatives of improvements to those communication processes.

What is culture?

There are different definitions for culture, the one I like the most is the idea introduced by Fons Trompenaars, a famous Dutch organizational theorist. He stated that “Culture is the way one solves dilemmas. The way one resolves dilemmas is culturally determined.” [1]. In his terms, a dilemma is a problem which has different valid solutions, each one of them equally valid and morally correct depending on the culture which is applying it. For example, “is it morally expected to wait for the green pedestrian traffic light, to cross the street, or can we cross it when it is in red?”. Or in software terms, “Do we communicate a

problem with all the details when it happens? or Do we try to solve it first, or wait until it becomes too critical in order to communicate it?".

Each culture is shaped by a set of "default" solutions to common dilemmas and they are taught by parents to children across generations.

Culture as a set of "given for granted" dilemmas

Daniel Kahneman, explains in his book "Thinking, fast and slow" [2], that our brain has so to say, two systems, the first one: active, stupid, very active and quick, and the second one: slow, clever and lazy. He explains that our system 1 is responding to most of our daily and routinary activities. And during more complicated activities, our second one responds. For example, when learning a new programming language, we need to use our second system, we need to use more resources of our brain in order to learn this new thing. Once we manage it, it becomes part of the range of default quick answers, in which we do not have the need to use lots of brain resources, because it becomes part of the known activities of our system 1.

The responses to common problems we give to the world, while being in our own culture, are part of our first system. We don't need to think about it anymore, it is just a standard quick answer we give to the world without thinking on the reasons why we select that specific answer. Often happens that, once a person exits their cultural environment, and enters another one, starts noticing the differences the new culture has with regard to their own culture. Juliette Tournand de Rouyn, a famous author and speaker on cross cultural cooperation, well said that culture in few words is *"The vision of what is good and bad inspired by a specific environment that we don't question until we meet another one." [1]*

After these ideas, we could understand culture "as a series of rules and methods that a society has evolved to deal with the recurring problems it faces. They become so basic, almost like breathing, that people no longer think about how they approach or resolve them". [3]

Cultural differences between roles

Coming back for a minute to our newly understood concept of culture, it says "culture is the way we solve dilemmas". A project manager approaches a new project in terms of scope, cost, risks, resources required and timelines, a software architect approaches it in terms of functional and nonfunctional requirements, technical risks, technical constrains, client briefings, among others. Both roles share same goals, and same problem, how to build the desired product, but they approach it in a different way, they use different tools and different solutions to the problems the project might have. Culturally speaking,, is that both roles have different ways to solve the same problem. And if we link this idea to our concept of culture, we could also view the difference of culture across roles within an organization or team.

There is scientific research [16] which affirms that individual culture among two developers of different national background might be more similar than the culture among one of those developers with a co-worker of a different role. Why this happens? Could it be that the brains of people with different professions brains are trained in a different way? Could it be that our profession also shapes the way we view the world?

Conway's Law

Melvin Conway was a software engineer, and hacker, who stated:

"Organizations which design systems are constrained to produce designs which are copies of the communication structures of these organizations." (1968) [5]

For every design choice, or dilemma to be solved within a project, there are different alternatives to solve chose from. We tend to chose one of the alternatives which mirrors the communication processes of the team. In 2011, MacCormack [10], perform a study to test this law. He chose projects from the open source community, which were made either for loosely coupled team, distributed across the world, or highly coupled teams, which were located in the same office working for the project. Specifically in the software, he looked for how modular was the software these teams made. He found out that the teams which were loosely coupled, wrote a product which was more modular than the teams which were highly coupled. This happened because they had the main need to make the code easy to be changed, and understood by any other developer in the world who might contribute to the project. He concluded that "products tend to 'mirror' the architectures of the organizations in which they are developed." and carried on saying "This dynamic occurs because the organization's governance structures, problem solving routines and communication patterns constrain the space in which it searches for new solutions." [10].

Conway's Law in cross cultural teams

Both authors highlight the special correspondence between software design and teams who develop them, and the latest one, according to Parsons[1] (1951)[11] can be seen as a social system.

