

The Development of a Taxonomy of Desired Personal Qualities for IT Project Team Members and Its Use in an Educational Setting

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Executive Summary

Although much literature exists on desired qualities of team leaders of IT projects and even desired components of the team, there is a paucity of literature on the desired personal qualities of individuals working within team settings. This research set out to empirically investigate the personal qualities which students believe would be desirable in IT project team members. An initial attempt to create a taxonomy of desired personal qualities was made using feedback from two groups of students; undergraduate and graduate students who had completed an IT project management (ITPM) course. The students were asked, as part of a major group assignment, to give the personal qualities that they would want in project team members if they were a project manager. This topic had not been explicitly covered in their course, though there had been an underlying emphasis on the importance of 'soft skills'.

From reading the students' responses, a taxonomy that varied along two main dimensions was developed; first, whether the named quality related specifically to the work environment or whether the quality was one that would be relevant to many aspects of life, and second, whether or not the quality relied on interaction with others and thus whether it was better described as personal or interpersonal. Further, a division was made concerning whether the quality was more a characteristic of a person, called a trait here, or a skill.

After the initial taxonomy was developed, it was applied to a different set of students. This new group of students had recently completed a third level, year long, group IT project for external clients. These students, who were from a different university from the first two groups of students, were asked, via email, to give the personal qualities they would want in project team members. From reading the responses, it was apparent that the taxonomy needed to be extended by adding a new dimension, 'values', which would include qualities like *honest* and *hard-working*.

This new dimension thus allowed a distinction to be made between qualities that reflected a person's values and those that did not, like being *co-operative* or *fun-loving*.

While a simple reading of the responses had led to a taxonomy and while it was apparent that the third group had responded somewhat differently from the first two groups, it was not clear if the third group dif-

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ferred significantly from the first two groups or, in fact, whether the first two groups differed from each other. The resulting extended taxonomy was thus applied to a comparison of three groups of students to see if response patterns differed significantly. To test for differences between the groups, an analysis of the quality first mentioned by each student was performed. The first quality mentioned by each student was recorded and classified according to the taxonomy. The first quality mentioned was used as it would not be possible to include every quality mentioned by every student and first mentioned qualities seemed better to use than a random quality because the placement of the quality was thus kept constant and, being first, was possibly the most important for the student.

A log-linear analysis was performed on the frequency data for the three groups. The results showed that there was a highly significant interaction between the student groups and the dimensions on the taxonomy. That is, each of the three groups showed a different pattern of responding. For the group project students, just over half of the first mentioned qualities fell into the “Environment Specific - Values” cell. This was in great contrast to the other two groups of students, both of whom gave few responses that belonged in this cell. The graduate ITPM students were less concerned with “Personal – Ubiquitous” skills and traits than undergraduate ITPM students. On the other hand, the undergraduate ITPM students were less concerned than the graduate students with “Interpersonal– Environment Specific” skills or “Interpersonal – Ubiquitous” traits. Both the graduate and undergraduate ITPM students were more concerned with “Environment Specific – Personal skills” (where ‘hard skills’ like *programming* and *documentation skills* would belong) than were the group project students.

Although the initial aim of this study was to develop a taxonomy of desired personal qualities for IT project team members, the study led to a realisation that the personal qualities listed by students are a window to understanding the differing circumstances of the respondents. Students who have had the experience of working with other students in a year long group project for external clients come to put great emphasis of the *work values* of team members. In contrast, the other student groups were more concerned with *work related personal ‘hard’ skills*. The group project students may be reacting to an environment in which some of their fellow students did not do a reasonable share of work on the project. It may be that while universities attempt to provide ‘real world’ experiences of team work, students may be confronted to an unrealistic degree with poor work ethics of fellow team members, thus leading to a perspective where work values are paramount. Interestingly, while the ITPM course had placed an emphasis on ‘soft skills’, the undergraduate ITPM students gave less emphasis to interpersonal qualities than graduate students. It may be that the work experience of graduate students has allowed them to see the importance of interpersonal skills. Though initially not concerned with the effects of different methods of educating future IT Project members, our findings give some insight into such educational issues.

