Information Systems as creative products: What are industry's expectations?

Anine Kruger, Machdel Matthee, Marita Turpin

Department of Informatics, University of Pretoria, South Africa
machdel.matthee@up.ac.za

Abstract. This study presents the first step in exploring the match between IT managers' expectations of functional creativity within an information system, and the functional creativity of the information systems developed by final-year undergraduate IS students. The study commences by exploring the value of functional creativity in information systems. An appropriate means to assess functional creativity in information systems is sought. The Creative Product Assessment Model (CPAM) is accordingly motivated and presented. The CPAM is used as a means to elicit the expectations that IT managers in various IT industry sectors have of functional creativity within information systems. The CPAM also forms the roadmap for Phase 2 of the study where final-year IS student projects will be evaluated for functional creativity by the same IT managers. During Phase 1 of the study it is found that while IT managers value functional creativity in an information system, there are other creativity aspects that are considered to be more valuable. These aspects include the skills to design the creative information systems, the creative design process as well as the eventual end-user experience.

Keywords: Functional Creativity in Information Systems, Innovation, Creative Product Analysis Model (CPAM), IS students

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1 Introduction

The Information Systems (IS) field requires the finding of practical solutions to complex problems. Creativity skills is generally acknowledged as an important prerequisite for solving complex problems [1, 2]. In fact, creativity is included as a foundational skill in the IS2010 curriculum [3]. However, in 2010, Seidel, Müller-Wienbergen, and Becker [4] pointed out the lack of research on creativity in IS. The authors provide a valuable research framework which delineates the non-trivial matter of operationalizing the concept 'creativity'. Yes, despite this, creativity in IS still seems to be under-researched. As a result there is a limited formal knowledge base to draw from, and the term creativity is often applied loosely and subjectively without a clear understanding of what is meant by it and from an educational context, what is required or expected from students.

In a previous study, the authors investigated what is being done at eleven South African universities to develop the creative ability of undergraduate IS students [5]. It was found that domain knowledge is regarded as more important for developing creative ability than creativity techniques, and that the nature of problems presented to students is regarded as important for developing creative ability. Lecturers mentioned the importance of the problems being "real-world" and authentic. The capstone (final year) project was singled out by respondents as a way to expose students to such problems, since it provides an ideal environment for solving real-life problems in a creative way [5]. All the universities that participated in the above study provided such learning environments for IS students in one or the other way. The assumption is therefore that South African IS students are well prepared to be creative problem solvers when entering industry and hence universities produce graduates that can meet industry needs. This study focuses on investigating the plausibility of this assumption. We therefore need to ask the question: Do universities deliver students with creativity skills that meet the expectations of industry?

In our attempt to address this question, we approached the problem in two phases: 1) Determining the expectations of industry regarding creativity in the IT workplace and 2) Determining whether IS graduates meet these expectations. Although the focus of this paper is on Phase 1, Phase 2 requires the evaluation of creativity. Industry members will have to use an evaluation framework according to which they evaluate aspects of creativity of IS students. We therefore decided to select a creativity evaluation framework as starting point for Phase 1.

This led us to the non-trivial matter of evaluating creativity. Creativity can be defined in terms of four Ps, namely Person, Process, Product and Press (environment) [6]. Stated in terms of the four Ps, creativity is the "interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context" [7]. How can this multifaceted phenomenon be evaluated?

Diverse instruments and approaches exist for assessing creativity. In an attempt to make sense of this assortment of approaches, Hocevar classifies criteria for creativity evaluation into ten categories: tests of divergent thinking, attitude and interest inventories, personality inventories, biographical inventories, teacher nominations, peer nominations supervisor rating, eminence, self-reported creative activities and achievements and judgement of products [8]. Most of the creativity evaluation mechanisms involve judgment from other people, such as experts or peers [8].

