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CONTEXTUAL FACTORS WHICH INFLUENCE CREATIVITY IN REQUIREMENTS ENGINEERING

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Abstract

In many disciplines, creativity has been recognised as an important part of problem solving. In business, creativity enables the generation of better solutions and provides an opportunity to gain a competitive advantage. In Information Systems (IS) creativity assists developers in finding solutions to difficult problems by helping to efficiently utilise available resources and allows the more effective planning and running of complex projects. One of the most important aspects of IS development is Requirements Engineering (RE), the development activity aimed at understanding the needs and wants of IS customers. While previous RE researchers suggested that creativity is crucial in building high quality information systems, fostering creative outcomes in RE is difficult as it is affected by the multifaceted socio-organisational context within which IS development commonly takes place. This paper reports findings from an empirical study into creativity in RE. Specifically, it reports various contextual factors which were found to influence the creativity of individuals and their teams.

Keywords: Requirements Engineering, Creativity, Case Study.

1 INTRODUCTION

A traditional view of Requirements Engineering (RE) has been that it is a structured, systematic and repeatable technique (e.g. Kotonya and Sommerville, 1998). Models of the technique have supported this view and suggested that if the techniques are followed consecutively, a satisfactory outcome will be achieved. However, an emerging view of RE has recently suggested that the process of the development of a requirements specification is not smoothly incremental but instead involves a series of increments with an occasional reorganisation of the requirements specification following a creative insight (Nguyen, 2000).

Earlier authors such as Guindon (1990) and Khushalani et al. (1994) explored the impact of creativity on the software design process and suggested that designer behaviour was not pre-planned but rather opportunistic. Carroll and Swatman (1999) further postulated that opportunism occurs in RE when the requirements engineer's adapt their activities in response to the stakeholders and by reacting to their movements between different problem areas. Nguyen and colleagues (1999; 2000) offered a new understanding of the RE process as consisting of catastrophe cycles of building the requirements model and restructuring it as a result of reconceptualisation insight. The catastrophe cycle process supported Wallas' (1926) creative process model. Nguyen and Swatman (2003) further argued that managerial actions might be required to promote and support creative problem understanding and solving in RE by monitoring and promoting reconceptualisation crux points.

In recent years, the role of creativity within RE has been further expanded. Maiden and Gizikis (2001) view creativity as a central part of RE and call for a recognition of the importance of creativity in the RE process. Maiden and Gizikis (2001) and Robertson (2002) further state that in the future, creativity will be central to economic and market trends. This view of the importance of creativity was further tested (Pennell and Maiden, 2003) by applying creative techniques such as brainstorming, analogical reasoning, storyboarding and "combinational creativity" to facilitate informed creative thinking about requirements and opportunities for novel software applications. The approach taken was useful and demonstrated that some creative techniques were more effective than others in providing better outcomes (Pennell and Maiden, 2003). Maiden et al. (2004) continued this approach of applying creative techniques within RE workshops and uncovered several problems or barriers to creativity, such as the lack of expertise in the creative technique, the lack of time available for undertaking some components of the creative process, the loss of the original rationale behind ideas, the reactions of people and their frustration to change, a lack of "champions" of the workshop process and more.

Debating and discussing about creativity with a group of RE practitioners, Cybulski and colleagues (2003) strongly emphasised the importance of creativity in the RE process. As a result of their study, an initial conceptual framework for understanding creativity within RE emerged: C/RE (pronounced "sera"). The conceptual framework involves the following elements in RE creativity:

- Context: The socio-organisational context within which the problem solving occurs in RE. The context element of RE creativity includes both individual and social dimensions. Barriers to creativity are also raised, including lack of experience, organisational politics and cultural barriers.
- Outcome: Issues concerning promoting, assessing and accepting creative RE problem solving solutions.
- Process: The characteristics of the process. The patterns undertaken by participants and their place within the psychology of problem solving and theories of creativity within the RE process.

This framework reflects Pohl's (1994) views of the three dimensions of RE: the reaching of agreements between stakeholders in a social context, the specification process, and various presentation formats of the outcome. Furthermore, the C/RE framework also reflects the people, process and context aspects of the creativity of general problem solving discussed in creativity literature (for example, see Csikszentmihalyi, 1998; and Taylor, 1988). For instance, person, process, product and environment have been suggested as four common elements that form the basis for many understandings of creativity (Taylor, 1988). Tying these elements together, Jonathan Plucker, an associate professor of learning, cognition and instruction, described creativity as "*the interplay between ability and process by which an individual or group produces an outcome or product that is both novel and useful as defined within some social context*" (IU Home Pages, 2003). In fact, the context element in C/RE framework can also be related to "person" and "field" in Csikszentmihalyi's (1988) systems view on creativity.