Keywords: IT project team, desired personal qualities, group assignments.

Introduction

In the literature on IT Project Management, it is well-recognized that people are the most important asset of an IT Project Manager (Cadle & Yeates, 2001; Schwalbe, 2004). It is also well-recognized in the literature that ‘soft skills’, such as skills in communication, conflict resolution, motivation, getting along with others, and leadership, are vital to project success (Belzer, 2001; Sukhoo, Barnard, Eloff, Van der Poll, & Motah, 2005), so much so that many organizations include ‘soft skills’ training in their training programs (Arora, 2003). Universities and academics also seem to recognize the importance of ‘soft skills’, often proposing the embedding of ‘soft skills’ in university programs or courses (Jewels, 2003; Sukhoo et al. 2005; Tong, 2003). It would seem, then, that companies and universities realize the importance of project team members hav-

ing ‘soft skills’. The initial purpose of the present paper was to develop a taxonomy of desirable personal qualities of project team members as an aid to assessing the range of personal qualities of current or potential project team members. It turned out to be more than that: when different student groups were asked about personal qualities they believed would be desirable in project team members, differences were found between undergraduate and graduate students who had been learning about project team management and also between these students and those who had just completed a year long group project with external clients. The result is not just a taxonomy of personal qualities desired in project team members, but evidence that the different educational opportunities afforded by different types of educational experiences greatly affects students’ beliefs about what would be desired personal qualities of IT project members. Implications of this finding are discussed.

Desired Personal Qualities of Project Members

With many IT projects being cancelled before completion, running over budget and time, and being less reliable and having less functionality than expected, the great need for improvement in the delivery of IT projects is well-documented (Dhillon & Backhouse, 1996; Hochstrasser, 1993; Lin & Pervan, 2001; McGunnagle, 1995; Schwalbe, 2004; The Standish Group, 1995, 2001). There is a growing recognition that IT projects do not normally fail because of a lack of adequate technology and that it is the so-called ‘soft skills’ that contribute to the success of projects (Mulally, 2002; Murch, 2001). Thus, there is also increasing acknowledgement that it is not just technical skills that project team members need in order to ensure project success (Brewer, 2005): ‘soft skills’ in team members are vital. However, at the moment when authors discuss ‘soft skills’ they usually simply give lists of skills. Some examples are given in Table 1.

Table 1: Examples of ‘Soft skills’ listed by various authors, grouped by common themes

Mulally, 2002	Arnstein, 2004	Schwalbe, 2004	Sukhoo et al., 2005
<i>excellent communication skills</i>		<i>effective communication skills</i>	<i>communication skills</i>
	<i>conflict resolution</i>	<i>conflict management</i>	<i>the ability to manage stress and conflict</i>
	<i>leadership</i>	<i>leadership skills</i>	<i>leadership skills</i>
	<i>team building</i>		<i>team building skills</i>
<i>ability to connect with people at all levels of the organization</i> <i>able to collaborate to develop effective solutions</i>	<i>political skills</i> <i>interpersonal skills</i>	<i>influencing the organization to get things done</i> <i>negotiation skills</i>	
		<i>motivation</i> <i>problem solving</i>	
			<i>flexibility and creativity skills</i>

Sukhoo et al. (2005) do suggest which skills a project manager will need to activate more during different phases of project management, but the 'soft skills' are still seen as a list. Like Sukhoo et al., other authors also focus their discussion of 'soft skills' on the skills that Project Managers, or leaders in general, should have. DuBrin (2001), looking specifically at characteristics of good leaders, says that qualities found in effective leaders fall into three broad categories: personality traits (such as self-confidence or adaptability), motives (such as power or achievement), and cognitive factors (such as creativity or knowledge of the business). The qualities desired in team members, the individuals who make up the team, are usually forgotten. Instead, research has focussed on the types of *tasks* that individuals in teams must undertake if they are to be successful. Margerison and McCann (Margerison, 2005; Margerison & McCann; 1995) identified nine critical work activities:

1. Advising: Gathering and reporting information
2. Innovating: Creating and experimenting with ideas
3. Promoting: Exploring and presenting opportunities
4. Developing: Assessing and testing the applicability of new approaches
5. Organising: Establishing and implementing ways of making things work
6. Producing: Concluding and delivering outputs
7. Inspecting: Controlling and auditing the working of systems
8. Maintaining: Upholding and safeguarding standards and processes
9. Linking: Coordinating and integrating the work of others

High performing teams, they say, will have a balance of people who can perform well at the different activities.