In IS, most of the research on the evaluation of creativity focuses on the judgment of the creative product. In the reviews of both [4] and [9], the only creativity evaluation studies they could identify were those focusing on ideas or systems (both IS products). There are good reasons for evaluating the creative product rather than the other aspects of creativity. The product is something tangible which reveals something of the creativity of its creator (who is more elusive to evaluate): "Unambiguously creative products are constructed by unambiguously creative persons" [10]. Some researchers are of the opinion that the evaluation of creative products should be the starting point for research on creativity and that this is perhaps the best way of evaluating creativity [11 - 13].

Still, research on the assessment of the creative IS product is scarce. There are "surprisingly few studies aimed at assessing the creativity of products in the sense of tangible, scientific or technological products" [14]. A study by [9] shows that between 1998 and 2011, only 6% of creativity and IS-related research focused on the creative product.

The tangible nature of the product as well as the lack of research on its evaluation in IS, influenced our decision to choose a framework focused on the evaluation of the creativity of the information systems (an IS product). The CPAM [12] was chosen to inform our investigative study. Similar to [10] we believe that the creativity of the product reflects the creative ability of those that developed it.

In conclusion: the aim of this study was to explore the expectations of IT industry experts regarding the creativity of information systems. Representatives of four sectors within the IT industry were interviewed and the findings are presented. The Banking, Insurance, Telecoms and Software Development sectors were included in this research study. In Phase 2 of the study, IT industry experts will evaluate the functional creativity of final year IS students' information systems. We believe that the findings will bring universities closer to a meaningful integration of creativity enhancing skills into the IS curriculum.

The rest of the paper is structured as follows. Section 2 provides background on functional creativity (referring to the creativity of the product) and its role in Information Systems. Section 3 considers the assessment of functional creative products. Section 4 explains the research approach. Section 5 presents the findings of the study with discussions and conclusions in Sections 6 and 7.

2 Functional Creativity and Information Systems

While the concept of novelty is a necessary element of creativity in the domain of arts and aesthetic products, it does not necessarily play the same role when creativity is

examined in a technological setting or when an engineering product is scrutinized [12, 14]. Here, the creative idea or product must also be useful [14-16]. Accordingly, Mumford & Gustafson defined creativity as the ability to produce both novel and useful ideas; or ideas that can be implemented practically to solve a meaningful and unique problem [17]. David and Arthur Cropley combined the notions of novel and useful creativity to formulate a term, namely 'functional creativity'[18]. Functional creativity of a product can be assessed when the observer or user of the product is aware of the initial problem so that the product can be appreciated as a functional creative solution, in other words its usefulness can be assessed.

The notion of functional creativity is applied to information systems as follows. An information system is a functional creative product that originates from a creative idea developed in response to a problem. The idea develops through a process of design and development in a specific social context, which is then expressed in a product that is both original and useful to industry. Products, such as information systems, that perform tasks or solve problems relate to a type of useful creativity, or creativity with a goal [19, 20]. If an information system can meet a customer's need, then it is not important whether the system is a completely novel solution to a problem or an existing system applied in a new manner [21]. In IS, novelty is concerned with the imaginative recombination of known elements [16]. The design and development of a functional creative product relies on the application of existing knowledge and skills in new ways to accomplish goals [22].

3 Evaluation Frameworks for Functional Creativity in IS Products

Existing research on the evaluation of products in IS covers more than only the evaluation of information systems. Examples include studies that analysed the impact of creativity support systems or decision support systems on individual creativity [23, 24]; the assessment of creative IS ideas [25, 26], and even the assessment of novel and useful software UML designs [27]. Some studies focus solely on one aspect of the creative information system, such as 'Elegance' [28, 29], or 'Usability' [30].