The recent tutorials on creativity in RE held at RE'02 and RE'04 (IEEE International Requirements Engineering Conference 2002, and 2004) have demonstrated a growing interest in developing a further understanding of the role of creativity in RE. However, the reactive response to the new interest in creativity, held by researchers and practitioners, has been rather slow in RE education (for example, Nguyen et al., 2002; Armarego, 2004).

In response to the need for further understanding creativity, this paper offers an examination and further refinement of the C/RE conceptual framework by extending its context element, and identifying individual and socio-organisational factors which influenced creativity exercised by students undertaking RE in one of their major university projects.

2 RESEARCH APPROACH

A qualitative-interpretive multiple case study (Benbasat et al., 1987; Yin, 2002) was adopted to explore and identify individual and socio-organisational aspects of creativity in RE.

The study took place over a period of approximately 12 weeks at an Australian university in 2004. Two case studies involved two student groups consisting of six members each (referred to as Group A and Group B). Both undertook a final year project concerned with the design and implementation of a system for an external client. The two student groups were engaged in two separate projects each supervised by a mentor. The students were assigned roles in their project, which included a systems analyst involved in aspects of requirements engineering. Some students took on more than one role, for example, one student could be systems analyst as well as project manager.

The researchers tracked the groups' progress, observed the groups' meetings, conducted interviews, and analysed produced documentation. The C/RE framework was used as a lens to focus the researchers' observations and to guide the interviews with individual research participants. Closing interviews were conducted with the majority of the participants from both groups at the completion of the project. RE artefacts such as diagrams, assignment submissions, agendas, etc. were collected and subsequently examined to clarify the issues emerging during data analysis. Although the RE process including requirements elicitation workshops, data and process modelling, prototyping activities and deliveries were the focus of data collection, the whole development process was under observation in order to appreciate creativity exercises and their effects.

Meaning condensation technique was used in the analysis of the collected qualitative data (Kvale, 1996). In the process large "chunks" of data (answers to interview questions, meeting notes, etc.) were condensed into shorter sentences or statements while keeping the main meaning of the original data. Reading, questioning and contemplation was undertaken to think and ask questions in order to reflect on these short statements. Questions like, "Why?" or, "What is it about?" were asked in order to uncover relationships between the short statements and the research question. Themes were identified through these relationships.

Descriptive meanings of the themes were then developed by looking further at these themes (Kvale, 1996). Therefore, the meaning condensation technique supported inductive data analysis by allowing new concepts to emerge, in the form of meanings and relationships between themes.

3 RESULTS AND DISCUSSION

The client for Group A was Redcorp[1], a small, family-owned retailer that is a home-based business. The project entailed replacing Redcorp's existing website. The owners desired a more professional website for their business. After several meetings with Redcorp, Group A developed a specification for the required system. The website specification offered marketing opportunities for the company and a content management system for Redcorp to update product descriptions.

The client for Group B was Healthsmart, a health care provider. The project entailed converting part of Healthsmart's paper-based system to a computer-based database. This was to be completed as part of a quality improvement process the business was undergoing and involved the conversion of three paper-based forms. Greater efficiencies and access to data were expected by making these forms electronic.

Our observations showed that while both groups provided solutions that were accepted by their clients, they demonstrated different levels of creativity while undertaking RE. Both groups utilised some creative idea generation techniques (Harrington et al., 1997) and both creatively combined known solutions to produce innovative ones (Boden, 1994). In both groups unstructured brainstorming and whiteboard discussions were exercised. In Group A, diversion and conversion thinking through searching for and evaluating existing solutions and ideas was applied. In trying to understand Healthsmart's perspective, some members of Group B undertook real-life role play by working at the organisation. More details and examples can be found in Dallman (2004).

The following sections (3.1 and 3.2) identify some of the contextual factors observed to influence creativity exercised during the groups' requirements engineering tasks. The individual and socio-organisational dimensions of the identified factors are discussed aspect by aspect to illustrate their potential in extending the context element of the C/RE framework and to cross-reference the findings with RE and creativity literature. These two dimensions also reflect Csikszentmihalyi's (1998) personal and social (field) views of creativity in general.