But what are the desired *qualities* of team members? Can a useful taxonomy of desired qualities be developed? A taxonomy of personal qualities considered desirable in IT project team members could provide greater focus on what is missing and what is not: it would help employers select project team members, it would help Project Managers see where members are weak or strong, it would help evaluate Project Managers themselves, and it would help students of IT see the importance of 'soft skills'.

An Initial Taxonomy

One could take the IT Project Management literature as a starting point to develop a taxonomy of desired personal qualities. We decided, instead, to construct an initial taxonomy by using lists of desired qualities given by students who were studying an IT Project Management (ITPM) subject that had emphasized the importance of 'soft skills'. The reason for this was two-fold. First, these students, as a whole, had read a great deal of literature on project management and could thus not only give their personal opinions, but could also give opinions offered in the literature. Thus, a good range of qualities should be covered. Second, some information might be gained about whether the students saw the importance of 'soft skills', a point that was emphasized in their course.

The students consisted of twenty two 2-4 person groups of graduate students and eighty 2-4 person groups of undergraduate students who had just completed a subject on IT Project Management in which a single case study was used to provide a real world example of a large IT Project in which the students could become immersed. About 85% of the students were male. The case study was the Dag-Brücken automated storage and retrieval system (ASRS) (Jewels, 2003), which describes how the project's IT development processes and the environment in which the processes took place contributed to the eventual failure of the project. The case study covered real events over a 20 month period of the project, from the initial requirements stage to the eventual

demise of the project. A specific aim of the ITPM course was to help students understand ideas and meanings rather than to merely impart the learning of techniques (Jewels & Bruce, 2003; Jewels & Ford, 2004; Jewels, Jones, & Ford, 2003).

Methodology

As part of a major group assignment, students in groups of up to four were asked to say what personal qualities they would look for in people that they were about to select to work on a project with them. The relevant part of this assignment, shown Figure 1, is an attempt to encourage students to synthesize the concepts being taught in the ITPM course. It actually represents 10% of the total assessment for the course but importantly *the topic itself is never specifically discussed within the course structure*. Inherently, however, there is an underlying emphasis in the course on the importance of ‘soft skills’. In this part of the assignment, then, we hope that students will reflect upon and name the ‘soft skills’ they consider most important.

... Within this project plan there is an additional requirement, which should be integrated into the project plan but in its own section. As project manager you need to select the people that will be working with you on this project.

Your secondary objective is to produce the criteria of personal qualities that you believe would contribute to project success.

You will need to argue your selection of qualities. In other words what are the personal qualities that you are looking for in people that you are about to select (and work with) for a project? There is no expected word count for this section although it is expected that considerable group thought might be extended on developing the criteria. Inter-group collaboration is particularly encouraged for this part of the assignment.....

Figure 1: Qualities part of group assignment

Each quality given by the groups was considered and an attempt was made to develop a taxonomy in which all the qualities could be easily slotted.

The resulting taxonomy

From reading the students’ responses, it seemed that the desired qualities identified by the students could be considered to vary along two main dimensions. The first is whether they were related specifically to the work environment or were instead ubiquitous in the sense that they are relevant to many aspects of life. Thus, for example, there were some qualities that were only relevant to the work context or that were stated as relating to work, such as having certain technical skills or being proactive at work. On the other hand, some qualities could be relevant in many aspects of life, such as getting on well with other people or being punctual. The second dimension is whether or not the qualities rely on interaction with others, and thus whether they are better described as interpersonal or personal qualities. Further, it seemed that while some qualities were traits, others were skills. While skills are abilities, traits are more like characteristics of a person. So, for example, having the ability to motivate others is a skill, while being confident is a personality trait. Table 2 presents the initial taxonomy that was developed, together with an example of a desired quality in each cell.

