

## **Innovative Work Behaviour of teachers in Higher Education: An extended view; A first exploration**

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### **Introduction**

Innovation appears to be a determining factor for long-term success and survival of organisations in the era of global competition, and this applies to private as public organisations (Amabile, 1988; Eesley & Longenecker, 2006; Kanter, 1988). For organizations, innovations are of great importance to stimulate the efficiency, effectiveness and the development of new products and services. It is generally acknowledged that the quality of an educational system mainly depends on the quality of the teachers (George & Sabapathy, 2011; Hattie, 2009; Van der Klink, 2012) and that they are also the key factor in the success of innovations. Innovations will only succeed if teachers experience a stimulating climate that encourages innovation and if they possess sufficient competencies to work on innovations (Fullan, 2007).

The purpose of the present study is threefold. First we aim to develop a valid and reliable instrument, based on the measurement of Messmann (2012) that measures Innovated Work Behaviour, and included a new dimension “idea sustainability”. The concept of Idea sustainability has been overlooked by other researchers (De Jong & Den Hartog, 2010; Messmann, 2012). Secondly we want to answer the question: “Do teachers from different faculties differ in their innovative work behaviour”? The third aim of this study is to explore which individual and job characteristics are related to the extent of innovative work behaviour.

### **Theoretical framework**

#### **1. The concept of IWB**

Traditionally the teaching profession demands for subject matter experience and instructional competencies, but today there is a growing need to advance the levels of teachers’ innovation competencies to assure that teachers are able to perform the role of innovator as well. The search for these competencies and attitudes, necessary for today’s innovative organisations, have led to the development of theoretical concepts. One of the main emerging concepts is the concept of innovative work behaviour (IWB) of individuals (Messmann, 2012). In this section, we will define IWB and the extended view on IWB.

### 1.1 The concept of IWB: an extended view

Innovative work behaviour, which can be defined as a behaviour that leads to initiation and presenting new ideas, products or procedures within the working place, team or organization (De Jong & Den Hartog, 2010; Farr & Ford, 1990), can be divided in different behavioural aspects: behaviours related to creativity (exploration and generation of idea's) and behaviours related to implementation or change (the championing and application of idea's) (Janssen, 2000; Scott & Bruce, 1994). This individual level is of interest because individuals within an organisation initiate the process of innovation (Janssen, 2000).

The innovation process starts with an exploration of opportunities (problem recognition) and idea generation, the creation of novel and useful ideas in a certain domain (Messmann, 2012; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Kanter, 1988), followed by an implementation phase, which includes idea promotion to seek sponsorship for an idea and thereby trying to build a coalition of supporters for it. Finally the innovation process concerns idea realization by producing a prototype or model of the innovation that can be experienced and implemented in the organization (Kanter, 1988). Although these innovation tasks are interdependent and partly built on each other, they do not automatically follow a linear sequence and are rather iteratively related (Dorenbosch, Van Engen, & Verhagen, 2005; Messmann & Mulder, 2012).

In sum it can be concluded that the concept of IWB emphasises, though in a rather implicit manner, that the innovation process consists of the following phases: the initiation phase, the promotion and the realization phase. However, this reflects a rather limited view on innovation. Fullan (1991, 2007), for example, developed a model for educational change that distinguishes four phases in the innovation process. He included a continuation phase, which is not included in the concept of IWB. This continuation phase is an extension of the implementation phase wherein the new program or innovation will sustain beyond the first two years. This additional step is recommendable especially in the field of education because a great deal of teachers act as routine professionals and do not adapt new routines easily (Van Eekelen, et al., 2006) The work of West and Farr (1989) also presents a broader perspective on innovation than is advocated in the concept of innovative work behaviour. West and Farr consider the innovation process as a cycle. They argue that all innovations can be seen as modifications of an existing group or organizational system. The mentioned innovation cycle also distinguishes four phases.

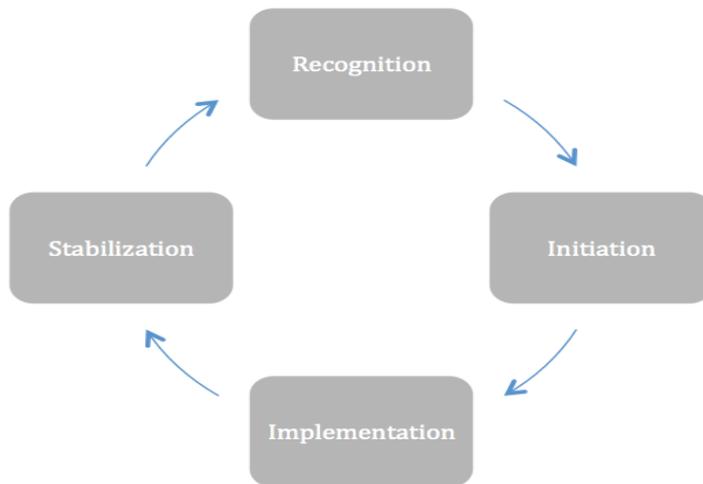


Figure 1: the innovation cycle (West & Farr, 1989)

