Integrated Model of Innovative Competence

Nina Bozic Yams
School of Innovation, Design and Engineering
Mälardalen University, Eskilstuna, Sweden

Abstract

This conceptual article contributes to understanding of individual innovative competence by providing a comprehensive view of the concept, integrating different theories from innovation management into one model and linking it to the theory from studies of competence, where Illeris (2013) competence model is taken as the base. The contribution of this article is to fill the gap in existing innovation management theory where most researchers focus only on specific dimensions of innovative competence. The proposed integrated model of innovative competence was developed based on a systematic literature review, using the ISI Web of Knowledge database for Social Science domain between 1980-2016, and different combinations of words “individual” and “innovation” with terms “competence”, “behavior”, “skill”, “attitude” and “trait”, as search words. It shows how individuals need to combine different knowledge, personality traits, functional and interactive skills to demonstrate innovative behavior in practice. There is a certain ambidexterity or two-sidedness in the elements of innovative competence that enables individual to move between exploration of opportunities and generation of ideas on one hand, and implementation and exploitation of ideas on the other. The model can be used in different ways, both in teaching and in organizations. Teachers can use it as a reflection tool to increase understanding of innovative competence among students, but also as the basis for developing practice-based curriculum for strengthening innovative competence among students. Organizations can use the model both as a support in recruiting innovative talent, assessing and developing innovation as a core competence among employees, and when forming innovative teams.

Keywords: Innovative competence, innovative behavior, innovation skills, integrated model, systematic literature review

Introduction

This article proposes an integrated model of innovative competence on the individual level. Since innovation plays a central role in organizational competitiveness (Reuvers et al, 2008; Shalley et al, 2009), organization’s high innovation performance cannot rely anymore on a few select people working in R&D, but rather depends on engagement of everyone in organization across disciplines, functions, and levels (Trokhan, 2007; Abstein and Spieth, 2014). This means that innovative competence has become a core competence that is generic by nature and shall be integrated in everyday practice of employees. Several studies by different institutions have included creativity and innovation on their lists of core skills and competences, for example the OECD (2005), the EU (2006), the Danish Ministry of Education (2005), the UKCES employability skills (2009), 21st Century Skills (Binkley et al, 2010), and Transferable 21st
Century Skills (Pellegrino and Hilton, 2012). As such, innovative competence shall be part of the curricula in higher education (Vila et al., 2012; Borras and Edquist, 2015) as well as practiced in all types of business and other kinds of organizations (Rässänen et al., 2015). In line with this trend there has been a rise of related concepts in innovation management, such as employee-driven innovation (Høyrup, 2010) and practice-based innovation (Ellström and Nilsen, 2014), discussing the importance of distributed innovation, which is driven both bottom-up by employees and supported top-down by management, and rather than being a separated process or function, becomes integrated in the daily practice of all employees.

The challenge is, though, that there seem to be no clear agreement on the definition of innovative competence in the current literature (Zhang et al., 2013) since different researchers focus on highlighting only specific aspects of the phenomena. This is not surprising because competence is in itself a complex concept that lacks a common definition agreed upon by researchers in the field (Illeris, 2013). Second, innovation is an interdisciplinary field of study on the crossroads between psychology, sociology, economics, engineering, and organizational theory (Ford, 1996) where many different perspectives meet. The innovation management field has also developed in time and similarly to studies of leadership ideas around innovative competence have changed from focusing on the individual psychological traits and attitudes of innovators (Amabile, 1983; Cerinsek and Dolinsek, 2009; Nanda and Singh, 2009) towards looking more at the functional skills for innovation (McGourty et al., 1996; du Chatenier et al., 2010; Dyer et al., 2011), and recently starting to pay more attention to the interactive skills needed to practice innovation in teams and in more complex collaborative networks (Hargadon and Bechky, 2006; Darsø, 2012; Bissola et al., 2014). A holistic perspective that integrates these different aspects of innovative competence and gives an overview of fragmented bits and pieces of research proposed by different researchers is thus needed.

From the systematic literature review it can be observed that the term innovative work behavior (Scott and Bruce, 1994; De Jong and den Hartog, 2010) is used more commonly than innovative competence. The term refers to behaviors that are at the core of practicing innovation, such as identifying opportunities, generating ideas, finding support for ideas and implementing them (Kanter, 1988; Janssen, 2001; Abbas and Raja, 2015). These specific innovative behaviors are crucial because they can be observed and can indicate the level of innovative competence performed by an individual but they are not in themselves competences (Hayton and Kelley, 2006). When trying to understand what influences individuals’ ability to perform a specific activity in professional context and how we can improve that ability it might be more adequate to use the concept of competence, because the term behavior is rather broad and relates to individual’s actions in general. Competence, on the
other hand explains what **knowledge, skills and personal characteristics enable an individual to perform a specific task or activity in practice.** Although different authors might define competence in various ways, most of them would include the above mentioned elements in their definitions (Illeris, 2013). So if innovative competence shall be developed as a core competence among students and employees across sectors, a more holistic understanding of personal characteristics, knowledge and skills that influence innovative competence is needed as a basis for developing educational and professional training programs in this field. While the positive aspect of competence is that it can be changed and developed through training and practice, it has to be observed that only training individuals to improve their innovative competence will not necessarily result in innovative performance if other external innovation enablers, such as leadership, culture, and infrastructure for innovation in organizations are not in place (Smith et al, 2008; Nanda and Sigh, 2009; Crossan and Apaydin, 2010; Brem et al, 2016).