There is a concept in mathematics called Homomorphism[15], which according to the Encyclopedia Britannica, can be defined as the special correspondence between the members of two systems which share same basic structure. And, while their elements and operations may appear entirely different, results on one system often apply as well to the other system.

[1] Parsons, a famous sociologist of the last century, introduces in sociology the idea of conceiving societies as social systems, he said that in order to be able to analyse the action performed by a society, we need to analyse that society as a system, which has processes, structure and relations with its environment

If teams and national culture are also a system, and share a similar shape with software design, then we could argue that when improving the communication processes in cross cultural teams, and reducing the cultural gap, might therefore improve the quality of the software the team writes.

Strategies to close the gap

“Different cultural orientations and views of the world are not right or wrong — they are just different.”[3]

The first step to break a bad habit, is to accept the problem [9]. In a cross cultural environment, the first step to bridge those differences, is to understand that other’s views are not wrong, nor right, they are just different.

Developing cultural intelligence

Once this idea is settled, then we start to develop what is known as Cultural Intelligence, or Cultural Competence, the first one, defined by Molinsky (2007)[7] as a person’s capacity to successfully adapt to new cultural contexts. The latest one defined by Trompenaars [5], as the capacity for bridging the business differences, those which seem to be discordant values.

In order to be able to adapt ourselves to another culture, three elements need to be in play:

1) Cognitive element: Being able to understand that one is in a cultural-difference situation.
2) Motivational element: Have the drive to learn about the cultural differences
3) Behavioural element: Have the aptitude to develop new skill under a foreign environment.

From all these three elements, the most important one, is the motivational factor. Once we want to learn about the other, their views, and show honest interest in them. Then, we will have the drive to become aware that specific problems might not be being solved because cultural differences stand in between the problem and the solution.

Coping with cognitive dissonance when adapting behaviour

Switching to another culture, doesn’t mean to change or compromise the personal identity, it is “the act of purposefully modifying one’s behavior in an interaction in a foreign setting in order to accommodate different cultural norms for appropriate behavior” [7].

A cross-cultural concept of integrity

The cambridge dictionary, defines integrity as “the quality of being honest and having strong moral principles that you refuse to change”. When working across cultures, this construct doesn’t help to build that bridge across the cultures. Trompenaars suggests that the idea behind integrity should be the result of integrating seemingly opposing values, he adds that working across cultures is about integrating the strength of one culture with that of another. [1]

None of us is as smart as all of us

Some years ago, I watched a football match, there was this pay, one player came from the middle of the field with the ball, he reached the arch and was about to make the goal, suddenly one of the members of the other team, made him fall down, losing the opportunity to make the annotation. But, another fellow team member was there, took the ball, and hit the goal. Whose goal is this? The first player? The last one? none, The goal belongs to the team, they achieved it together, the higher goal, it was not about reaching the goal alone, or having an individualistic perspective. It is about doing it together within a team, the result will in any case, be higher and better than achieved alone.

Building relationships

“When each day begins with the acceptance that you don't know everything, there's room for curiosity, experimentation and piloting to take root.” [13]

I believe that great teams are based on strong relationships within their members. Build relationships departs from the acceptance that we don’t know all the answers, and we can’t achieve it all alone. Therefore, we need the others, we need them to achieve our goals, which in fact, are theirs also.

Edgar Schein (2013)[6], a famous psychologist from Austria, explained that trust in the context of a relationship is believing that the other person will acknowledge me, not take advantage of me, not embarrass or humiliate me, tell me the truth, and, in the broader context, not cheat me, work on my behalf, and support the goals we have agreed to.

If we depart from that belief, when we approach the others, for a conversation, we can honestly be interested on their view. This will allow us to ask questions which will lead us to increase our cultural knowledge, therefore, we will be able to come up with ideas to get the best of the others, while keeping the best of us.