The phases in the cycle are the recognition phase, the initiation phase, the implementation phase and finally the stabilization phase. In this stabilization phase the innovation becomes a part of the system of the organization (West and Farr, 1989). The concept of IWB consists dimensions of the first three phases. The last phase in the cycle, the stabilization phase is not included in the concept of IWB. But, if it is required teachers really integrate the innovation in their daily practice then it is necessary that the innovation becomes part of their routine behavior (Van der Klink, 2012) and thus a sustainability phase is very important.

So far, some attention has been paid to stretching the concept of innovative work behaviour towards a concept that better includes the extended views on innovation as proposed by, for example, Fullan (1991). In 2001, Kleysen & Street tested a multi-dimensional measure of individual innovative behaviour, that consisted of: 1] opportunity exploration, 2] generativity, 3] formative investigation, 4] championing and 5] application. Also other scholars like Messmann (2012), De Jong & Den Hartog (2005, 2010) and Janssen (2000) have worked recently on the further development of IWB as a theoretical concept. These authors state that Innovative work behaviour must be seen as a dynamic and context bound construct as well.

IWB can then be defined as *the sum of physical and cognitive work activities carried out by employees in their work context, either solitarily or in a social setting, in order to accomplish a set of tasks that are required to achieve the goal of innovation development (Kanter, 1988; Messmann & Mulder, 2011)*

In this study we adhere to the work of Messmann (2012) because he conducted his research in educational settings (e.g. vocational education) that are to some degree rather comparable with the research setting in our study. In his work, innovative work behaviour consists of four dimensions: 1] opportunity exploration, 2] idea generation, 3] idea promotion, and 4] idea realization. Messmann added items on reflection within the dimension idea realization because IWB is not static and context -bound. It is dynamic, because of the complex relation between the teachers' past activities and the present work activities. IWB is context-bound, because contextual factors influence work activities and the outcomes.

So innovating teachers have to reflect continuously on the progress of innovation development, evaluate the success based on activities and outcomes, examine one's personal advancement during the innovation process and improve action strategies for future situations. So monitoring the outcomes and adapt where necessary, to embed the innovation better in their regular work processes.

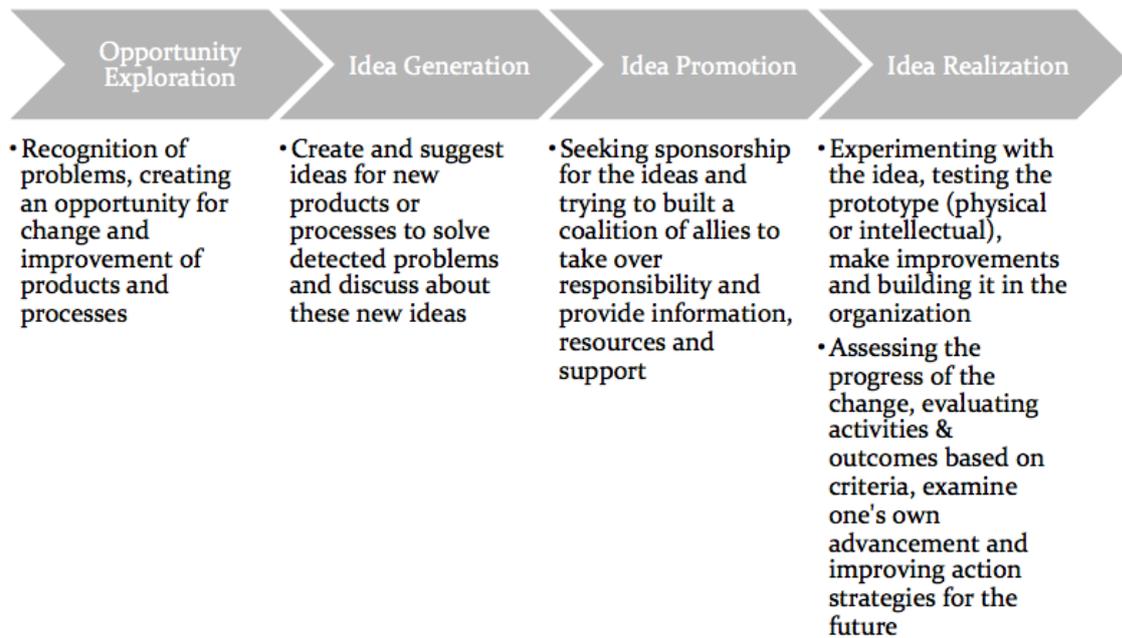


Figure 2: The concept of IWB (Messmann, 2012)