3.1 Individual dimension

3.1.1 Motivation

Motivation appears to have played different roles in the creative performance of the individuals within the two groups. There were different factors involved in motivations observed: financial rewards and positive comments.

Financial reward emerged as an important motivational aspect for some of the group members after a prize of $1000 for the best project had been announced. A clear contrast in the groups' attitudes was observed between members of Groups A (affected) and B (not affected). Our observations show that the role of the monetary reward on the individuals across both groups varied, ranging from highly motivating, competition-driven motivating, not motivating at all to even a source of disappointment (also see Fisher, 2004).

[1] For the purposes of anonymity all organisations and individuals are given pseudonyms.

In terms of feedback, reaction by individuals to positive recognition of project quality was quite mixed. The positive comments from Group B's mentor were construed as an incentive. However, some individuals believed that continued positive feedback resulted in a decrease in the value of that feedback as a motivator. Our examination of the effects of rewards does not negate Harrington et al's view (1997) that recognition is important in order to encourage creativity. It tends to support Eisenberger and Shanock's (2003) view that rewards for novel solutions increase creativity, while rewards for the conventional solutions actually cause a decrease. The motivation aspect overlaps somewhat with the management aspect of the social dimension (see section 3.2.2).

3.1.2 Personal Agenda

Personal agenda reflects the importance that individuals place on a project due to their individual motivations. While all of the interviewed individuals viewed the project as very important, their personal agendas varied slightly and impacted their performance. A common agenda held by the final year students was to increase their employment prospects, i.e. the project could offer them valuable experience when seeking future employment. Some individuals had additional agendas in undertaking the project. For example, one student was concerned that his academic performance would impact his immigration issues if he failed a subject. Another student considered the project as her first priority:

> "*It's always here, the first one [priority] that's the project.*"
>
> *– Tania (Group A)*

As a result, the clear majority of students aimed at achieving a High Distinction (80% and above) result and invested a lot of effort, emotion, and time into achieving this common goal.

> "*This unit, I chose the course to do this unit … It's starting to rule my life at the minute … I've just invested so much emotional … time and effort into this.*"
>
> *– Erin (Group B)*

It is worth noting that some members from Group A expressed their concern that one particular group member would be happy just to pass the subject or to receive a lower mark. Although the effect of having different agendas was minimal in this case, this is an indication that the personal agenda requirements engineers bring to a project may affect their personal performance and influence trust and group dynamics in complex organisational situations. In particular, the trust and morale of group members have been seen as important for RE creativity according to the C/RE framework.

3.1.3 Self-Perception of Being Creative

One-to-one interviews with students revealed that they have a common understanding of the concept of creativity. It was interesting to note that all students saw themselves as creative. Surprisingly, one individual, who believed she was not a creative person, still admitted her own creative potential.

> "*I don't think I'm a creative person until this subject actually ... I'm a bit of a text book follower I think. Yeah I don't think I'm creative, but I can be.*"
>
> *– Vanessa (Head Analyst Group B)*

Tardif and Sternberg (1988) explain that perceiving others or one's self as creative may in fact be very difficult to achieve. Creative individuals are described in terms such as intelligent, articulate, imaginative and capable of originality. Some of these character traits may not be part of any particular creative individual or can only be demonstrated within a specific domain of individual activity (Tardif and Sternberg, 1988).

3.1.4 Perception and Knowledge of Creativity

Students demonstrated some good understandings of the nature of creativity. They generally identified creativity with the elements of novelty, divergent thinking, concept recombination and formulation of conceptual relationship. These issues have been well examined and agreed by creativity researchers (Torrance, 1988; Boden, 1994). Interestingly, each student's individual perception and knowledge of creativity seemed to impact their ability to recognise creativity as an important part of their RE outcomes and processes during their projects.

3.1.5 Creativity Education

It was not entirely unexpected that the students reflected on the relative disregard for the value of creativity in RE education. In fact, students from both groups had little or no formal creativity education in RE:

> *"Honestly it only covered one lecture so I don't think there was great emphasis on it … I've read it in text books but it wasn't part of what I was supposed to read … As yet I haven't come across creativity … in terms of requirements or software engineering … in any other subject [except for Advanced Systems Analysis and Design]."*
>
> *– Erin (Group B)*

> *"[The lecturer in the project unit we are undertaking] has being stressing a lot on creativity and trying to be different from the others if you have to make a mark in the industry."*
>
> *– Liam (Group B)*

In fact, it was the lecturer's personal industry experience and reflection of creative undertakings, rather than the subject curriculum, that had a more direct and long-ranging impact on some of the students' approaches to solving their project's RE problems creatively.