Achieving cooperation

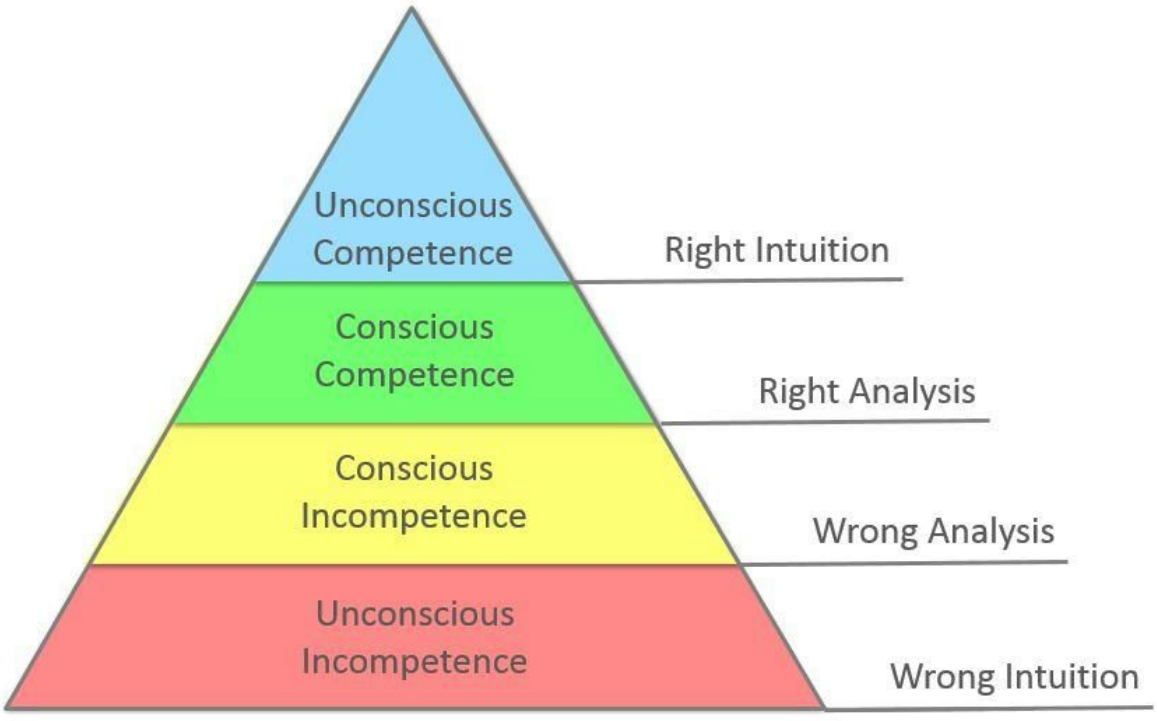
David Solomons, a coach on cultural differences [12], explains, that in order to get the cooperation of the other, we need our mindset from the “I need to get this done by this person”, to “I need to understand how this person can do this, from their context”. When the mindset is changed, no more than honest interest on the other can be shown, and

honestly felt, so we will be able to enter the negotiation not focusing too much on the self, trying to achieve our own agenda, but trying to understand the other, by asking questions.

Edgar Schein [6] adds, that in order to be interested in the other, we need to recognize, that when it comes to that task, we are depending on the other, we need them, therefore, we need to trust on them, and express our trust by asking questions which would lead us to understand their perspective. When we ask questions, when we show interest on the other, we will be building a relationship.

Patience

Developing multicultural intelligence, showing interest, earning cooperation and adapting our own behaviour to match other culture's moral in a specific situation requires patience. In psychology there is a concept called "conscious competence"[2] [13], which states that there are four stages of awareness.



Hierarchy of Competence

Author: Kokcharov. Wikipedia

The model explains that, when we start learning about any new topic, we don't know how incompetents we are on the field. After being in the area quite a time, we become aware of what we don't know, and start focusing on developing that knowledge. Once we have

[2] It is unknown the original author of the model, but it is nowadays well known and broadly used.

got it, we become consciously competent, after practising those skills during some time, we become unconsciously competent. Developing cross cultural intelligence is not different.