Another argument that speaks in favor of a need for an integrated model of innovative competence is that one of the latest state-of-the-science reviews on innovation and creativity in organizations (Anderson et al, 2014) suggests there is a general lack of conceptual development pieces proposing new theories and models in the field. Furthermore, Vila et al (2014) argue that the literature sheds hardly any light on the competency profile of innovators, which would give a broader picture of diverse aspects of individual innovative competence needed for people to take part in innovative activities at the workplace. As Zhang et al (2013) underline, the fact that researchers are in little agreement in defining and understanding what is meant by innovative competence might hinder students and practitioners in developing their innovative competence and teachers and trainers in supporting them to do so.

The contribution of this article is thus a proposed integrated model of individual innovative competence, which is based on a systematic literature review. It explains in more detail what kind of knowledge, skills and personal characteristics influence innovative competence, presenting them through intrapersonal, interpersonal and content dimensions of innovative competence, drawing on Illeris (2013) ideas about competence. The model of innovative competence presented in the article is characterized by two-sidedness or ambidexterity, which supports individual to continuously move between the more creative side of practicing innovation by exploring new opportunities and generating ideas, and more exploitative side of innovation, championing and implementing novel ideas and thus creating value out of them.

The model can be used by educators both as a reflection tool to increase understanding of innovative competence among students, but also as the basis for developing practice-based curriculum for strengthening students’ innovative
competence. On the other hand, organizations can adopt the model when recruiting innovative talent to help them understand better what kind of knowledge, skills and personal characteristics they should look for. Organizations can utilize the model also to support employees when reflecting upon and assessing their current innovative competence, and identifying opportunities for improvement. Furthermore, the model can be applied as a basis for developing practical training programs for strengthening different aspects of innovative competence among employees. Due to its integrative nature that makes the model quite complex it can be applied as well to form innovative teams, making sure that different skills, which influence innovative competence and could be hardly possessed in their totality by each individual, are covered by different team members.

The article provides first a theoretical framework behind the concepts of competence and innovation that were used as a base to perform the systematic literature review. The methodology of the research process is explained and results summarized in the model of individual innovative competence. Applications for practice and theory are discussed, and limitations and future research questions suggested.

Theoretical background

Competence model

Since the term competence is addressed in different ways by researchers in the innovation management field (Zhang et al, 2013), often discussing only specific dimension of competence, a framework defining competence is proposed first to clarify what the author refers to when using this term. Illeris (2013) has done an encompassing review of concepts in the competence field and tried to synthesize and visualize them in a “competence flower” (p. 61) that can be seen in Figure 1. The complexity of elements in his model shows multidimensionality of the competence concept in general.

Illeris divided his competence flower in two layers of petals that represent key elements of competence as seen in Figure 1. The inner layer synthesizes those elements that are relatively common also in other definitions of competence, such as knowledge, skills and personal characteristics. But he suggests that these elements are not enough to be competent in any area of work today when we operate in an increasingly complex and fast changing environment. One needs to develop another set of abilities that will enable her to act competently not only in known situations that can be defined in advance but also in unknown situations that she has never been in before. This is why Illeris added another outer layer of petals to his competence flower, which represent the elements that are usually not systematically mentioned in other competence definitions but help individual practice her competence also in new situations (ibid.) These are:
The above elements are very close to innovative competence itself and will be integrated in more detailed definition of innovative competence in the continuation of the paper. They support the argument of this paper that innovation has become a generic part of being able to act competently in any field of practice. But if the innovative aspect of competence is put aside for now, what are the other core dimensions of competence?

In figure 2 the other elements from Illeris’ competence flower are summarized in a simpler framework for the purposes of this article. In the corners of triangle there are different elements that an individual needs to combine to be able to act competently in practice, which is at the center of the competence framework. The supporting elements are organized in three dimensions: the
content, intrapersonal and interpersonal dimensions.

Figure 2. Competence framework, developed based on Illeris’s competence flower (2013, p. 61).

The intrapersonal dimension of competence is represented by person’s attitudes, personal profile, holistic engagement of both intellectual and emotional aspects of self, and abilities to act autonomously, making competent judgments and decisions in concrete situations. The second dimension is the content dimension of competence, which includes the specific knowledge, functional skills and structural understanding of the field in which the competence is practiced. Since competence is often used in interaction with other people in practice, the interpersonal skills of sociability and collaboration are also a crucial dimension of any competence, which can be called the interpersonal dimension. The ability of individual to combine elements of these different competence dimensions result in competent behavior demonstrated in practice. Or as Hayton and Kelley (2006) suggest, and individual will act competently when she can combine “the knowledge required to achieve a given outcome, the skills to implement that knowledge, and the personality characteristics required to motivate the implementation of the knowledge and skills to achieving a desired outcome” (p. 410). So called practice or ability to use one’s capacities, dispositions and potentials to act in concrete situations is thus at the core of any competence (Illeris, 2013) and is therefore placed in the center of the competence framework in Figure 2.