Couger and Dengate were among the first researchers who introduced a framework to measure creativity of information systems [21]. Their framework measured the 'utility' and 'novelty' criteria of a software product on a scale of low, medium, and high. This framework was used by a panel of judges to assess six innovative software products to determine the products' contribution towards novelty (e.g. new technology, algorithms, etc.), economy (to increase Return On Investment (ROI), customer retention, retaining market niche, etc.) [21]. Couger and Dengate's framework provides a starting point to look for creativity components in a software product. However, the focus of this framework is more on the creative product after implementation. (The eventual goal is to evaluate students' information systems, which is typically not in the implementation phase).

Over time a few rating scales have been developed to assess creativity in products. For example, the Creative Product Inventory scale was developed by Taylor [31], the

Consensual Assessment Technique (CAT) was developed by Amabile [32], and the Creative Solution Diagnosis Scale (CSDS) was developed by Cropley and others to systematically assess the functional creative elements in engineering products [14].

The Creative Product Assessment Model (CPAM) is a comprehensive theoretical model used for the assessment of product creativity in general. This model is based on thirty years of empirical research and describes creativity in terms of Novelty, Resolution, and Style [12]. Pritzker considers it as "the most thorough attempt" to "develop a general measure for recognising creative products" [33:418]. Table 1 below presents the CPAM [12]. **Error! Reference source not found.** gives a summary of all heading levels.

Table 1. The Creative Product Assessment Model [12, 24]

Component	Description	Aspects
Novelty	The degree of newness in the product in terms of the number and extent of new materials, new concepts and new processes included	**Surprising:** The product presents unaccepted or unanticipated information to the user, listener or viewer; **Original:** The product is unusual or infrequently seen in a universe of products made by people with similar experience and training.
Resolution	The degree to which the product fits or meets the problematic situation.	**Logical:** The product or solution follows the acceptable and understood rules of the discipline. **Useful:** The product has clear practical applications; **Valuable:** The product is judged worthy because it fills a financial, physical, social or psychological need. **Understandable:** The product is communicated in a communicative, self-disclosing way, which is 'user-friendly'.
Style	The degree to which the product combines unlike elements into a refined, developed and coherent whole, statement or unit. (How well the solution is presented to the world.)	**Organic:** The product has a harmonious sense of wholeness or completeness about it. All the parts 'work well' together. **Well-crafted:** The product has been worked and reworked with care to develop it to its highest possible level for this point in time. Quality. **Elegant:** The product shows a solution that is expressed in a refined, understated way. Simplicity.

The first component namely Novelty refers to the newness of a product [12]. However, the idea or product does not have to be completely new to be novel. Sometimes a small change in an existing product can give a new fresh look and desirability to a product which in return also boosts its value. According to the framework, Novelty includes the Surprising aspect as well as the Original aspect. A product might be highly original, but if the associated surprisingness is too high, it might upset some users. The balance between these two factors needs to be considered for Novelty to be appreciated by the end-user.

Resolution refers to the functionality of the product: "A creative product must work!" [12]. 'Resolution' contains the following four aspects: logical, useful, valuable, and understandable. A new coffee machine can be very novel or original in design, but there is no value or usefulness in such a product if the end-user cannot make a decent cup of coffee. Usually a product originates from a problem that needs a solution. If the product solution is not 'logical' or 'understandable' to the end-user, it affects the overall creativity and appreciation of the product. For example, a coffee machine is expected to follow certain conventions on how it receives instructions and dispenses coffee otherwise it won't seem like a logical solution. Also, if the user needs to read extensive user manuals before using the product, then it affects the understandability of the product.

The Style of a product refers to how well the product is presented. It speaks about the product's personality in relation to other products of its kind rather than how stylish it is. Besemer divided Style into three aspects: organic, well-crafted, and elegant. The organic aspect of a product is concerned with the balance and harmony that exist among all the different parts of the product [12]. It is all about the natural flow to its appearance. The well-crafted aspect of the product is about how good each part of the product has been polished to give a fine, finished product. The elegance of a product is all about the pleasure it brings to the end-user. It might be the colour of the product, how well it is packaged, or even just the ambience that a product creates while observing or using it.

