

## RADICALITY OF INNOVATION

### **Radicality of innovation: Perceptions of organizational members**

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### **Abstract**

Evaluations of 'radicality' of innovations are mostly related to final products and services, however, examination of innovative ideas earlier on has important implications for future innovations. Organizational members make decisions on whether or not to propose innovative ideas to the agenda. These decisions are often based on their personal judgements and perceptions. In this article a categorization of innovative ideas by low, medium and high degree of radicality is proposed. The objective is to, on one hand, demonstrate the correctness of the categorization proposed and, on the other hand, retrieve insights on how the level of radicality of products is conceived by practitioners. The results of a quasi-experimental investigation report that radicality of innovation relates to a degree of change in products. Based on perceptions of practitioners, with an increase in degree of radicality of innovative ideas, the value for rewards enhances.

**Keywords:** change, innovative ideas, innovations, radicality, rewards

## Introduction

It is commonly understood that innovations can be radical in different dimensions and entail different degrees of 'radicality' (Harmancioglu et al., 2009; McNally et al., 2010). Evaluations of radicality are mostly related to final products and services (Rice et al., 2001), since at the early-stage of the innovation process it is hard to estimate how an innovative idea will look like as a final product or service, and how it will transform a technology, an organization and a market (Reid et al., 2014). The ex-post examination is hence easier, but also less critical for practitioners who want to estimate the power of an idea early on. Radical innovative ideas may be transformed into radical innovations which are increasingly recognized as important for organizations and national economies (Story et al., 2014). These types of innovations provide foundations on which future generation of products and services are created (Sandberg and Aarikka-Stenroos, 2014). However, firms face many challenges and barriers which hinder radical innovation efforts. Radical innovations are seen as disruptive changes which deal with higher levels of uncertainty, often requiring high levels of knowledge from specialists and associated costs (Bessant et al., 2014). Arguably, the decision to pursue innovative ideas of different degrees of radicality has important implications for business practices (Story et al., 2014).

The innovation process can be considered as comprising various activities needed to transform an innovative idea into a final product, service or process (Bessant and Tidd, 2007). Within organizations, employees need to come up with innovative ideas and need to be willing to articulate them to the agenda. It can be argued that if there are too few radical ideas, radical innovations will probably not happen (Garcia and Calantone, 2002). But more importantly, organizations may not lack the number of innovative ideas, but often lack an understanding how to transform them into a meaningful, breakthrough products and

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services. Organizational members make decisions on whether or not to propose innovative ideas to the agenda. These decisions are often based on personal judgements and perceptions of rewards and incentives, having significant implications on organizational innovativeness (Piller and Walcher, 2006; Hodgkinson and Healey, 2014). In order to understand the rationale behind these decisions, there is a need to tap into practitioners' own perceptions on radicality of ideas and willingness to contribute radical ideas to the agenda. These areas are particularly important for practitioners and policy makers in understanding how to support/foster radical innovations.

In this article a categorization of innovative ideas by low, medium and high degree of radicality is proposed. The objective is to, on one hand, demonstrate the correctness of the categorization proposed and, on the other hand, retrieve insights on how the level of radicality of product or service is conceived by practitioners. Specifically, the following dimensions were selected to explore: (a) project team members' perceptions of factors that they take into account in order to evaluate ideas by radicality, and (b) their preferred rewards for proposing these ideas. This paper begins by reviewing relevant literature on radicality of innovations and proceeds to describe the proposed conceptualization of radicality of innovative ideas. The next section outlines the research methodology, followed by the empirical findings and discussions in relation to the reviewed literature. Finally, some practical implications and new venues for future research are suggested.

### **Understanding radicality of innovations**

At present, the literature does not offer a measure of 'radicality' of innovations, yet this is increasingly recognized as critical construct in the field of innovation and new products (Bessant et al., 2014). Radicality of innovation is commonly associated with a degree of novelty and change. Utterback (1996: 200) defined radical innovations as "change that

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sweeps away much of a firm's existing investments in technical skills and knowledge, designs, production technique, plant and equipment". Authors such as Markard and Truffer (2006) define radicality of innovation based on degrees of change in the existing products or services, distinguishing between low, medium and high radical innovation. Sergeeva (2014) investigated employees' willingness to contribute low, medium and high radical ideas to more or less work-related actors. The findings suggest that experts were more willing to contribute highly radical ideas than less radical ideas; while non-expert were more inclined towards proposing low to medium levels of radicality of ideas. These ideas are taken further, providing deeper insights into organizational members' perceptions of factors that they take into account in order to evaluate ideas by radicality, and their preferred rewards for proposing these ideas.