It is important to notice, though, that individual’s development and practice of any kind of competence is influenced by the context in which she works. As
Illeris (2004) proposes, different aspects of work environment, like the technical and organizational aspects on one hand and the social-cultural aspects on the other hand will influence how the competence is developed and used in practice. There is a dynamic process going on between the content of the learning, the individual’s personal attitudes and traits that drive individual’s learning dynamic, and her interaction with environment in which she develops and practices her competence through interaction with others (ibid.). Investing in training employees to develop their innovative competence is thus not enough to achieve high innovation performance, if other enablers for innovation, such as leadership, climate, and infrastructure for innovation (Smith et al, 2008; Nanda and Sigh, 2009; Crossan and Apaydin, 2010; Brem et al, 2016) are not in place. Infrastructure for innovation can include a wide variety of elements, such as innovation strategy (Crossan and Apaydin, 2010; Nybak et al, 2011), a systematic idea management system (Bessant, 2005; Crossan and Apaydin, 2010), tools and methods for creative thinking (Brem et al, 2016), material and financial resources for innovation (Smith et al., 2008; Nanda and Sigh, 2009; Crossan and Apaydin, 2010), HR policies to recruit and retain creative talent (Chadwick and Dabu, 2009; Searle and Ball, 2003), the design of workplace (Leonard-Barton and Swap, 1999; Schaeffer, 2014), and strong external networks (Panayides, 2006; Romero and Molina, 2011).

Practice-based and ambidextrous nature of innovative competence

Castañer’s (2016) recent review of the creativity and innovation field problematizes the overlap between the terms creativity and innovation, which needs to be clarified to be able to distinguish between creative and innovative competence, and understand the two-sidedness or ambidexterity of innovative competence. He proposes that if newness is a central attribute to both creativity and innovation, innovation differs essentially from creativity because it refers to actually using a new idea to materialize or implement a new process, product, or service (ibid.). Creativity should not be limited only to ideas considered to be potentially useful, as it is the role of other activities in innovation processes to determine usefulness of ideas through evaluation, selection and application (ibid.). Practicing innovation thus involves the ability to combine creativity, which enables exploration of new opportunities and generation of novel ideas on one hand, and the ability to produce or adopt these ideas and implement them on the other (Van de Ven, 1986; Scott and Bruce, 1994). It could be said that innovation in this way puts individual in a conflicting situation, on one hand challenging her to think creatively when solving problems, but at the same time requiring solutions that can be implemented considering organizational constraints (Sok and O’Cass, 2015). Several researchers have suggested that creativity involves primarily intrapersonal cognitive processes, while the implementation of ideas often depends on interaction and collaboration of several people (Anderson et al, 2014; Bissola et al, 2014). This supports the idea that a combination of intrapersonal and interpersonal dimensions of
competence will be crucial for practicing innovation. Nevertheless, since innovation is a rather messy and iterative process (Paulus, 2002; Anderson et al, 2014), in which an individual will have to be able to cyclically shift between more explorative and exploitative mode or even use them simultaneously, it will be probably hard to isolate certain elements of innovative competence that are important for a specific stage of innovation process. Contrary to a common belief that creativity is only important in initial phases of innovation processes, Castañer (2016) suggests that creativity should refer to generation of new ideas in any phase of innovation process. Consequently, it is suggested that what is at the core of individual’s innovative competence, is some sort of ambidexterity or two-sidedness, which enables individual to seamlessly move between diverging and converging, deconstructing and reconstructing, exploring and generating ideas on one hand and implementing and exploiting them on the other throughout the innovation process. To do so, a person will have to combine different elements of content, intrapersonal, and interpersonal dimensions of innovative competence, which will result in individual’s innovative practice.

In this article the expression “innovative” rather than “innovation” competence is used because the focus is on the process of continuously innovating in everyday work routines rather than on the result - innovations in the form of new products and services. It is suggested that if organization builds innovative competence as a way of thinking and acting in daily work of all employees, the result will be also innovations in different forms. The focus on innovation as part of everyday work routines suggests that innovation is not just a top-down driven idea management system that is organized through sporadic creative workshops and idea competitions and seen as a separate function and process in organization but is more a way of being at work for all employees. Every employee then needs to develop her own innovative practice through learning and experimentation in daily work routines, and focus on developing those elements of innovative competence that are needed in her specific work context and role in each point of time. Innovative competence thus stresses the practice-based aspect of innovation and is understood as a dynamic concept that changes in time through practice and learning.

Methodology

Following a structured process of performing a systematic literature review (Webster and Watson, 2002) several stages were performed. First a few steps to collect and organize data, and then some further actions to perform data processing and analysis (Crossan and Apaydin, 2010). The ISI Web of Knowledge database for Social Science domain was chosen because in this way only peer-reviewed journals with validated knowledge would be considered (Podsakoff et al., 2005). Since not only the term “competence” is used in relation to individual innovative competence in the literature, different combinations with words “individual” and “innovation”, such as “competence”, “behavior”, “skill”,...
“attitude” and “trait”, were used as search words. The search was performed for the period between 1980 to 2016 (4 February) and resulted in 5.279 hits. From all the 5.279 titles read, 236 were identified as potentially relevant. Many titles that were discarded in the first step of selection were related to specific health-care issues, in which the term “individual behavior” of patients was often used. In the next phase, after reading all the 236 abstracts, 94 articles were chosen for further analysis. Many articles that were excluded in this phase were somehow related to innovation, creativity or entrepreneurship but did not discuss relevant issues for individual innovative competence. 70 out of selected 94 articles were available in the online databases, downloaded and read in-depth. They were analyzed in two ways. On one hand by looking at the relevance of the content of each article for innovative competence field in general. On the other hand, the model of innovative competence with content, intrapersonal and interpersonal dimensions presented in theoretical background of this article was used as the basis for analysis. A detailed database was built to show in a systematic way which elements of innovative competence referring to which dimensions (content, intrapersonal and interpersonal) were discussed in each article, how many times each element was mentioned in total, what was the main focus of each article, the key terms used in relation to innovative competence, and finally, the year and journal in which each article was published.