Table 2 indicates how the CPAM compares with other creativity assessment techniques in terms of focus as well as adoption (measured by Google Scholar citations).

Table 2. A summary view of a few creativity assessment techniques

Method name	**Dimensions/Criteria**	**# of citations (Google Scholar)**	**Comments**	**Reference**
Creative Product Inventory	Generation, Reformulation, Originality, Relevancy,	17	Used for chemical products	[31]

	Hedonics, Complexity, Condensation			
Consensual Assessment Technique (CAT)	Not based on any theory of creativity. Judges use an agreed-upon-consensual rating to assess products	3	Used for any creative product (e.g. poems, paintings, stories). No objective measurement but products compared to each other	[35]
Creative Product Assessment Model (CPAM)	Novelty, Resolution, Style	179	Products can be judged by expert and non-expert judges on a 55-item, bipolar adjective Liker scale. This tool collects information about consumer perception of existing products or services, or product concepts or protoyptes. Judges rate a product in three dimensions with high accuracy and consistence among various products of same type.	[12]
Creative Solution Diagnosis Scale (CSDS)	Relevance, effectiveness, Novelty, Elegance, Genesis	86	Products can be judged by expert and non-expert judges on a 30-item, 5-point Likert scale to indicate the degree to which the CSDS item applies to the given product. Developed in 2005 to measure functional creativity in engineering products, such as mousetraps, hands-free mobile phone holders etc.	[14]

To conclude: a number of rating scales and theoretical models are available to assess the creativity of a product, of which some are appropriated for technical products. Of these, the CPAM is the most widely adopted and is based on an empirical research foundation that spans thirty years. To the authors, the CPAM appeared intuitive as well as accessible to use. Hence the CPAM was selected as a departure point to explore the expectations of industry.

4 Research Approach

This section considers the approach used to answer the main research question of this study, namely: What are the expectations of industry experts regarding the functional creativity of information systems? Recall that this study reports on the first phase of a larger study with aim of comparing industry's expectations regarding creativity in the IT workplace to the way in which the functional creativity of students' capstone projects live up to expectations. We are very well aware that by narrowing the scope of creativity to the product this may skew results. However, in Section 1 we argued that by evaluating the functional creativity of a system developed by the students, we should get a good indication of the creative ability of the students. Since creativity is usually assessed by a panel of experts and in Phase 2 we want the students' creative abilities assessed against workplace expectations, a panel of judges is selected from the IT industry.

This study employs an interpretive philosophy to explore expectations of industry experts around functional creativity (which we believe is inherently subjective) in information systems. Interpretive research aims to understand the subjective meaning which people ascribe to a specific phenomenon [36, 37]. Data were collected through semi-structured and open-ended interviews with IT industry experts from a few IT industry sectors to explore their expectations of functional creativity in information systems.

4.1 Data Collection

Data were collected through interviews with IT industry experts selected from four IT industry sectors where IS graduates often start their careers, namely: Banking, Insurance, Software Development and Telecommunications. It was initially anticipated that the IT sectors may differ in their approaches to software development as well as their perceptions of creativity. Hence, a few prominent companies in each sector were identified and their IT managers (or the equivalent person overseeing the information systems design and development projects) were contacted to invite them to participate in the study. A requirement for inclusion was that the IT manager must have had more than five years' experience as a manager in the specific sector and more than 10 years' experience in the Information Systems development field. It was assumed that the selected IT managers would generally have expert knowledge in terms of systems design and development for their industry sector, as well as knowledge about the company's philosophy and strategy of software development. Of the people who were contacted and who met the requirements for participation, nine were available to participate: four people from the Software Development sector, three from the Insurance field, one from the Banking industry and one from the Telecommunications industry. The required processes of gaining consent and protecting identities were followed. Ethical clearance was obtained before conducting this study.