Table 2: The initial taxonomy of desired personal qualities in project team members, with an example in each cell

Area		Environment specific	Ubiquitous
Characteristics		<i>examples</i>	<i>examples</i>
Personal	skills	<i>application area skills</i>	<i>self-management</i>
	traits	<i>business aware</i>	<i>has a sense of humor</i>
Interpersonal	skills	<i>ability to supervise staff</i>	<i>good communication skills</i>
	traits	<i>thinks win-win</i>	<i>cooperative</i>

This taxonomy seemed simple and easy to use and would also accommodate qualities identified in the literature. Thus, for example, Mulally's (2002) "*ability to connect with people at all levels of the organization*" would be an interpersonal skill that was environment specific, as would Schwalbe's (2004) "*influencing the organization to get things done*". Sukhoo et al.'s (2005) "*flexibility*" would be a personal ubiquitous trait, while their "*creative skills*" would be a personal ubiquitous skill. Schwalbe's quality of having "*motivation*" would be a personal trait that is probably environment specific, since being motivated is presumably extremely context specific. Schwalbe (2004) and Sukhoo et al.'s (2005) "*communication skills*" are interpersonal ubiquitous skills. Arnstein's (2004) "*political skills*" would be interpersonal environment specific skills. Sukhoo et al.'s quality of "*the ability to manage stress and conflict*", given the context, could be classified as an interpersonal environment specific trait, though if it were known that the person managed stress and conflict in various aspects of life it could be classified as an interpersonal ubiquitous trait. When classifying the students' desired qualities into the taxonomy, there was usually enough information given by the students to determine whether the qualities were considered environment specific or as relating to a more general quality that the person would have in multiple areas of life. Not surprisingly, since Mulally (2002), Arnstein (2004), Schwalbe (2004) and Sukhoo et al. (2005) were considering 'soft skills', none of the skills they mention belong in the personal, environment specific, skills cell of the taxonomy where "hard skills", such as programming skills, or documentation skills, would be placed.

Extending the Taxonomy

Having developed the initial taxonomy, we wished to use it again, but on a somewhat different population. This would not only indicate whether the taxonomy needed to be modified, but would also indicate in what ways the groups differed.

Methodology

Students at a different university who had not taken the IT Project Management subject were used as subjects. These students had just finished a third level, year long, group IT project for external clients, taking the project through the full development lifecycle. They were asked, via email, to give the personal qualities they would look for in project team members. Thirty three responses were received, a response rate of approximately 30%. Again, about 85% of the students were male.

The new taxonomy

On examining the responses, it was immediately apparent that the taxonomy needed to be extended. Many of the group project students focused on traits that would indicate values held by

other team members, such as being hard working or trustworthy. The new taxonomy thus had a new dimension, “values”, added, as shown in Table 3, again with an example in each cell.

Table 3: The extended taxonomy of desired personal qualities in project team members, with an example in each cell

Characteristics \ Area		Environment specific <i>examples</i>	Ubiquitous <i>examples</i>
Personal	skills	<i>application area skills</i>	<i>self-management</i>
	traits	<i>business aware</i>	<i>has a sense of humor</i>
Interpersonal	skills	<i>ability to supervise staff</i>	<i>good communication skills</i>
	traits	<i>thinks win-win</i>	<i>cooperative</i>
Values		<i>hard working</i>	<i>trustworthy</i>