After performing the analysis, the abstracts of those 24 articles out of 94 selected articles that were not available in the online databases were read again, trying to see if they could add something to the current analysis. Only one article seemed to be contributing something new, and was thus ordered separately and added to the analysis. Based on the in-depth analysis of the 71 selected articles and the competence framework presented in theoretical background, an integrated model of innovative competence was built. Other texts were used in the process to see if something was missing in the analysis and for developing argumentation and discussion of the article. The additional texts were either found as references in the articles gathered through the systematic literature review, recommended by other researchers or read by the author prior to doing the systematic literature review.

<table>
<thead>
<tr>
<th>Database</th>
<th>ISI Web of Knowledge database (Social Science domain)</th>
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<tr>
<td>Period of search</td>
<td>1980 to 2016 (4 February)</td>
</tr>
<tr>
<td>Search words</td>
<td>“individual” and “innovation” in combination with “competence”, “behavior”, “skill”, “attitude” and “trait”</td>
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<tr>
<td>Step 1</td>
<td>5.279 hits in total</td>
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<td>Step 2</td>
<td>236 articles selected based on the relevance of their titles</td>
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<tr>
<td>Step 3</td>
<td>94 articles selected based on the relevance of their abstracts and scanning of the content</td>
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Results
The overall analysis of articles shows that the term “innovative behavior” is the most commonly used term across literature, while the words “competence” or “competency” are used less often. This is not surprising since innovative behavior is the most observable and thus probably also the most easily measurable part of innovative competence (McGourty et al, 1996). But while the ability to act in certain ways is necessary to practice innovation, it is important to understand what kind of knowledge, skills and personal characteristics drive and enable these actions, and this is what the concept of innovative competence can explain.

Exploring new opportunities, generating, promoting and implementing novel ideas are the kind of actions that are central to practicing innovation, and in this sense some sort of common denominator of innovative competence across the field of innovation management. On the other hand, there is a great variety of elements that different researchers discuss and can be related to other dimensions of innovative competence. Out of 71 articles included in the in-depth analysis, 51 of them discussed at least some element of intrapersonal, content or interpersonal dimensions of innovative competence. 32 articles included elements connected to personal attitudes and traits that stimulate innovative behavior (intrapersonal dimension), 25 articles the knowledge and functional skills related to innovation (content dimension) and 24 the interactive skills for innovation (interpersonal dimension). Correspondingly, the number of different elements mentioned within the intrapersonal dimension was highest (26) and lower for the content (15) and interpersonal (16) dimensions. From the articles in my literature review it can be observed that debate around personality traits and attitudes of innovators is still prevailing, while the discussion of functional and interactive skills related to innovation is gaining importance. An increased amount of articles discusses also other team and organizational factors that influence individual’s innovative competence.

<table>
<thead>
<tr>
<th>Discussing which dimension of innovative competence</th>
<th>Articles part of in-depth analysis</th>
<th>Number of different elements discussed within each dimension</th>
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<tr>
<td>71 (total)</td>
<td></td>
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<tr>
<td>Intrapersonal/content/interpersonal dimensions</td>
<td>51 (72%)</td>
<td></td>
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<tr>
<td>Personal attitudes and characteristics (Intrapersonal dimension)</td>
<td>32 (45%)</td>
<td>26</td>
</tr>
</tbody>
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The variety of journals discussing relevant issues around innovative competence shows the multidisciplinary aspect of research in the innovation field. 34% of articles were related to management, organization and leadership journals, 30% to creativity and innovation journals, 8% to psychology, 8% to HRM, 6% to marketing, and the rest of 14% to entrepreneurship, education, hospitality and policy journals. A more detailed analysis of journals in which the 51 articles included in the in-depth analysis that discussed some element of intrapersonal, content or interpersonal dimensions can be seen in Figure 5.
Figure 5. Analysis of journals in which 51 articles discussing the three dimensions of competence were published

Innovative practice
As mentioned earlier, the core of individual’s innovative competence is to be able to combine a variety of personal characteristics and attitudes, knowledge,
functional and interpersonal skills to act in an innovative way in practice. Researchers use slightly different terms when defining which these innovative actions are, but most of them refer to the typical stages or core activities performed in the innovation process, including idea or opportunity exploration, idea generation, idea championing or promotion, and idea implementation or realization (Kanter, 1988; Scott and Bruce, 1994; Janssen, 2001; de Jong and den Hartog, 2010; Abbas and Raja, 2015).