As can be seen, the sectors were not equally represented and the number of participants were too small to make sector specific conclusions. Hence, the sectors that the

respondents belonged to were captured during data collection and carried through to the data analysis for interest sake only (to see from which sector a comment originated).

Semi-structured face-to-face interviews were conducted with each IT manager to individually determine their perceptions and expectations of functional creativity in information systems. The CPAM was provided to each of the interviewees before the interviews commenced, so that they could familiarise themselves with it. Interview questions were based on the CPAM. The interviews included open-ended questions that also explored elements other than functional creativity that were regarded as important in information systems. All interviews were recorded and transcribed and notes were taken by the lead author.

The following questions were asked during the interviews:

a. Is it important for an information system to be functionally creative? Motivate your answer.
b. How important or valid is each of these components (of CPAM) in your industry sector? For example, how will you rate/weigh these components (novelty, resolution and style) according to importance?
c. Is there anything that you would like to add or omit from the CPAM?
d. Are there other elements in an information systems (software product) that you value more than functional creativity?

4.2 Data Analysis

The interview data were analysed and coded to identify any themes that relate to 1) the perceived importance of functional creativity in information systems, 2) comments and critique on the components of the CPAM and 3) other aspects considered more important than functional creativity of information systems [38]. The CPAM acted as guide in the analysis but themes unrelated to the CPAM also emerged. The interview summaries were sent afterwards to each interviewee to confirm that they agreed with the analysis and that the transcriptions reflected what was discussed during the interview [39]. This helped to reduce biases of the researchers, when they interpreted and analysed the data.

5 Findings

The expectations about functional creativity in information systems have been discussed with nine managers from the IT industry through an interview process. Below is a discussion of the responses for each interview question. The sectors that respondents belong to are indicated for interest sake only. Apart from question (b), sector specific analyses are not done due to the small number of respondents per sector.

a) Is it important for an Information System to be functionally creative? Motivate your answer.

The IT managers all responded that creativity is important in information systems development. One respondent mentioned the increasing importance of a creative system: "*Traditionally it was not important. The problem now is that you have customers who are beyond the point where they are not completely 'stupid' about the systems they want. They know what there is and they know what they can use. They don't want a system that is the same as a competitor. They want something unique to their environment. Thus, creativity in IS today is very important*". However, one IT manager in the Insurance sector mentioned that sometimes creativity in an information systems can have negative implications. The respondent mentioned that although a creative information systems is useful for innovation and moving forward, it can also be a "scary thing" if it becomes the standard in the organisation and management starts to expect that same level of functional creativity in all information systems. The respondent felt that such a standard becomes very difficult to maintain because functional creativity is "special and rare". These remarks from IT managers echo the sentiments voiced already in 1992 by [21]: "Behavioral research clearly shows that the native creativity of most individuals is constrained by the emphasis upon conformity in the U.S. educational process and by bureaucracy in the business world … In an era of scarce resources there is the potential of resurfacing this highly valuable resource - one that will hugely benefit the IS organization".

b) How important is each one of these components in your industry sector? For example, how will you rate/weigh these components according to importance: Novelty, Resolution and Style?

Table 3 provides a summary of the responses. During the interviews, the respondents were requested to prioritise each CPAM component (novelty, resolution and style) as 1, 2, or 3 to indicate its priority within their specific sector. A rating of '1' indicates that the specific CPAM component has the highest priority, where a rating of '3' means that the specific CPAM component has the lowest priority. A weight percentage was added by each respondent to provide a finer indication of each CPAM component's importance in their sector. The weight percentage of each component (novelty + resolution + style) adds up to 100%.

Table 3. The importance rating assigned to each CPAM component by interviewees.

		Telecoms	Banking	Insurance	Software development
Number of respondents		1	1	3	4
Novelty	Priority rating	3	3	3	3
	Importance	5%	5%	5-10%	5-10%
Resolution	Priority rating	1	1	1	1
	Importance	80%	80%	75-80%	50-80%
Style	Priority rating	2	2	2	2

	Importance	15%	15%	15%	15-45%

The responses are shown per industry sector. While there are not enough data to attach value to variations between sectors, it is interesting to note the consensus between respondents of the different sectors.