Radical innovations are often juxtaposed with incremental innovations. Hurmelinna-Laukkanen et al. (2008) and Bessant et al. (2014) define incremental innovations as small-scale, low risky problem solving, with established knowledge bases to be undertaken by a wide range of employees within the organization. Radical innovations, on the other hand, deal with higher levels of uncertainty, often requiring higher levels of knowledge from specialists:

"Radical innovation that presents a discontinuity involves challenges which do not fit the existing schema and require a reframing – something which existing incumbents find hard to do." (Bessant et al., 2014: 1285)

Chiang and Hung (2010) reinforce that radical innovation require a high degree of information and learning. The argument is that in order to pursue radical product innovations, managers should seek new ideas from a large number of external knowledge sources; while

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incremental innovations require a more intensive access of new ideas from a small number of external knowledge channels.

Griffin et al. (2014) agree that radical innovations typically require different types of personnel: inventors (technical personnel in the R&D labs), champions and project managers. The technologists are seen responsible for generation of new radical technologies for the firm. They have little or no market knowledge, and no motivation to manage the processes required for the development stage. Champions are described as individuals who put themselves forward to get the concepts accepted for development. They usually do not create radical technologies, but manage the processes of gaining project acceptance. Project managers are considered responsible for organising the execution of the project after all technical and market unknowns have been eliminated. Hence, it can be argued that different people are responsible for different aspects of radical innovations. Griffin et al. (2014) emphasize that radical new products were defined less explicitly in the front-end. Proposed models of radical innovation emphasize the need to start from strategy and explicitly link any potential opportunity.

Story et al. (2014) argue that 'radicalness' can be seen from a number of dimensions, with many definitions focusing on the consequences on the market, while others refer to departure from the prevailing design norms. The literature suggests that it is not always simple to actually understand what is, or is not radical innovation, particularly given the differences in terminologies (Harmancioglu et al., 2009; McNally et al., 2010). Radical innovation is often associated with various terms including discontinuous innovation, disruptive innovation, breakthroughs and major innovation. More research is needed to understand the skills, competencies and architectures required to improve success rates for radical types of innovation activities. Reid et al. (2014) contend that in the early stages of

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radical innovation, ideas for developing a technology for market application are multiple, highly diverse, and many stem from a variety of processes and sources. Hence, in order to succeed with the divergent ideas that tend to prevail during the early stage of radical innovation, firms need to have a set of organizational skills and processes that can absorb, worked with and be enabled by such ideas.

Authors such as Murmann and Frenken. (2006) and Piller and Walcher (2006) argue that a core challenge for manufacturers when opening the innovation process is how to incentivise users to transfer their innovative ideas. Some companies promise cash rewards or licensing contracts for innovative ideas, other build on non-monetary acknowledgements promising peer or company (brand) recognition and facilitating a pride effect. These rewards or recognitions are not given to everyone submitting an idea, but for the best of these submissions. Hodgkinson and Healey (2014) further highlight the role of incentive systems surrounding risk and reward associated with radical innovations, but fail short in providing further explanations. There is hence a demonstrable need to explore organizational members' perceptions of incentives and rewards in relation to evaluation of innovative ideas by degrees of 'radicality'.

### **Categorization of innovative ideas by radicality**

Table 1 presents the proposed categorization of the radicality of innovative ideas.

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In order to examine innovative ideas and their radicality factors that organizational members perceive as criteria for their evaluation are examined. The proposed categorization

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is contrasted with practitioners' own perspectives in order to reveal its correctness. Eight factors were selected for evaluation in the current research:

- Degree of change in the existing product.
- Degree of novelty.
- Requirement of new information, learning and knowledge.
- Change of the inputs (e.g. materials used in the production) in the existing product.
- Change of the outputs (e.g. exterior design, function) in the existing product.
- Impact of change on the process.
- Impact of change on cost.
- Degree of financial risk.

These particular factors were selected for several reasons. First, the selected factors overlap with those identified as important in the reviewed literature on radicality of innovation. Second, these factors may have practical implications, as they are claimed to be important for potential organizational innovations (Murmann and Frenken, 2006; Puller and Walcher, 2006).