Idea exploration relates to ability to perceive a situation and become aware of an opportunity, recognizing problems or needs for improvement (Vila et al, 2012). It is about exploring how to improve current products, services or processes or trying to think about them in alternative ways (e.g., Kanter, 1988; Farr and Ford, 1990; Basadur, 2004). Idea generation is the next aspect of innovative behavior where the key is to access, combine and reorganize knowledge from different sources in new ways to find innovative solutions to problems (Hayton and Kelley, 2006). Once ideas have been generated, they need to be promoted in order to gain support for further development. Convincing others about the benefits of ideas and overcoming the usual resistance to change are crucial part of idea championing. Inspiring and enthusing others, building coalitions, being persistent and getting the right people involved are also essential (Howell et al, 2005; Hayton and Kelley, 2006; Reid et al, 2014). Once the ideas have support, they need to be implemented. For idea implementation one needs to gather the resources, but also engage with considerable effort, result-oriented attitude, testing and modifying new products and processes to then make them part of the regular work processes (Kanter, 1988; Kleysen and Street, 2001; Hayton and Kelley, 2006). The four key activities that are part of innovative practice are demonstrated in Figure 6.
It is important to acknowledge that innovation is rather discontinuous in its nature, which means that individuals “can be expected to be involved in any combination of these behaviors at any time” (Scott and Bruce, 1994, p.582). So even if specific innovative activities are often associated with specific phase of innovation process, for example creativity or ability to generate new ideas with the initial phase of innovation process, they are important throughout the process (Castañer, 2016). This is supported also by the researchers of innovative work behavior who found strong correlations between different aspects of innovative behavior in their measurements, and concluded that different items are best combined and used as a single additive scale instead of separating the items (Janssen, 2000; Kleysean and Street (2001); Krause (2004); Dorenbosch et al. (2005); de Jong and den Hartog, 2010). For this reason the article does not suggest to identify specific combinations of attitudes, knowledge and skills needed for each innovation process phase or innovative activity but rather defines the set of core attitudes, knowledge and skills that can be combined in a number of ways to practice innovation, depending on specific situation, people, and needs involved. It is important to underlie, though, that in order to fully understand the innovative practice we need to understand also the intrapersonal, content and interpersonal dimensions of innovative competence as they do not exist without each other.

Intrapersonal dimension
Individual’s personal attitudes and traits are still the most discussed aspect of innovative competence. Even though this is the dimension of innovative competence that is the hardest to influence (Munoz-Doyague et al, 2008) and in itself does not necessarily guarantee individual’s innovative performance,
Personal characteristics and attitudes can serve as a powerful driver of innovative behavior (Balau et al, 2013). The ability to recruit innovative people, and then stimulate and nurture innovative attitudes and traits among employees is thus important for organizations that want to build innovative culture (Cerinsek and Dolinsek, 2009; Nanda and Singh, 2009). In the systematic literature review, 26 different elements of the intrapersonal dimension of innovative competence were identified. They were then grouped and distilled to ten most relevant elements that are included in the model and can be seen in Figure 7.

**Figure 7. Key elements of the intrapersonal dimension of innovative competence**

Individually’s ability to act autonomously, making competent judgments and decisions in concrete situations, is one aspect of the intrapersonal dimension of innovative competence (Amabile, 1986; Woodman et al, 1993; Ford, 1996; Mathisen et al, 2008; Abstein and Spieth, 2014). In order to be able to act autonomously, individuals need to have freedom over allocating their time or determining how their work is done (Shalley and Gilson, 2004). They also need to feel confident in that they can fulfill a task (Abstein and Spieth, 2014). Self-confidence is thus another important element that helps individual to share her own views and ideas, and act autonomously despite of the barriers and opposition she might encounter in the innovation process. A commonly discussed concept in the literature that can strengthen self-confidence is self-efficacy, since individuals who are able to use their strengths experience positive feelings and as a consequence feel more confident in performing also non-routine, creative tasks (Bandura, 1997). The next element that is crucial for
innovative competence is individual’s intrinsic motivation (Amabile, 1993; Woodman et al, 1993; Munoz-Doyague et al, 2008; Chen et al, 2011). Individuals are intrinsically motivated when they are interested in what they do, emotionally engaged, can satisfy their curiosity and are challenged at work (Amabile, 1993). Being intrinsically motivated also helps persist towards goals and deal with ambiguity (Abbas and Raja, 2015). Persistence or resilience is as well a helpful trait in innovation to fight different challenges on the way towards implementing ideas, like the bureaucratic hurdles, people’s resistance to change etc. (Walter et al, 2011; Moenkemeyer et al, 2012). Openness, on the other hand, is connected to the need to enlarge and examine experience (McCrae, 1996) and thus supportive in exploring and generating ideas. It is seen in vivid fantasy, depth of feeling and is closely related to other two elements of intrapersonal dimension of innovative competence – flexibility and intellectual curiosity (ibid.). Flexibility means that one can easily adapt to changing circumstances and has a high tolerance for ambiguity (Mathisen et al), while curiosity is connected to motivation for learning new things and often a wide variety of interests (du Chatenier et al, 2010; Zhang et al, 2013). Risk taking is a classical characteristic of innovators (McGourty et al, 1996; Chen et al, 1998; Fairlie and Holleran, 2012) and in combination with the need for achievement or strong desire to fulfill goals helps individual to not only explore but also implement new ideas (du Chatenier et al, 2010; Räsänen et al., 2015). Intuition is the last element of intrapersonal competence dimension in the model since it helps making decisions and act quickly even in complex and unknown situations when one needs to deal with high ambiguity (Chen et al, 2011; Illeris, 2013; Hodgkinson and Healey, 2014).

From the ten above described intrapersonal elements of innovative competence one can see the ambidexterity or two-sidedness that is needed to practice innovation. On one hand, some of the intrapersonal elements are more closely related to opening up, exploring and generating new ideas by being open to new experience, curious, flexible, autonomous in views and emotionally engaged. On the other hand, there are intrapersonal elements that can help individual converge and move forward towards implementation of ideas in innovation process, using self-confidence and intuition to deal with uncertainty and make decisions, daring to take risks and push ideas further by being persistent despite of the obstacles on the way, and using the need for achievement as a driver to reach goals and realize ideas.