All respondents agreed that resolution has the overwhelmingly highest priority (up to 80%) with Style second and Novelty third. This corresponds with previous research findings regarding the importance of the resolution component of functional creativity, which is generally most highly valued among IT industry experts and novelty as the lowest when IS related products are considered [12, 15, 16, 18]. The managers all agreed that on most IS projects, the systems are already in place and that analysts basically follow a recipe to create the next version of a systems solution. It is only on rare occasions that there is the opportunity to really be creative and invent a truly novel product. Most interviewees agreed that whenever they have the opportunity to bring novelty into the product, their first priority is to be original rather than surprising. This also corresponds with previous research from Besemer [12], which stated that the surprising aspect of any creative product can shock people or consumers of the product so that they would rather avoid it.

The style element (15%) was rated by all respondents as the most important after resolution. Style was said to relate to the end-user in a visual way and creates the first impression about the information systems. A respondent from the Software Development sector stated that style is what sells an information system to the end-user; even if they discover at a later stage that the resolution of the system is lacking or not of the required standard.

(c) Is there anything that you would like to add or omit from the CPAM?

There were no IT managers who indicated that they wanted to remove components from the CPAM. In fact, when the interviewees were presented with the CPAM, some of them were pleasantly surprised and found this model very interesting because they had not considered creativity in this way before. Interviewees from the Software Development sector did however mention some aspects which might be considered further elaboration of the CPAM. These are:

- *User Experience* (for both customer and developer): Two interviewees mentioned that User Experience should be added to CPAM as a sub-component of *Style*; or should perhaps even have its own category.
- *System Integration:* One interviewee mentioned that CPAM lacks a component for 'integration'. The interviewee said that if a newly developed information systems cannot be integrated with other existing information systems, then it impacts functional creativity negatively.
- *Affordability and profitability*: If a system is not affordable for the client and profitable for the organisation, then being creative has no value.

(d) Are there other elements in an information systems (software product) that you value more than functional creativity?

All the IT managers indicated that while functional creativity in an information systems is great and important, there are other aspects or elements that are of equivalent value or are even more valuable than a functional creative system. These other aspects range from the people and development process aspects of the system, to the environment in which the creative information systems are being developed and can be categorised into the remaining of the four P's of creativity mentioned earlier. The discussion that follows present the findings according to the other three creativity categories namely People, Process and Press (environment). A summary of the findings is given in Table 4.

People.

The aspect that the Banking sector interviewee valued most important was the IS employees who need to develop the system. These employees needed to value quality: If a person values quality within everything they do, then it will transcend to everything else they do; including developing creative information systems. He added that 'happy' employees create more creative end products. Respondents from the Insurance sector appeared to share the views of the IT manager from the Banking sector. They mentioned the importance of attitude of IS personnel. IS personnel's lack of positive attitude towards any challenge or project can stand in the way of developing a creative system. The interviewee from the Telecoms sector mentioned the importance of staff's resourcefulness: "*How well does an engineer or software developer use what he has at hand to solve a problem. For me, that is resourcefulness – how he uses the building blocks around him to the best of his ability. This leads to the elegance of a solution. You can either build a solution that cost[s] a lot because you buy new components, or you can deliver a solution that makes use of what you already have within the company and deliver it under budget. This is a more elegant and efficient solution."*

Interviewees from the Software Development sector mentioned the importance of the skills and knowledge (both business and technical) of employees. It was stated that the challenge is not the development of a good creative information system, but rather the recruitment of good quality IS experts: if the right experts can be recruited, they will design the creative system that is required.

To conclude, the following people related traits were mentioned as important: people who value quality, attitude of IS personnel, resourcefulness of staff, as well as skills and knowledge.