3.1.6 From Experience to Design Bias

Both groups A and B brought their individual development assets into their projects, i.e. their members' experience and education, and fragments of their past projects and work-products. Design decisions were consequently based around programming and Web development solutions that individuals had studied previously and felt comfortable using (such as MYSQL, PHP, and various Web templates). The heavy reliance on reusable information and components, however, did not in any way discount the value of their creative outcomes. It is recognised that combinational creativity commonly occurs where old solutions and their elements are combined together to produce new creative outcomes (Boden, 1994).

3.1.7 Conformance versus Dogma Breaking

The students in both groups A and B expressed a desire to conform to previously acceptable solutions by preferring to follow set tasks and showing clear reluctance to take risks. For example, Group A chose to adopt a particular solution because it was used by other students in this unit before.

> *"Everybody is doing that now, all of the other teams, even I asked my friend … all of the other teams last year … [used] …MYSQL and PHP. First I wonder[ed] whether it is one of the criteria to use that or [whether] we can use a different language … because we know before from the other teams, for sure MYSQL and PHP has worked."*
>
> *– Tania (Group A)*

Vanessa (Group B) supported this view and related it to creativity. Doubts that individuals have over entering uncharted waters can be difficult to overcome.

> *"When using creativity, if you [are] not using creativity and you've just got like the assignment in front of you, do this, do that. It's straight forward and the answer is easier, whereas creativity is sort of taking a risk. Is it right? You don't even know if it's right."*
>
> *– Vanessa (Group B)*

This sentiment is reflected somewhat more vehemently by Dean (2001) in his unorthodox non-conformist book, *The aesthetics of incorrectness [sic]: The freeing up of thinking by the arseholing of academic wankers' tyranny and monopoly of what is correct*. In his critique of academia, Dean (2001) postulates that creativity is being "*castrated by correctness*" as thinking and believing are cast into acceptable or non-acceptable social norms. Vanessa's fear of the risks associated with not having the structured academic assignment placed in front of her reflects a constraint that has been placed around her problem solving skills through her experiences with academia. This view is also supported by Armarego (2004) who says that students expect definitive solutions to their problems in the mode of science and mathematics.

The conformity and risk avoidance as shown by these individuals could be compared and contrasted to previous discussions on risk taking in creativity. Traditional dogmas form standard practice, procedures and solutions. People prefer to conform, are taught to conform and believe they risk embarrassment or ridicule by straying from the norm (Harrington et al., 1997). The students to some degree have reflected these behaviours. However, innovative and creative outcomes require thinking outside the box and are therefore often non-conformant to dogma. Creative requirements engineers should take risks and stand up for their dogma-breaking ideas (Cybulski et al., 2003). Therefore, conformance and risk avoidance could be construed as barriers to creativity in RE.

In the context of problem solving, Harrington et al. (1997) adds that the barriers to creativity are risk avoidance, lack of education and the lack of use of an individual's creative ability.

3.2 Socio-organisation dimension

The *social* dimension of the C/RE framework represents the groups undertaking the project, organisational influences, cultural issues, external forces and stakeholders. With the exception of the cultural aspect, other aspects, specifically: group, management, organisational and stakeholders, have been examined in this study.

3.2.1 Group

From the group aspect, there are two factors which influence the RE creativity – group leadership and group dynamics.

In terms of *group leadership*, both groups A and B experienced difficulties with their project managers, who were appointed by the lecturer prior to the commencement of the project. This process may have contributed to the leadership problems.

In Group A, the members clearly took the responsibility for solving their own leadership issues as a group. This was to the extent that in one incident the group turned on the leader and demanded that she learn more about some areas of the project.

In Group B the leadership issues were clearly linked to gender-related conflict. This eventually led to the unexpected resolution of the problem when Group B fractured into two sub-groups, with a female project manager and her male assistant separating the tasks between the sub-groups. The project was divided into two distinct project sub-goals.