Using the new taxonomy

The need for the added dimension resulted from the difference in how the group project students responded compared with the IT Project Management students. It was clear that many of the group project students desired personal qualities in team members that indicated the values, and especially the work values, of project team members. Our data suggested that these two groups of students differed, but we wanted to see whether the differences were statistically significant and whether the undergraduate and graduate ITPM students differed from each other. With the taxonomy in place, we could now use it to test for significant differences; so, had the use of different groups simply led to the addition of some extra features, or were there significant differences between the three student groups. One way of testing for a difference between the different groups would be to tally all the qualities mentioned by each student in each group; but this would be daunting and, since some people produce longer lists than others, any comparison would be difficult. One could instead take a quality at random from each student’s list. We chose, instead, to look at the quality first mentioned in a student’s list. In this way, every subject contributes the equivalent amount of data and the positioning of the quality in the student’s list is held constant. One might even assume that the quality mentioned first by a person is usually the quality the person thinks is most important, but, regardless, an analysis of the first mentioned qualities given by different groups of students can be used to compare groups in a straightforward manner. Thus, to compare the three groups of students — the graduate ITPM students, the undergraduate ITPM students, and the group project students — we can look at the quality first mentioned in each submission. Accordingly, the first mentioned quality in each submission was classified as belonging to one of the cells of the extended taxonomy. The resulting percentages of qualities in each cell are shown for the three groups of students in Tables 4– 6.

Table 4: The percentage of first mentioned qualities belonging in each cell of the taxonomy for graduate ITPM students

Characteristics \ Area		Environment Specific	Ubiquitous	
Personal	skills	27.2	0.0	36.3
	traits	9.1	0.0	
Interpersonal	skills	18.2	13.6	45.4
	traits	0.0	13.6	
Values		4.5	13.6	18.1
		59.0	40.8	

Table 5: The percentage of first mentioned qualities belonging in each cell of the taxonomy for undergraduate ITPM students

Characteristics \ Area		Environment Specific	Ubiquitous	
Personal	skills	33.3	3.0	54.5
	traits	6.1	12.1	
Interpersonal	skills	0.0	18.2	27.3
	traits	9.1	0.0	
Values		9.1	9.1	18.2
		57.6	42.4	

Table 6: The percentage of first mentioned qualities belonging in each cell of the taxonomy for the group project students

Characteristics \ Area		Environment Specific	Ubiquitous	
Personal	skills	15.1	0.0	27.3
	traits	6.1	6.1	
Interpersonal	skills	0.0	6.1	9.1
	traits	0.0	3.0	
Values		51.5	12.1	63.6
		72.7	27.3	

A log-linear analysis was performed on the frequency data for the three groups. The results showed that there was a highly significant interaction between the three factors, that is, Student Group, Area, and Characteristics ($G^2 = 75.5$, $p < 0.0001$). More detailed analyses showed that this three way interaction held for all pairs of student groups: the group project students vs. the undergraduate ITPM students ($G^2 = 51.8$, $p < 0.0001$), the group project students vs. the graduate ITPM students ($G^2 = 44.7$, $p < 0.0001$), and the undergraduate ITPM students vs. the graduate ITPM students ($G^2 = 40.3$, $p = 0.0001$). Thus, all three groups show significantly different patterns of responding. For the group project students, 63.6% of their first mentioned qualities were in the “Values” cells, compared with 18.1% and 18.2%, respectively, for the graduate and undergraduate ITPM students. However, the difference in the “Values” cells is confined to the “Environment Specific - Values” cell, with 51.5% of the group project students’ first mentioned responses being there. The graduate and undergraduate ITPM students have approximately the same percentage of responses in the “Environment Specific” cells (59.0 and 57.6, respectively) and in the “Ubiquitous” cells (40.8 and 42.4, respectively), but the patterns vary within the Area and Characteristics dimensions. The graduate ITPM students have no first mentioned qualities in the “Personal – Ubiquitous” cells, whereas the undergraduate ITPM students have 15.1% responses there. The undergraduates have no first mentioned qualities in the “Interpersonal skills – Environment Specific” cell or the “Interpersonal traits – Ubiquitous” cell, while the graduate students have 18.2% and 13.6% of the responses in these cells, respectively. Both the graduate and undergraduate ITPM students are more concerned with “Environment Specific – Personal skills” (where ‘hard skills’ like programming and documentation skills would belong) than are the group project students.