Content dimension

The next dimension of innovative competence is the content one, which encompasses the knowledge, functional skills and the structural overview of the field. In the systematic literature review 15 different elements of this dimension were identified, and then grouped down to ten most relevant elements, which are included in the model and depicted in Figure 8.
If one shall be innovative in their own field of practice, it helps to have some domain-relevant expertise, factual knowledge and technical skills (Ford, 1996; Obstfeld, 2005; Mack et al, 2008; Chen et al, 2011). The wider the experience and expertise is, the greater is the number of different possible alternatives to produce new combinations of how the work is done or a problem solved (Amabile, 1997). On the other hand, in order to not get trapped within the standard solutions in one’s own field of practice, it helps if an individual possesses also a wide variety of interests outside of her profession, which enables her to combine her domain relevant knowledge with heterogeneous knowledge from other fields (Steiner, 1998; Hayton and Kelley, 2006; Trokhan, 2007; Huang and Liu, 2015). Another two ambidextrous functional skills of innovative competence are on one hand divergent thinking, which is needed to generate new ideas (Woodman et al, 1993; Munoz-Doyague et al, 2008; Chen et al, 2011) and on the other hand convergent thinking, which helps individual to move towards selecting and implementing ideas (Woodman et al, 1993; Backström and Söderberg, 2015). Divergent thinking is a cognitive style that favours breaking from cognitive schemes, exploring new paths, delaying judgment and keeping options open (Amabile, 1988, p.131). It helps individual seeing things from many different perspectives (Reid et al, 2014) and generating alternative solutions to a problem (Ford, 1996).
Associational thinking is also a crucial element of innovative competence (Hayton and Kelley, 2006; du Chatenier, 2010; Bissola et al, 2014) and is connected to the “ability to make surprising connections across areas of knowledge, industries, and even geographies” (Dyer et al, 2011, p. 41). It is about combining ideas, objects, technologies, and disciplines in new ways, using fantasy and playfulness to come up with new solutions (Mathisen et al, 2008). The next two elements of the content dimension of innovative competence that are closely related are reflection (Hargadon and Bechky, 2006; Trokhan, 2007; du Chatenier, 2010; Hodgkinson and Healey, 2014) and questioning or challenging behavior (McGourty et al, 1996; Burch et al, 2008; du Chatenier et al, 2010; Dyer et al, 2011). Reflective skills enable individuals to reconsider their experience and re-evaluate actions, learning from mistakes and changing their behavior patterns (Benammar, 2004). The goal of reflection is to gain new insights, make sense out of things and gain a new level of understanding (ibid.), which can help reframe problems (Hargadon and Bechky, 2006) and evaluate ideas in innovation process. Questioning skill on the other hand means that one often challenges status quo and the underlying assumptions about individual, team, organization and society by posing the “why” and “what if” questions that are helpful to understand the deeper roots behind things (Dyer et al, 2011, pp. 65-89). In that sense it is close to reflection. Questioning or challenging behavior means also having a critical perspective and being ready to show resistance against the mainstream or dominant power structures (Illeris, 2013, p.57) in order to realize new ideas.

Another functional skill of innovation is observation (Dyer et al, 2011), which helps to be attentive to detail (Sok and O’Cass, 2015) and perceive new opportunities in the business environment (Wang et al, 2013). Observation skill includes both intense observation in novel situations as well as ordinary encounters and it often engages multiple senses (Dyer et al, 2011). It is about actively observing the world around, listening, seeing and noticing what is different and surprising. It could mean observing customers, market trends or society in general (ibid.). Experimenting is also a typical skill of innovators (McGourty et al, 1996; du Chatenier et al, 2010; Trokhan, 2007) and includes both mental and physical exploration. Mental exploration could be for example related to research and reading information from different kinds of sources, while the physical exploration is related to taking things apart and testing new things in practice (Dyer et al, 2011). It is about making continuous experiments, like building fast prototypes, and learning through trial and error (ibid.). Last but not least, the problem solving skill is as well an important element of innovative competence (Zhang et al, 2013) and helps innovators to focus their experimenting on finding solutions to relevant problems.

Elements in the content dimension of innovative competence also reflect the two-sidedness of innovative competence. Some of them help individual to open
up perspectives, notice and try out new things, generating and combining ideas in unexpected ways, using observation, divergent and associational thinking, experimenting and heterogeneous knowledge. On the other hand, there are elements that will help individual evaluate and further develop ideas, focus on the solution and move towards exploitation of ideas, like the expertise, problem solving skills, reflection, convergent thinking and critical perspective.

**Interpersonal dimension**

The last dimension of competence is the interpersonal dimension, which includes individual’s skills to connect and collaborate with others in different ways that are important in innovation work. The research in innovation field shows that most challenges which organizations face today are too complex to be solved by individuals alone, which is why innovation work is often performed by mixed groups of people that can contribute with a variety of backgrounds, knowledge, skills and personal characteristics. From the systematic literature review an increased number of articles that look at how innovation happens through interaction in teams (Janssen et al, 2004; Hargadon and Bechky, 2006; Bissola and Imperatori, 2011; Jiang and Zhang, 2014; Saad et al., 2015) can be seen. 15 different elements or interactive skills were identified for the interpersonal dimension of innovative competence in the literature review. They were then grouped and formed into ten most relevant items that are included in the model and can be seen in Figure 9.