In a broader context, the Moore III (2000) study of small groups raises an interesting point about the effect of appointed leadership versus democratically elected leadership in small

groups. Moore III (2000) found that when combined with other creative variables, creativity decreased in appointed leadership groups as compared to groups with democratically elected leaders. The difficulties faced by Group A and B may therefore have affected the creative output of the group. This also questions the effectiveness of pre-appointment of leaders.

Group dynamics, on the other hand, had a very different impact on the creative performance in both groups. Group A clearly asserted the group setting enabled creative outcomes. With members' differing inputs they could fuse their ideas together with recognisably higher quality results. This also led to the recognition of good listening skills as an important part of working in a group by Group A. Both of these issues caused problems in the fractured Group B. The assistant project manager, Liam, felt that members of the group (before the separation) were not always prepared to listen to and respect other opinions.

> *"If there were certain ideas he didn't like, he would just, just go, 'That's just, that's just bullshit, it's just not going to work' … He just didn't want to listen and next time when you come to that stage you think to yourself is there any point me putting up that idea?"*
>
> *– Liam (Assistant Project Manager Group B)*

His view was supported by two other members, for example:

> *"Yeah, I think that affects your creativity … why do you want to open your mouth?"*
>
> *– Vanessa (Head Analyst Group B)*

Members of Group B believed that they worked well in their sub-groups when they debated with each other and argued over ideas. They saw both positives and negatives in the creative output that could be achieved in groups and believed that their creative output had been somewhat curtailed by the fracturing of their group. Nevertheless, they seem to have recognised that splitting their group created a barrier to their group's creativity.

Our observations tend to confirm previous studies (Mamykina et al., 2002: 99; Cybulski et al., 2003) that team size, trust and morale have a clear influence on team creativity.

3.2.2 Management

In this study, management aspect can be examined from the mentor role. A mentor provided each group with a performance monitor and control as well as assistance and support. The mentors of the projects differed and had different effects on creativity within the two groups.

Group A's mentor provided constant positive support and feedback for most of the process and was personally liked by members of the group. He was described as being more like a friend than mentor and on the same level as the group members. As mentioned earlier, the effect of repeated positive comments for conventional performance caused creativity to diminish during the project. Group B received both positive and negative advice from their mentor. Only one member reacted to negative feedback defensively and viewed it as a personal attack. Overall, both positive and negative feedback had been well gauged and perceived as motivation to succeed.

Interestingly, Group B's mentor appeared to provide a source of creativity for Group B. He was seen as approachable and was used as a sounding board as well as for technical advice. This was particularly useful when the group struggled with modelling issues. It was felt that if Group B were totally stuck and had reached a crisis point; their mentor would have a solution or provide them with new insight. The mentor of Group B also helped to surmount the "lack of champions" barrier to creativity proposed by Maiden et al. (2004).

3.2.3 Organisation

The organisation in this study was the educational institution. There were two organisational factors observed – time constraints and the consequences of decision making.

Both groups operated under the *time constraints* that were placed on them through undertaking the project as part of a tertiary unit. They felt that time was a large constraint with the imposed deadlines of the deliverables in the subject. In addition, the students had commitments to other subjects as well.

> *"I have to concentrate on … so many subjects and it does took [sic] away my time … [from] putting creativity and effort into this project."*
>
> *– Brian (Group A)*

Time is an interesting constraint as it can also be seen as a trigger for creativity (Cybulski et al., 2003). Harrington and colleagues (1997) also believe that time outside of the norm is required to develop a creative solution. Maiden et al. (2004) also saw a lack of time available for undertaking some components of the creative process as a constraint. The design and timing of the unit deliverables (that fit the waterfall model) acted as a barrier to creativity. The structure of deliverables following one after the other does not allow a requirements engineer the flexibility to develop both a full understanding of the problem and to solve it at the same time by extensively exploring the problem space (Nguyen, 2000).

In both projects, the *consequences of decisions made* reflected the altered reality of the situation. The clients of both groups did not have to pay for the products produced by the two groups and therefore had a different view of what was acceptable. The mentors were also more flexible than they would have been in a real world project. Both groups were reassured when they were having difficulties finishing (for either time reasons or expertise issues) that a lesser solution or a later time would be acceptable.