By proposing highly radical ideas, organizational members may require greater rewards than their peers who suggest less radical ideas. There could be various reasons behind this type of behaviour: a high degree of knowledge and information associated with radical innovations, a high risk and cost associated with radical innovations. It may well be the case that by proposing highly radical ideas, organizational members favour intrinsic rewards (e.g. recognition in the company, personal development) over extrinsic rewards (e.g. increased salary), and vice versa. These issues are important to understand if organizations aim to implement radical innovations. When organizational members are appropriately rewarded then, arguably, they will be willing to take risks and be committed to future innovations.



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Understanding of organizational members' perceptions of reward for proposing innovative ideas of different degrees of radicality is hence important.

Organizations often try to actualize appropriate managerial practices and the reward systems for the transformation of ideas into innovations. One managerial arrangement towards establishing a suitable internal work environment for the innovations to occur is to appropriately compensate project team members who propose the innovative ideas. Although these rewards and motivations have been focus of research on creativity and innovation over the last few decades (Hodkinson and Healy, 2014; Piller and Walcher, 2006), the question of how organizational members would prefer to be rewarded in relation to radicality of their proposed ideas has received scant attention. The link between project team members' preferred rewards and the radicality of proposed ideas is, therefore, examined in this paper.

In order to understand how to appropriately reward project team members, it is important to examine their preferred rewards for proposing ideas in relation to radicality. Two categories of reward were selected to be explored:

- Extrinsic rewards (e.g. cash bonus, increased salary, support from superior, career promotion, recognition from immediate superior and recognition from colleagues).
- Intrinsic rewards (e.g. better knowledge and understanding, greater satisfaction, increased self-confidence, sense of development and enhanced skills).

These particular rewards were chosen for several reasons. First, both extrinsic and intrinsic rewards may have practical implications in terms of appropriate rewarding of contributors of ideas of different levels of radicality. Second, the selected rewards supposedly overlap with the incentives identified in the reviewed literature on innovation.

### **Research methodology**

It has been recognized that construction firms often struggle to innovate and learn between projects, often having weak internal processes (Gann, 2001). The presence of key individuals who put forward innovative ideas of different levels of radicality is frequently cited as important for successful businesses (Winch, 2014). However, there remains a lack of understanding concerning the factors that practitioners take into account for suggesting innovative ideas to the agenda.

Seventy six organizational members from a variety of industrial sectors were invited to participate in a quasi-experimental investigation. Half of them from construction-related firms and half were from other industries (pharmacy, chemistry, biology, engineering, IT). The sample combines experts and non-experts in order to explore perceptions of radicality of innovative ideas more generally; to investigate the drivers for suggesting ideas of different levels of radicality, regardless the differences in expertise. On average, practitioners were 31.25 years old and had an organizational tenure of 5.73 years in the UK. At the time of the quasi-experiment, 32% of the participants were senior managers, 27% were junior/middle managers and the other 41% held non-managerial positions.

#### **Quasi-experimental tasks**

The quasi-experiments took approximately two and a half hours in total to complete. Several participants performed the experimental tasks at the same time, working individually and without sharing their ideas with each other. The first quasi-experimental task required participants to generate as many innovative ideas as possible that would either change or improve the three artifacts if they had the opportunity to start building them from the beginning. 'Taipei 101', 'Great Belt East Bridge' and 'Queen Mary II' artifacts were selected because they represent three different industrial sectors and may help to explore radicality

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from a broader perspective. They were shown in a series of images with accompanying technical descriptions. A visual representation is particularly useful in this experiment to gain understanding of the given information (e.g. LeGrand, 1990). Fifteen minutes were allowed to generate ideas for each of the three artifacts with five-minute intervals. This task is operationally similar to the existing experimental study conducted by Sternberg *et al.* (1997). In their study people had to produce two creative products in each of four domains: writing, art, advertising and science.

The second quasi-experimental task required participants to evaluate ideas by their radicality. Participants were asked to evaluate their own generated ideas from the first quasi-experimental task and ideas that were prepared in advance by the researcher by low, medium or high levels of radicality. Six innovative ideas were prepared in advance by the researcher for each of the three artifacts (see Appendix). Two ideas about each artifact correspond to low, medium and high degrees of radicality. Ideas were randomly distributed, so that the researcher could not tell which ideas of these selected by participants were in the low, medium or high radicality. Participants were not told about this pre-categorization to avoid biasing the results. The purpose of this quasi-experimental task is to explore the correctness of the proposed categorization of radicality of ideas based on participants' evaluations.