But what Messmann and other scholars did not address was the inclusion of another dimension of the innovation cycle into the concept and measurement of IWB, the stabilization or continuation phase. Although Messmann & Mulder (2012) added items on reflection to their scale, which includes the assessment of the progress of the innovation process, these items are not explicit aimed at the long-term implementation. However, if we assume that this dimension is crucial for the sustainability of innovations then it is desirable to explore the implication of the concept of innovative work behaviour and to determine what knowledge and skills should be added to the concept of IWB, and to the scales that are in use for measuring IWB.

### 1.2 The extended view on IWB: idea sustainability

Already in 1986, Van de Ven stated that one of the central problems in innovation research is the lack of research on the routinization of innovative ideas. He argues to focus both on implementation of innovations in the short run, but also on the implementation in the long term, a sustained implementation of innovative ideas. So, administrators or teachers responsible for implementation an innovation must face the challenge of planning the time after the implementation phase. The continuation of an implemented new idea must become a primary goal (Johnson, Hays, Center, & Daley, 2004).

So sustainability can be defined as a change process wherein particular sustainability steps have to be taken to strengthen the infrastructure capacity and innovation attributes that are necessary to sustain a new idea or innovation (Johnson, et al., 2004). To accomplish durable changes, innovative ideas should be sustained by further use over time. This will be achieved by disseminating innovative ideas in the deeper structure of the organization through institutionalization or habitualization (Gannaway, Hinton, Berry and Moore, 2014; Raey et al., 2013). For example, ideas should be embedded in the deeper structures of an organization, by contacting administrators to adapt the currently used systems. In literature features of sustainability are mentioned. The main features are: 1] Improving and optimizing the innovation (updating, PDCA- cycle of Deming, continuous regeneration) to avoid implementation dip (Fullan, 2002, Coffey & Horner, 2012, Loh, 2014, 2] Disseminating the innovation in depth in the system of the organization (capacity for securing adequate resources) (Loh, et al, 2014, 3] Disseminating the innovation on a larger scale (planning for project growth, broader application) (Loh, et al, 2014) and finally 4] Visualization of the benefits of the innovation for stakeholders (community participation, longer term vision, outcomes) (Loh, et al, 2014).