> *"He told us that if we can't do it, if we can't do the CMS [Content Management System] it doesn't matter because we have done [a] very good website … He encouraged us to just try … [and said] if you can't do it you still have done really very well."*
>
> *– Tania (Project Manager Group A)*

While it is uncertain whether and how the above response impacted on the creative output, it does raise an issue regarding the effectiveness of capstone projects. Students may be able to get a more realistic experience by working with a real world commercial project in work placement scenarios. Holt et al. (2003) suggest that work placements provide a good way for students to learn by experience in real industry projects under the guidance of experts.

3.2.4 Stakeholder

Project stakeholder expectations and conflicts affected the students' creativity.

In terms of *stakeholder expectations*, the client of Group A, Redcorp, constantly communicated their very low expectations of the project outcomes. Redcorp was subsequently satisfied with any solution provided as long as it was not too complex or removed from their organisational dogmas (Cybulski et al., 2003). Not surprisingly, these low expectations were considered as a barrier or constraint to the group's creativity. By setting a simple project the client also removed the discomfort that is often required for creativity to happen (Pennell and Maiden, 2003).

Conversely, the client of Group B, Healthsmart, was more open to the group's creative suggestions and prepared for a change of direction. Healthsmart also played an active role in shaping the boundaries of the group's problem space through group/client negotiation. This contrasted starkly with the more conservative client approach that constrained Group A.

It appears that Group A responded mainly to Redcorp's wants in the development of the specification rather than exploring the businesses-specific needs and opportunities. This may have occurred due to sociological factors such as their youth, national culture and social

position in relation to the clients or their inability to break through the business's established dogmas (Cybulski et al., 2003).

Conflict between stakeholders is an interesting phenomenon not uncommon in student projects. This phenomenon was observed in Group B's project. Healthsmart had an existing IT service provider. Not surprisingly, Group B experienced difficulties accessing Healthsmart's information systems resources from this provider.

> *"He wasn't helpful at all … Probably, he just had this feeling that we were just going to take over and he was going to lose his job … He would answer calls … but he wouldn't just [sic] help us."*
>
> *– Liam (Assistant Project Manager Group B)*

Experience was withheld by the operator and his lack of co-operation hindered the efforts of students to explore some possible creative options. The conflict experienced by Group B parallels the political forces identified in the C/RE framework. The politics within the stakeholder's extended organisation may have acted as a barrier to creativity.

4 CONCLUSION

In summary, this paper reviews the current understandings of the notion of creativity in RE, demonstrated the emerging interest in this topic by the RE community, and suggests that further understanding of the nature and context of creativity is required to promote and encourage creative RE practice.

Through two case studies, this paper identifies contextual factors that influence creativity exercised by student groups undertaking RE in their university projects with external clients. The paper examines and extends the context element in the C/RE framework (Cybulski et al's, 2003), an earlier conceptual framework for understanding creativity in RE (see Table 1).

Individual dimension	
Motivation	The personal motivations held by individuals that effects their performances for the organisation.
Personal Agenda	The importance that individuals place on a project due to their own motivations.
Self Perception of Being Creative	The belief that one holds about one's own innate creativity.
Perception and Knowledge of Creativity	What an individual understands of the meaning of creativity.
Creativity Education	The level and influence of formal creativity education in RE on an individual.
Experience and Design Bias	The desire to use past knowledge and solutions that have been previously developed by one's self or others.
Conformance versus Risk Taking	The desire that an individual has to conform to dogmas and to avoid risk.

Social dimension		
National culture		Different cultural backgrounds in groups may have some effect on creative outcomes but this study has not proven this.
Project Group Behaviour	**Leadership**	The effects of the leadership of a group on its creativity.
	Team/Group Dynamics	The effects of group behaviour (group size, trust, morale) on creativity.
Management		The effect of a management style on creativity.
Organisation	**Constraints**	The constraints, such as time, placed through the requirements engineer's organisation.
	Consequences	The "buy in" reality or importance that is set by the organisation on the project.
Stakeholder	**Expectations**	The effect of the stakeholder's expectations on creativity.
	Conflict	The effect of conflict with stakeholders on creativity.

Table 1. Individual and social dimensions of creativity in RE

Having offered an extension to the conceptual framework to understand and study creativity in RE, this paper suggests future research into the further examination and application of the extended framework in organisational and commercial settings.

The various human and organisational technological aspects and factors described in this study will assist project managers in the identification of possible areas of project performance and process improvement. This is especially useful in RE projects and business situations, in which creativity and innovation are highly desired. Organisations will also benefit if they take into account the findings from this study in running graduate training programmes and in promoting a creativity culture in their organisations.

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