Questionnaires were completed at different stages during the quasi-experimental procedure. The first questionnaire included general background information which was introduced before the quasi-experimental tasks. The second questionnaire was introduced after the experimental tasks and was directly related to participants' perceptions of radicality of ideas. Participants were asked to evaluate the factors that they take into account to evaluate radicality based on five-point Likert scale ranging from 1 ('least important') to 5 ('most important'). They were then asked to evaluate the preferred rewards for proposing

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ideas of low, medium and high radicality based on five-point Likert scale ranging from 1 ('least important') to 5 ('most important'). Because participants' perceptions of radicality of ideas may vary, it is important to get insight into the factors that affect their evaluations beyond those suggested by the researcher. Therefore, open-ended questions about other important factors that influence participants' evaluations of ideas by radicality and other preferred rewards were included in the questionnaire.

### **Empirical findings**

#### **Practitioners' evaluations of radicality**

Table 2 shows means, standard deviations and Kendall's tau correlations of the factors that practitioners take into account for evaluating ideas by their radicality.

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The results indicate that, on average, practitioners defined radicality to be heavily related to a change in the innovation process, but were not particularly concerned with financial risk or the impact on cost. Among other factors that practitioners took into account to evaluate the ideas according to radicality were the following:

- How the end-user perceives the innovative ideas as 'value-adding'.
- The legacy that the radical outcome of the idea will have over the years of its experience.
- Influence of innovative ideas on how organizational actors think and feel.
- Ecological benefits.

#### **Project team members' evaluations against the proposed categorization**

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79%, 67% and 61% of practitioners agreed with the proposed categorization of ideas by low, medium and high levels of radicality respectively. Although the results do not show an absolute consensus between the practitioners' evaluations of innovative ideas by radicality levels and the proposed categorization, the results are quite promising. The follow-up Kendall's W test was conducted to test the agreement between the practitioners' evaluations of innovative ideas by radicality and the proposed categorization for all three artifacts. Kendall's W is ranges from 0 (no agreement between individuals) to 1 (complete agreement between individuals) (Field, 2009). The results demonstrate that, on average, the consensus between the practitioners' perceived categorization of ideas by levels of radicality and the proposed categorization is 0.748. The significance value is close to 1, confirming the consensus. Therefore, the categorization of innovative ideas by low, medium and high levels of radicality can be a good starting point for further investigation.

### **Preferred rewards for suggesting low, medium and highly radical ideas**

Figure 1 demonstrates the importance of intrinsic and extrinsic rewards in relation to the proposed degrees of radicality.

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The results indicate that both extrinsic and intrinsic rewards are valued as important by practitioners proposing ideas of low, medium and high radicality. Using a five-point Likert scale ranging from 1 ('least important') to 5('most important') the achieved mean values for ideas of low, medium and high radicality are 3.32, 3.51 and 3.86 respectively. It is evident that the importance of any kind of reward increases with the level of radicality.

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Among other preferred rewards for proposing ideas of low, medium and high radicality were the following:

- Joy of creation and pride in accomplishment.
- Demonstration of creativity and skills (pride).
- Better performance.
- Cost effectiveness.
- Satisfaction from users.

### **Discussion**

The quasi-experimental intervention demonstrates that practitioners are well aware of the degree of radicality of their ideas, so that categorizations based on this distinction may be relied on. On average, practitioners consider radicality of ideas to be related to an impact of change on the existing product, not being particularly concerned about financial risk and impact on cost. This is in keeping with Markard and Truffer (2006), Hurmelinna-Laukkanen et al. (2008) and Bessant et al. (2014) who associate radicality of innovation with degree of change and reframing the existing schema. Other factors recognized by practitioners, including end-user perceptions, the legacy and ecological benefits, confirm the arguments developed in the literature by authors such as Story et al. (2014) that radicality can be seen from a number of dimensions, depending on different contextual factors and individual perspectives.

The paper examined practitioners' perceptions of rewards that facilitate the transformation of innovative ideas into innovations have been examined. The results report that both extrinsic and intrinsic rewards are important for practitioners proposing innovative ideas to the agenda. However, on average, intrinsic rewards have been valued as more

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important than extrinsic rewards for proposing ideas. This does not necessarily mean that financial rewards for proposed ideas should be abolished. It does, however, indicate the importance of the reward system that pays a greater attention to the use of non-financial rewards, such as sense of development and achievement, knowledge and understanding, and self-confidence. This is consistent with authors such as Hodgkinson and Healey (2014), Murmann and Frenken (2006) and Piller and Walcher (2006) who emphasize the importance of both financial (cash, licensing contracts) and non-financial (recognition, a pride effect) incentives employees to transfer their innovative ideas into innovations. Other rewards recognized by practitioners, including joy, pride, demonstration of creativity and skills, better performance, satisfaction, contribute to understanding of the breadth of non-monetary rewards perceived important for practitioners.