The most common interactive skill for innovation mentioned in the literature is **networking** or the ability to build networks of relationships with people from a variety of disciplines, industries and functions that can be a source of relevant ideas, knowledge and resources in innovation (Obstfeld, 2005; Walter et al, 2011; Reid et al, 2014; Akhavan and Hosseini, 2016). **Sharing** information, knowledge, good practices and even mistakes is another skill that increases individual’s innovative competence (Kim and Lee, 2013; Bissola et al, 2014; Mura et al, 2014; Akhavan and Hosseini, 2016). As Obstfeld (2005) interestingly observed in her field work, innovators possess a wide variety of tools that help them articulate knowledge to make it more explicit and share it with others, such as metaphors, analogies, stories, informal sketches, perspective taking and even humor (p. 124). Another connected interactive skill is the ability to give and ask for **feedback** or help (McGourty et al, 1996; Hargadon and Bechky, 2006; Santandreu-Mascarell et al, 2013; Huang and Liu, 2015). Group reflection through feedback will help the group form a common agreement on things, prioritize and synthesize ideas, and move forward towards idea implementation.
Furthermore, skills like sensitive listening (Steiner, 1998; du Chatenier, 2010; Bissola et al, 2014), trust building (du Chatenier, 2010; Akhvan and Hosseini, 2016) and empathic communication (McCrae, 1996; Steiner, 1998; du Chatenier, 2010; Bissola et al, 2014) also strengthen individual’s ability to connect and collaborate with others while innovating. Listening helps individual to hear not only her own voice but also the voices of others that can contribute with new ideas and relevant experiences. Empathic communication strengthens social ties and collaboration with others by understanding them from their point of view and making them feel accepted and understood. This supports building an atmosphere of mutual trust and appreciation, which is important in innovation (Akhvan and Hosseini, 2016), where one often works in mixed groups of people with very different backgrounds and interests. The abilities to listen, build trust and be empathic also support another important element of the interpersonal dimension of innovative competence – namely improvisation. Improvisation is the ability to respond to unexpected events where individual needs to combine intuition, creativity and work tasks in an instant action to respond in unpredictable and unknown situations that are part of innovation process (Nisula, 2015). Improvisational attitude means that one must be present to be able to respond instantly to others’ proposals, saying “yes, and...” build further on them (Sawyer, 2000). Improvising will help the group to not over-rely on schemas and set patterns of thinking but to break away from them to create something new through collaborative effort (Lewis and Lovatt, 2013). As Vera and Crossan (2005) suggest, improvisation enables people to creatively adjust to
unexpected changes in innovation process and push products and services towards implementation. Because innovating often demands collaborating with people that can contribute with different perspectives, negotiation and conflict management are also important skills of innovative competence (Ancona and Caldwell, 1992; Janssen et al, 2004; du Chatenier, 2010). Conflict management helps innovative employees prevent escalations of dissent and dissatisfaction with others who might resist ideas (Janssen et al, 2004). On the other hand, innovators can use this skill to stimulate constructive conflicts resulting in integration of different perspectives and interests needed to implement innovative ideas (ibid.) And last, in order to move ideas further towards implementation, one needs as well the capacity to mobilize other people that can help provide ideas and resources for realizing innovations (Hayton and Kelley, 2006; Vila et al; 2014).

Coming back to the ambidexterity aspect of innovative competence model, I suggest that the above presented interactive skills will help individual collaborate better with others when practicing innovation and support her to find a balance between having her own autonomous voice and integrating with the group to converge on ideas and push them towards implementation through a collaborative effort. As Hazy and Backström (2013) suggest, moving between dualities of autonomy-integration, divergence-convergence, and exploration-exploitation is crucial for innovation processes in groups (ibid.). A good balance between these aspects will lead to self-organisation, which will help the group to adapt and transform when needed to achieve a better innovation output (Backström and Söderberg, 2015).

**Integrated model of innovative competence**

In Figure 10 all the elements presented earlier within separate innovative competence dimensions are integrated in a one model.

The proposed model is not a recipe to prescribe all the knowledge, skills and personal attitudes and characteristics that one should possess in totality to be competent in innovation. It is rather a map of many elements that, combined in different ways, can drive innovative behavior. A person should be able to combine at least some of the elements from content, intrapersonal and interpersonal dimensions to be competent in practicing innovation. But depending on the context of individual’s work, her role and needs in career development, different elements might be of greater importance to focus on for the individual to practice innovation. For example, people who have worked in a static and rule-based environment for a while might perceive the need to strengthen the creative aspect of innovative competence as crucial, developing the skills like divergent, associational thinking, and experimentation. But if they are working in a very dynamic, short-term performance-driven organization with many change projects constantly in place, they might feel they should pay more
attention to reflection, feedback, and knowledge sharing to learn from mistakes and become better at utilizing knowledge and prioritizing which new ideas and projects are worth investing in. On the other hand, if individuals are in the beginning of their career, they might feel the need to strengthen self-confidence and expertise knowledge in the field first to be able to come up with innovative solutions, while experts with long-term experiences might think that in order to not get stuck in routine ways of solving problems, they need to awaken curiosity for other fields of knowledge and strengthen networks beyond their own profession to be able to innovate. Since it is common that innovation teams engage both individuals who are strong on the explorative and divergent side of innovation and those who make sure that ideas are pushed toward implementation, it is very probable that elements from the model will be somehow shared or complemented among individuals on the team level. It can be said that different aspects of competence are compensatory to some extent, which means that being highly competent in some of them can compensate for being less competent in others (Hayton and Kelley, 2006).

**Figure 10.** Integrated model of innovative competence

From the model it is also seen that many of the elements from the three dimensions are interconnected and strengthen each other. For example, if one is
curious to learn new things (intrapersonal element), it is more possible that she will develop heterogeneous knowledge (content dimension), and connect or network with people from different disciplines (interpersonal dimension). Or if a person is flexible (intrapersonal dimension), she will more probably be able to think in divergent ways and see different solutions to a problem (content dimension), which will make it easier for her also to negotiate between alternative ideas proposed by various team members (interpersonal dimension).