Process.

The importance of the system development process was mentioned by interviewees from the Insurance as well as the Software Development sectors. There are different philosophies and methodologies when it comes to developing an information system. These include the waterfall methodologies (such as embedded in the SDLC) and Agile types of methodologies, such as Extreme Programming (XP) and Scrum. According to the interviewees' responses the choice in process, SDLC versus Agile, plays a large

role in the system being successful or unsuccessful. An iterative design process or agile methodology contributes towards a successful creative system that serves the needs and expectations of the end-user(s). An interviewee from the Software Development sector was of the opinion that a company cannot develop creative systems by continuously using the SDLC process.

According to an interviewee from the Insurance sector, change management processes should not be neglected. Change management helps to prepare the system users for the novelty aspect of the system. If this process is not in place, then system users easily reject the information system. The crucial role played by the requirements gathering process was also mentioned by a respondent from the Insurance sector. He said that the problem statement for the product development should be thoroughly and regularly interrogated rather than only accepted to perform the required actions. Without critical questions there cannot be a good quality creative product. The respondent further stated that IS personnel quickly develop tunnel vision about product development because they do not ask enough questions. This confirms findings by Robertson [40] and Nguyen and Shanks [41] that the requirements engineering phase is the most critical phase in the Systems Development Life Cycle (SDLC). A person from the Insurance sector added the aspect of system maintenance: If a creative information system is not well maintained after implementation, it becomes useless and then creativity means nothing and has no value for the organisation.

To conclude, the following process aspects were mentioned to be important: the system development process, change management, requirements gathering and system maintenance.

Environment (Press).

The importance of the environment for the development of a creative product was only mentioned by one respondent, who was from the Software Development sector. It was stated that if a manager cannot help his/her IS employees to be productive and give them the trust and freedom they need, systems analysts will not perform as expected, and trust is broken.

A number of interviewees (from the Software Development, Telecommunications and Banking sectors) mentioned the importance of reflecting and taking time to think about the problem to be solved. According to them it is important to have sufficient time in order to be creative: It is difficult to invent a creative product or solution if there is no time to really think about it. This refers to what Fromm said about creativity: "*daydream with a purpose*!" [6]. Their consensus view is that a good functional creative product implies that ample time was invested in understanding the problem and planning the system.

Table 4 below provides a summary of the aspects related to the other three Ps (process, people and press/environment) that interviewees mentioned as important.

Table 4. Important aspects other than functional creative information systems mentioned by different sectors

Aspect	**Examples**

Process	Agile methodology System maintenance Change management Requirements gathering process
People	Attitude of IS personnel Expert skills and knowledge Overcoming obstacles, resourcefulness People who value quality
Environment (Press)	Management style should foster creativity, freedom and trust. Contemplation, time to think

6 Discussion

It was determined that IT industry respondents from all sectors valued functional creativity in information systems, which confirmed previously established findings [16]. All respondents valued *Novelty*, *Resolution* and *Style* as the three main components of functional creativity, with *Resolution* being the most important factor. It was found that with tight budgets and timeframes the '*Resolution'* (logical, useful, valuable, understandable) aspect becomes the most important focus in the functional creativity framework, with *Style* and *Novelty* accordingly becoming nice-to-haves. This correlates with the findings from research conducted by [16] and [18] on the importance of '*Resolution'* in any functional product.

A surprising finding of this study was that the IT industry respondents valued other creativity factors or elements more so than a functional creative information system. Before the data was collected, it was assumed that of the four Ps of creativity (Person, Process, Product and Press) the functional creative information systems was the most valuable. The product, being the tangible result of the creative process, which was what brought the financial boost and competitive advantage. However, the other three Ps were found to be just as important and in some cases even more important than the functional creative product itself, according to industry. For example, people-aspects that were mentioned to be important are the traits of the person who develops the product, such as a love for quality and a can-do attitude, understanding the problem statement and reflecting on this problem before embarking on inventing the product solution. Process aspects mentioned as important included the user experience of the final creative information system, the maintenance and management aspects of the information systems when introducing it to the end-user, as well as the process and methodology used to develop the creative information system. A process aspects that was emphasised by respondents from all IT sectors was their belief that an agile methodology allows for better creativity in a creative information system than the typical SDLC methodology.