The results thus show a pattern where the group project students are more concerned with work values and less concerned with personal work skills than the ITPM students. Presumably these group project students have come to this appreciation from doing their year long group projects. Compared with their fellow ITPM undergraduates, the graduate ITPM students have a higher priority for some interpersonal features but a lower priority for personal ubiquitous features. Reading the complete lists of qualities given by all the students supported the differences shown by examining the first mentioned qualities and classifying the responses according to the taxonomy. That is, the first mentioned quality was often the one that received the most focus in the students’ lists. The difference between the group project students and the ITPM students was also supported by the passion with which the group project students, as opposed to the ITPM students, wrote. Thus, for example, consider these lists from five group project students which show their focus on work values (capitals and typing mistakes are by the students):

“COMMITMENT 80%, Technical knowledge 20%”

“I look for someone who is dedicated to their study, has excellent work ethic, will contribute equally in effort. Effort is more important than ability. The desire to learn and improve skills. Demonstrates initiative.”

“ hard working - HD achiever * willing to put 200% into the project (and ensure things get done (and done well) no matter what) * willing to take responsibility for their area (ie if your a programmer, take responsible for programming elements) * good time management skills (this includes ability to juggle work and uni commitments) * someone who is independent (can work on their own and does not need constant checking or bothers others for help or trivial things) * uses own intuitive (looks for work to be done, finds errors, does more than expected)”*

“Commitment; Ability to get on with others; communication skills; technical ability (in that order)”

Development of a Taxonomy of Desired Personal Qualities

“I’ve put some stuff from my experience in the project (I got in a group where I was by far the hardest worker):

**Hardworking (I don’t particularly care if someone does not have a really high GPA but are keen to put in effort and also perform tasks off their own bat to the project)*

**Ability to meet deadlines (Was a big problem with some people in my project)*

**Can manage time well (ties in with above point)*

**A mixture of skills across the team (i.e. not a whole team of people that all want the same role)”*

In contrast, the lists from the ITPM students were more matter of fact, possibly because their submission was part of an assignment and was seen more as an academic piece. Thus, for example, consider the follow five excerpts for ITPM students:

“It is essential for staff working on an IT project to possess a minimal level of technical skills, usually demonstrated by some type of formal qualification ... Where the project involves development of new technology it is desirable that the person has the ability to learn new skills and is able to adapt to the new environment and technology ... As projects sometimes involve long hours, it is also essential that team members have a strong work ethic and are dedicated to achieving the combined goal of the project ... Communication is said to be the aspect most critical to project success ... ”

“ Competency ... is the first and most critical factor to be considered in selecting team member. It is because we need to put the right man to the right job, so that each team member can perform their tasks at their optimum level. If we work with competent people, we will be confident that we can deliver the good quality product to the client, and being competent essentially helps to remove any cause for anxiety”.

“Self-management requires that you reflect on your experiences and their effects on your physical and mental state ...self-management is a skill that ensures that you are able to cope with new territories and difficult situations by managing your own time and adapting to changing situations ... ”

“Glen (2002, p80) states that “very few technical project roles can be fulfilled by someone working in isolation on a single task”. In order to work with another person, communication must take place ... ”

“Adaptability. A project involves change, and it requires team members to “embrace the changes, rather than resisting it” (Johnson 1998: 65). Members, who adapt to the small changes at early stages, will be able to adapt to more significant changes later on. Changes are inevitable and unexpected situations might arise. Members who can adapt to changes will have an advantage over those who can’t. Commitment. Committed team members are usually proactive and are concerned with what the team is doing ...Interpersonal skill is considered an important skill for each member to possess ... ”

Discussion

Although the research presented in this paper did not set out to consider differences between students in their level of study or in the courses they had been taking, the overwhelming differences reflected by using the taxonomy to test for significant differences between groups demand further

discussion. What appeared initially to be a straightforward attempt at developing a taxonomy of personal qualities desired for IT project team members ultimately resulted in a realisation that the personal qualities listed by students are a window to understanding the differing circumstances of the respondents. This is in line with arguments by Lewin (1952) and Csikszentmihalyi (1994) who suggest that actions are not taken by an individual without taking into account the domain in which the action is being taken and the psychological field at any given point in time.