The results demonstrate that the importance of any kind of rewards increases with the level of radicality. This means that practitioners who propose innovative ideas of perceived high radicality may require greater recognition and rewards than those who propose perceived low radical innovative ideas. Contributors of innovative ideas of high radicality hence should be highly rewarded and recognized in organizations to achieve radical innovations. These areas received very limited attention in the literature on radicality of ideas. This paper contributes to an understanding of the relationship between radicality and rewards.

### **Conclusions**

There has been an increasing interest within the literature regarding radicality of innovations. The empirical findings demonstrate the correctness of the proposed categorization of radicality of ideas. The paper retrieves insights into how the level of radicality of product or service is conceived by practitioners. It is proposed that understanding practitioners' own

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perspectives on radicality of ideas can be useful for organizations with an ultimate goal of radical innovations. Understanding of how appropriately reward contributors of highly radical ideas would result in future willingness to propose ideas to the agenda. Radical innovations are increasingly recognized as important for organizational success and national economies. Radical innovations provide necessary platforms on which future generations of products and services are created, creating a continuous process of radical innovations.

It is important to acknowledge the limitations of the study. The sample was composed senior managers, junior managers and team members, combining experts and non-experts. The purpose of the paper was to explore perceptions of radicality of ideas more generally. However, it is recognized that different groups may be driven by different targets, suggesting that these differences may be explored in greater detail in the future. The limited number of practitioners is another limitation of this study. The small sample size is due to a selected approach that includes experimental tasks and questionnaires engaging each individual for a considerable amount of time. Since most experimental studies on human behavior, perceptions, social psychology use a minimum of thirty participants to get stable measures (Field, 2009), therefore, the selected sample is believed to be of appropriate size to reveal radicality of ideas. Although radicality of ideas is introduced in this article, it should also receive greater attention in the future. The proposed categorization of ideas by low, medium and high radicality could also well be too simplistic for a more detailed categorization. Potentially, more than three levels of radicality may be considered. The practical challenge may be keeping radical ideas 'alive', as forces of organizational conservatism may intrude. Future research may investigate how radical ideas can be kept 'alive' in the context of organizational conservatism. In addition, future research may engage in conversations with



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project team members to explore how they make sense of radicality of innovative ideas using qualitative interviews and focus groups.

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**Table 1.-The proposed categorization of ideas by low, medium and high levels of radicality (adapted from Markard and Truffer, 2006).**

Radicality levels	Description	Examples
Low	Minor changes or improvements with no or very low impact on the development processes.	<ul style="list-style-type: none"> <li>• Changing the external design of an artifact (e.g. painting in different colour);</li> <li>• Refurbishing the interior design of an artifact.</li> </ul>
Medium	Moderate changes or improvements with moderate impact on the development processes.	<ul style="list-style-type: none"> <li>• Changing the production materials of some parts of an artifact (e.g. changing a roof of a building);</li> <li>• Modernisation of some parts of an artifact using different type of technology.</li> </ul>

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High	Fundamental changes or improvements with significant impact on the development processes.	<ul style="list-style-type: none"><li>• Changing the whole structure and production materials of an artifact;</li><li>• Changing the technology used to develop an artifact.</li></ul>
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**Table 2.-Means, standard deviations and Kendall's tau correlations among the variables<sup>a</sup>.**

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Variable	Mean	S.D.	S.E.	1	2	3	4	5	6	7	8
Impact of change on the process	4.16	1.05	0.12	.66							
Degree of change in the existing product	4.05	1.03	0.12	.20*	.73						
Change of the outputs	4.01	0.95	0.11	.29**	.19	.66					
Requirements of new information, learning and knowledge	3.82	0.93	0.11	.22*	-.17	.13	.65				
Change of the inputs	3.75	0.95	0.11	.37**	.41**	.33**	-.06	.68			
Degree of novelty	3.69	1.06	0.12	.28**	.12	.16	.53**	.16	.64		

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Impact of change on cost	3.32	1.34	0.15	.00	-.12	.25*	.34**	.10	.20*	.66	
Degree of financial risk	3.19	1.33	0.15	.00	-.14	.21*	.43**	-.06	.22*	.68**	.66

<sup>a</sup> N=76

\*p<0.05

\*\*p<0.01.

Cronbach alphas are reported in the diagonal.

**Figure 1.-Importance of extrinsic and intrinsic rewards for ideas of low, medium and high radicality.**