7 Conclusion

Creativity is a multi-dimensional concept which makes its operationalization and measurement a non-trivial matter. As IS educators, we believe the topic is important enough to investigate and started a number of investigationsWe hope to contribute is difficult to describe and evaluate. Creativity in IS is under-researched. The aim of this study was to investigate the expectations of industry regarding the functional creativity of an information system as IS product. The literature review investigated the evaluation of creativity in IS. Functional creativity was introduced as an appropriate measure, since it focuses on a tangible artefact and considers novelty as well as usefulness. In addition, functional creativity also alludes to the creativity of the developer behind the information system. In a search for instruments to evaluate functional creativity in IS Besemer's CPAM [12] was selected with its components of *Novelty, Resolutio*n and *Style*.

Data was collected from interviews with nine professionals within four different sectors in the IT industry to understand their expectations of functional creativity in information systems, and also to determine whether there were other aspects that were deemed more important to them than functional creativity.

It became apparent that participants from the IT industry values a good, functional creative information system according to the CPAM creativity components presented by Besemer [12]. However, the interview data also revealed that it is not good enough to only examine functional creativity when a typical information system product is analysed. The respondents explained that they are keenly appreciative of behind-the-scenes work. Industry professionals want to know more about the traits of the person who went through a process within a specific setting to develop the functional creative information systems. This shows that it is difficult to isolate the creative product from a creative process and the creative person who developed it. It was also evident that the user-experience and product maintenance after implementation affects the value and appreciation of a creative product.

A limitation of this study is that it involved only nine representatives from the four identified IT sectors. No doubt the involvement of more experts would have revealed more or even contradictory expectations. One implication of this study for the next phase is the limitation of evaluating information systems (the capstone projects of students) which is not implemented. From the interviews it is clear that the evaluation of the functional creativity of such systems is incomplete and will not give the full picture. This might imply adding aspects from existing creativity assessment instruments focusing on the creativity of individuals and/or groups.

This study makes a number of contributions. It contributes towards an understanding of what the IT industry expects and values when it comes to functional creativity in information systems; it fills the gap in literature to investigate the functional creativity of an information system and it is the first time that the CPAM is used in an interpretive study in IS. The study makes suggestions for expanding the CPAM to make it more relevant for application in IS. The study also contributes towards a better understanding for both industry and universities of what is expected from students and as such contributes towards the field of fostering creativity in IS teaching.

Future research should include representation from more IT industry sectors in the study and also more representatives (IT managers) from each IT sector to ascertain whether there are differences in their expectations and perceptions of functional creativity in information systems.

It is recommended that universities that offer IS degrees evaluate their curricula to ensure that efforts are being made to better prepare students for the reality of the IT industry's values. If it is true that the IT industry values other factors more than the creative end-product, then universities should help students to cultivate the necessary qualities. For example, is there enough focus within the curriculum to develop the necessary design skills to help students better understand the user experience of a creative information systems? Does the information systems design methodology allow for sufficient life cycle iterations to help students focus on bug fixes and incorporate new ideas with client feedback? Perhaps more companies need to get involved on a practical level with student projects at academic institutions to help students better prepare for their careers as inventors of creative system solutions. Despite the shortcomings of evaluating the creativity of systems not in the implementation phase (e.g. capstone projects), we believe that the next phase of the research will show whether some of the suggestions for teaching provided above, are already being implemented by IS educators. This, and additional suggestions will hopefully transpire from the evaluation by industry members of the creativity of the capstone projects of IS students.

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