Appendix A

Molinsky framework in non-academic language

1) Inform yourself about the other's culture approach: the greater the cultural knowledge, the weaker the effect of cultural norms discrepancies and complexity will be on performance, as cultural knowledge moderates their relationship.
2) The greater an individual's experienced performance, the more confidence the individual will experience while attempting a cross-cultural behavioural adaptation.
3) The less complex and discrepant the norms are in the new culture, and the greater the level of psychological safety created by the native audience, the higher the individual's level of experienced face validation will be.
4) The more an individual's face is validated from the code-switching experience, the more pride the individual will feel while attempting a cross-cultural code-switch.ä
5) An individual's personal values moderate the relationship between norm discrepancy and identity conflict such that when the new norms are not only discrepant but also conflict with the individual's personal values, the level of experienced identity conflict will be higher than when the norms do not strongly conflict with the individual's personal values.
6) The greater an individual's experienced identity fit, the more contentment and excitement the individual will feel while attempting a cross-cultural code-switch
7) The more positive emotion a person experiences while attempting a cross-cultural code-switch, the less the psychological suffering will be.

Appendix B

Common problems in software teams

Gregory et. Al. (2010)[8] from the University of Frankfurt, did a study in 2010 within a software team which members were located in Germany and in India. The most salient cross-cultural problems they identified in the study are shown in the table 1.

Problem due to cross-cultural differences	Effect on cross-cultural collaboration	Dimension
Indian project members frequently said “yes” even though they meant to say “no”. German project members failed to interpret the message correctly	Disrupted communication Problems with work coordination Interpersonal Communicational conflicts	Power distance[3] Direct vs. Indirect communication
Indian project members did not report problems with implementation or timelines.	Disrupted trust Interpersonal conflicts Problems with work coordination	Power distance
German project members had very particular expectations concerning project documentations, quality issues, and testing methods.	Interpersonal conflicts Problems with work coordination	Uncertainty avoidance[4]
Some German project members were initially not motivated to collaborate with Indian service provider due to the fear of job loss.	Disrupted trust	Uncertainty avoidance
Indian project members suddenly left the onshore team for personal family reasons.	Disrupted trust Problems with work coordination	Collectivism vs. Individualism[5]

Table 1

[3] In high power distance, a member of a team expects to be told what to do. In lower power distance, a member of a team expects to be consulted what to do.
[4] Countries with high levels of uncertainty avoidance, feel very uncomfortable within unknown situations.
[5] Countries scoring high on Collectivism believe that a society is successful when every individual does something for others. Countries scoring high on individualism believe that a society is wealthy when each individual improves themselves

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Achieving cooperation

David Solomons, a coach on cultural differences [12], explains, that in order to get the cooperation of the other, we need our mindset from the "I need to get this done by this person", to "I need to understand how this person can do this, from their context". When the mindset is changed, no more than honest interest on the other can be shown, and honestly felt, so we will be able to enter the negotiation not focusing too much on the self, trying to achieve our own agenda, but trying to understand the other, by asking questions.

Edgar Schein [6] adds, that in order to be interested in the other, we need to recognize, that when it comes to that task, we are depending on the other, we need them, therefore, we need to trust on them, and express our trust by asking questions which would lead us to understand their perspective. When we ask questions, when we show interest on the other, we will be building a relationship.