Our taxonomy allows for various domains. The ITPM students were working in a predominantly literature domain that discussed leadership qualities, that is, desired qualities of effective leaders, which they ultimately extrapolated to desired team member qualities. Many ITPM graduate students also had real world experience in project work. The group project students had, on the other hand, been working in a domain of practical student group projects for an external client. These projects had given students a practical perspective of desired qualities of team members. It is apparent that in this domain the work values of individuals dominate as desired qualities. It may well be that if team members of true 'real world' projects were asked to give the qualities that they desire in team members the taxonomy would reveal yet another pattern of responding. It may be, for example, that student project groups, even when they are meant to simulate a 'real world' experience, are in fact providing a domain that is perhaps 'skewed' in that it is an environment where there are problems with the work ethics of some team members. That is, in circumstances where universities attempt to provide 'real world' experiences of team work, students may be confronted to an unrealistic degree with poor work ethics of fellow team members, thus leading to a focus on work values and a 'skewed' perspective. It is a sad fact that student project groups often contain members that take a "free ride", relying on other students to do the work (Ford & Morice, 2003). Such "free riding" may be more extreme at university than in true 'real world' situations; so, for example, a work supervisor would notice if someone rarely attended meetings, but a university lecturer may never know about the "free rider". Future research investigating industry project teams would show whether their responding was similar to any of the student groups or, in fact, quite different from all student groups. Perhaps the pattern would look most like the pattern from the graduate student group, many of whom had had real world experience in projects in industry.

While we have only considered students' responses, one could use the taxonomy to help in the development or selection of project teams in the 'real world'. Thus, for example, workers could be asked what qualities they desire in project team members and also what qualities they think they themselves possess. If, for example, workers emphasized personal, environment specific, skills, with little awareness of the need for values and interpersonal skills and traits, some intervention may be helpful. The taxonomy could also be used in an educational setting in the same way, before team members start working together. Putting the results of a student survey into the taxonomy might lead to fruitful discussions, before work begins, about what is needed for a successful team effort, with an emphasis given to what team members are expecting of each other and what gaps are identified by the taxonomy and thus need to be filled.

More work could be done on refining the taxonomy. Apart from examining workers in the 'real world', other student groups could be examined. Thus, for example, we have not addressed the issue of any possible gender differences. Also, some of our students were submitting work that they knew was to be graded; do such students just say what they think the university instructor wants to hear? do they just repeat what they read in the literature, without much thought?

Conclusion

The research presented here led to the development of a taxonomy of desired personal qualities of team members. From studying three groups of students, we developed a taxonomy that varied along two main dimensions: whether the quality related specifically to work or was more ubiquitous and whether the quality was a personal skill or trait, an interpersonal skill or trait, or a quality that reflected a person's values.

The research not only led to the development of a taxonomy of desired personal qualities of team members but, in its application, also highlighted significantly different patterns of responses in three different groups of students. It is clear, then, that our taxonomy can be used not only to determine what qualities might be lacking in different team members, but to also investigate how different types of teams might view desired qualities differently. The taxonomy has thus been shown to be a very useful tool.

While we did not set out to compare the effects of different educational settings on students' perception of desirable qualities in IT project team members, our study showed the importance of different educational settings. Students' perceptions appear to vary not just according to whether they are graduates or undergraduates, but perhaps more importantly, whether they have been exposed to a large group project for external clients. While universities believe they are putting such students in a 'real world' setting, it may be that due to the poor work ethics of some students, the students develop a 'skewed' perception of the world, where work values take unusual prominence in people's perceptions of desired qualities. Finally, it was seen that even in a course that emphasizes 'soft skills', undergraduates may have difficulties taking the importance of such skills seriously.

We suggest that universities should provide multiple domains for learning about team work, including both theoretical and multiple practical perspectives. It may be that relying heavily on a single domain could skew interpretations of the reality of team work in industry.

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