Discussion and conclusions
The main contribution of the article is the proposed integrated model of innovative competence that connects different pieces of research in the innovation field and gives a better clarity and understanding of the complexity of elements that drive innovative behavior and help individual to act competently in innovation. The ambidexterity reflected in different elements in all three dimensions of innovative competence supports the idea that in order for an individual to practice innovation, she will have to engage different kinds of knowledge, attitudes and skills that will help her both diverge and converge, explore and exploit ideas. But what specific elements of intrapersonal, content and interpersonal dimensions of competence will be most important for each individual to use in order to act in an innovative manner will be largely dependent on individual’s work context, role, and needs in each situation.

Looking back at the competence flower developed by Illeris (2013) and visualized in Figure 1, the systematic literature review confirmed that the competence elements in the outer layer of his flower are part of the innovative competence as it was suggested in the theoretical background of the paper. Intuition, flexibility and persistence are elements of the intrapersonal dimension, combination ability and fantasy parts of associational thinking, critical perspective an aspect of questioning behavior and empathy an element of the interpersonal competence dimension. Creativity is a wider concept and is related to many elements included in several dimensions of the model, among others divergent and associational thinking, flexibility and autonomy. The fact that Illeris (2013) suggests these elements are part of any competence and help individuals act competently not only in known but also in new and unknown situations supports the idea that innovation has become a generic part of being able to act competently in any field of practice. Innovative competence is thus a core competence that should be developed across industries and also integrated in university curriculum in all fields of study.

The model of innovative competence presented in this article has several implications for practice. Individuals might use it to know what they need to learn to be more innovative and to increase their employability on the market, as innovation is becoming one of the core competences across different professions. Educational institutions can apply it both as a reflection tool to
increase understanding of innovative competence among students, but also as the basis for developing practice-based curriculum for strengthening students’ innovative competence. Since students often do not have much practical experience, problem- and project-based learning curricula can be effective ways to facilitate students’ innovative competence development (Zhang et al (2013). The model has been tested on the second year students of innovation management program at the Mälardalen University and the students perceived the model as a useful framework to help them reflect upon what innovative skills, knowledge and attitudes they currently use in their life and studies and what skills they would like to improve to become more innovative. Various creative exercises for strengthening selected skills from the model were tested on the same group of students in order to develop their innovative competence and support them to actively engage in a project-based innovation process. When these exercises were connected to solving specific problems students were facing, they better understood how the model can be used in practice.

Organizations from private, public and civil sectors might find the model interesting because of several reasons. First, to better understand what knowledge, skills and personal characteristics to look for when recruiting innovative talent to organization. Second, to help employees better understand the concept of innovative competence, assess its current level, and identify development opportunities. This was tried on a group of 20 practitioners from different municipalities participating in a customized training in innovation management at the Mälardalen University. Their feedback was that the model was useful both for individuals and teams to discuss the strong and weak sides of their current innovative competence. Furthermore, the model was used to explore how they could integrate development and practice of different innovative skills in their daily work processes instead of seeing innovation as a separate activity or function for which they thought there was a lack of time. It was interesting to observe that individuals, even if working in the same team or organization, identified different elements from the model as the ones they wanted to develop and thought were the most relevant for them in their current work. This confirms the suggestion presented earlier in the article that it is hard to prescribe what aspects of innovative competence one should focus on because this is influenced by each individual, their specific role and their perception of self and work context.

Apart from using the model for understanding, assessing and developing employees’ innovative competence, organizations could use it as support to define different job profiles where innovative competence is specifically important. The model can be applied as well to form innovative teams, making sure that different skills, which influence innovative competence and could be hardly possessed in their totality by each individual, are covered by different team members. And last but not least, management can use the model to
proactively nurture different aspects of innovative competence across organization to increase innovation capability on organizational level.

Based on the model a holistic measurement of innovative competence could be developed. Since the vast majority of previous research assessed innovation performance with self-reports, which are often biased (Potocnik and Anderson, 2012), it is suggested that a more multifaceted measurement method combining self-reports with those of important stakeholders would be more appropriate. Considering the nature of the model, the realist evaluation approach (Pawson and Tilley, 2001) could work because it would not prescribe one unified way of assessing the level of innovative competence and best ways of developing it for anyone in any context but would rather help evaluate what aspects of innovative competence are most relevant for whom in what circumstances and in what respects, and what methods for developing innovative competence work best for different target groups.

The limitation of the model is that it is relatively complex, which might make it difficult to use in practice. The model has been tested to a limited extent in practice, which means that it needs to be further operationalized in different contexts to learn more about its relevance and applicability. It would be interesting to further explore how different elements of innovative competence are interconnected and influence each other. Since the article proposes that innovative competence is a core competence that should be practiced by all employees and not only by innovation experts, it is unrealistic that all employees would possess all the elements included in the model. It would be thus necessary to better understand which elements of innovative competence are specifically relevant in different contexts, identify different levels of practicing innovative competence and ways to measure them. The danger of such a model can be if it is used as a recipe or to formalize and control innovation. Öberg (2013) suggests that adding too many competences per se can diminish the real innovative competences in use and decrease trust and commitment among those participating in innovation.

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**Corresponding author:**
Nina Bozic Yams can be contacted at: nina.bozic@mdh.se