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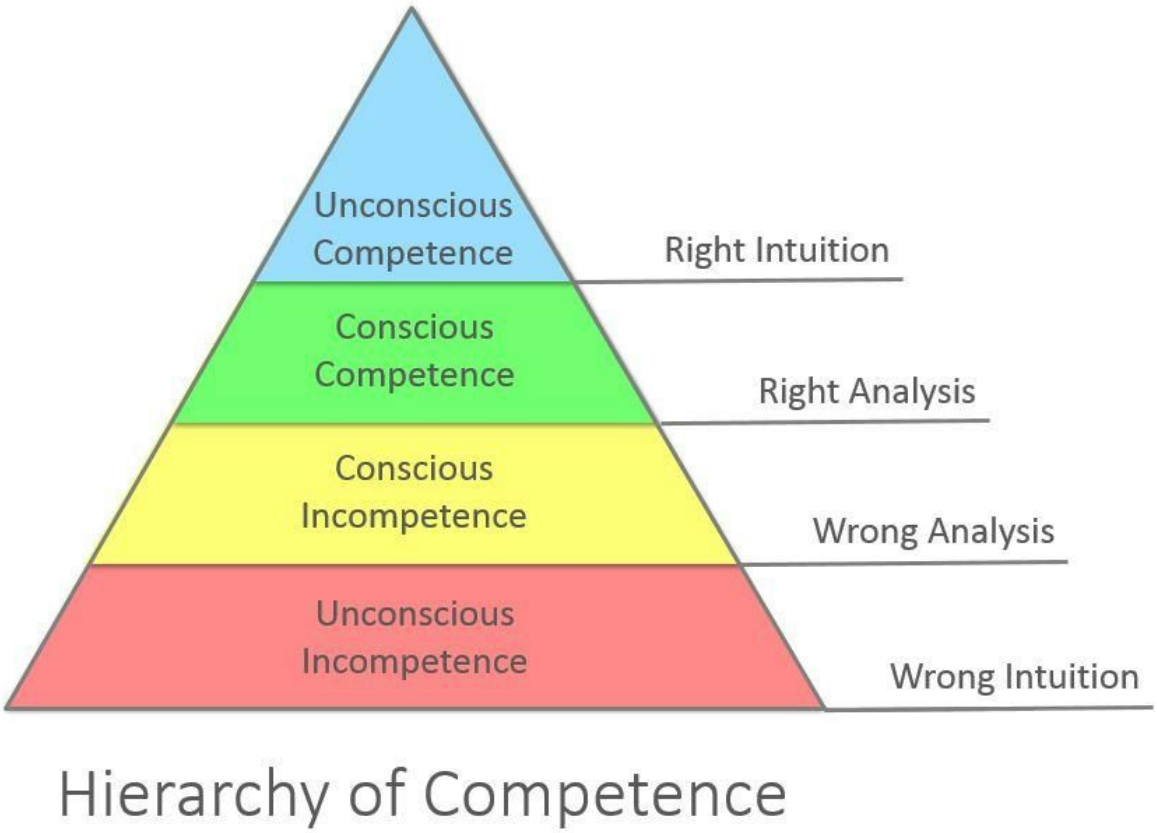
Developing multicultural intelligence, showing interest, earning cooperation and adapting our own behaviour to match other culture's moral in a specific situation requires patience. In psychology there is a concept called "conscious competence"[7] [13], which states that there are four stages of awareness.



Author: Kokcharov. Wikipedia

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The model explains that, when we start learning about any new topic, we don't know how incompetents we are on the field. After being in the area quite a time, we become aware of what we don't know, and start focusing on developing that knowledge. Once we have got it, we become consciously competent, after practising those skills during some time, we become unconsciously competent. Developing cross cultural intelligence is not different.

Appendix A

Molinsky framework in non-academic language

1) Inform yourself about the other's culture approach: the greater the cultural knowledge, the weaker the effect of cultural norms discrepancies and complexity will be on performance, as cultural knowledge moderates their relationship.
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7) The more positive emotion a person experiences while attempting a cross-cultural code-switch, the less the psychological suffering will be.

Appendix B

Common problems in software teams

Gregory et. Al. (2010)[8] from the University of Frankfurt, did a study in 2010 within a software team which members were located in Germany and in India. The most salient cross-cultural problems they identified in the study are shown in the table 1.

Problem due to cross-cultural differences	Effect on cross-cultural collaboration	Dimension
Indian project members frequently said “yes” even though they meant to say “no”. German project members failed to interpret the message correctly	Disrupted communication Problems with work coordination Interpersonal Communicational conflicts	Power distance (Hofstede) Direct vs. Indirect communication
Indian project members did not report problems with implementation or timelines.	Disrupted trust Interpersonal conflicts Problems with work coordination	Power distance
German project members had very particular expectations concerning project documentations, quality issues, and testing methods.	Interpersonal conflicts Problems with work coordination	Uncertainty avoidance
Some German project members were initially not motivated to collaborate with Indian service provider due to the fear of job loss.	Disrupted trust	Uncertainty avoidance
Indian project members suddenly left the onshore team for personal family reasons.	Disrupted trust Problems with work coordination	Collectivism vs. Individualism

Table 1

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