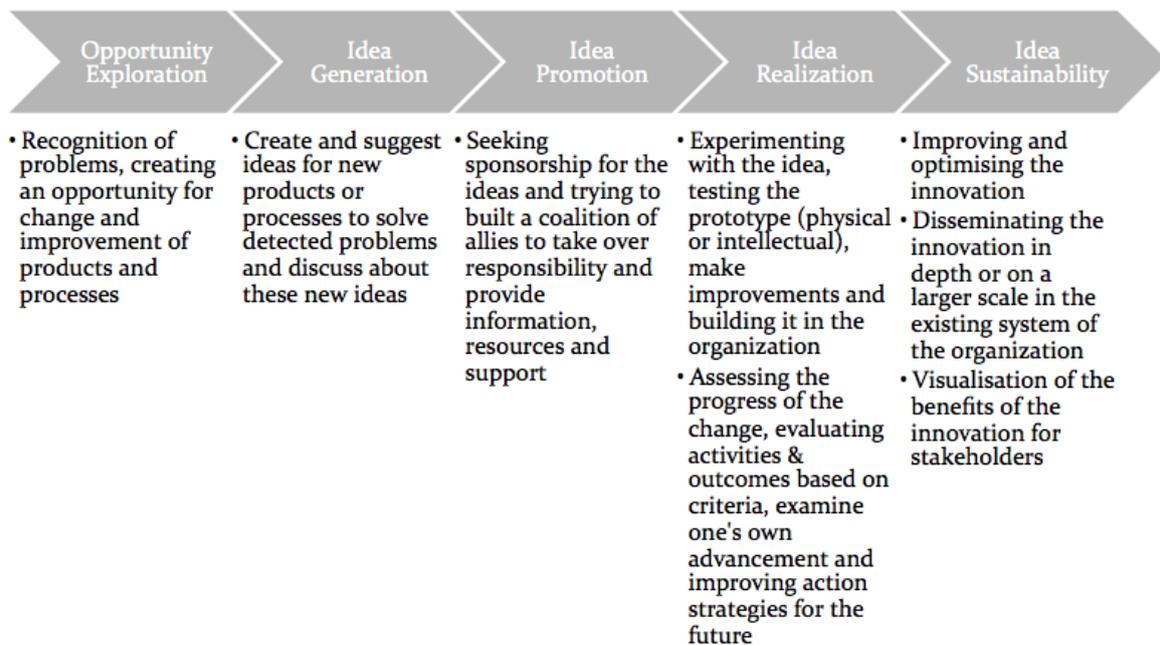


Figure 3: The extended concept of IWB

### 1.3 Related factors to IWB

The second and third purposes of this paper were an exploration of the influence of individual characteristics, like gender, age, tenure, work experience and job characteristics, like number of working hours, teacher position (function) on IWB. These additional background characteristics were chosen because they were already significantly related to dimensions of IWB, see table 1.

Table 1: Background characteristics significantly related to dimension of IWB

Variable	Authors
Gender	De Jong & Den Hartog (2010)
Age	Janssen (2005)
Tenure	Baer, Oldham & Cummings, 2013; Dorenbosch, et al (2005); Janssen, (2002, 2005)
Number of working hours	Messmann & Mulder (2012, 2014)

Although these background variables are significantly related to some of the dimensions of IWB it is unexplored whether they relate to the new dimension of IWB, idea sustainability, as well.

## 2. Research Questions

In this paper we will answer the following research questions:

How to measure Idea Sustainability as a part of Innovative Work Behaviour?

Do teachers in higher education from various faculties differ in their Innovative Work Behaviour?

In what way, are individual and job characteristics influencing the Innovative Work Behaviour of teachers in higher education?

## 3. Methods

### *Setting*

The study was conducted with teachers in a University for applied sciences in the South of the Netherlands. This institute for higher education was selected as an adequate domain to study innovative work behavior because today, innovations play an important role in institutes for higher education. Within this institute several initiatives are undertaken to put innovation high on the agenda.

### *Sample*

Between November and December 2014, 400 teachers representing different disciplines (healthcare, ICT, teacher education) were invited by email to participate in the study by filling out an online questionnaire. The number of respondents is 179 (response rate= 44.75%). For background characteristics of the respondent group see appendix A.

### *Development of measurement*

A questionnaire is developed, based on the questionnaire of Messmann (2012). Additional items are added to measure the new dimension idea sustainability. This new dimension contains the following concepts: Improving and optimising the innovation (ISIO), disseminating the innovation in depth in the system of the organization (ISDD), disseminating the innovation on a larger scale (ISDL) and visualization of the benefits of the innovation for stakeholders (ISV).

The sustainability items were developed as follows:

First, a literature search was conducted in the domain of sustainability of innovations. Used keywords were: sustainability, durability, transfer of innovations, diffusion, continuation of innovations, disseminate the innovation, institutionalization, maintaining innovations, scalability of innovation. A mind map was built to visualize the findings.

Next, the literature search was discussed with an expert group (N=4) in the field of innovations.

Together we have identified the most relevant features of the sustainability phase. Items around these relevant features are arranged in the style of the original questionnaire. These items are presented again to the four experts. After processing the feedback, the research design and the new questionnaire was presented to the research group “Professionalization of education”, which consists of teachers from the target group (N=10). There were two feedback rounds. During the first round, the researchers could give feedback on the development of the concepts. During the second round a few weeks later they assessed the electronic questionnaire using a feedback form. This feedback form included questions about both the content of the items as well as the layout of the electronic questionnaire. Again feedback was processed and a definite version of the questionnaire was sent to the teachers from the various faculties.

For measuring the existing dimensions of IWB the validated measurement of Messmann (2012) was used. Participants have to state on a 6-point Likert scale, ranging from 1 (“does not apply”) to 6 (“fully applies”).

Regarding background characteristics of the participants, information about individual characteristics (*age, gender, tenure, work experience*) and job characteristics (*number of working hours, job position and involvement in a research group*) was collected.

#### *Procedure survey*

Before starting the survey, the researcher contacted the faculty directors to inform them about the aims of the study. After an approval of the director, team leaders of the respective faculties were informed as well. Then team leaders or other key persons introduced the questionnaire within their teams (example; presentations in staff meetings or team days). Next to the introduction within the teams the electronic link with an invitation for participation was sent to the teacher teams. This invitation included information about the purpose, design and completion of the questionnaire. Two general reminders were sent during the months November and December.

#### *Methods of analyses*

For the assessment of the validity of the 20 added items of the new scale sustainability three approaches were chosen. Content analyses will be conducted to examine the items on their relatedness. Factor analyses will be performed. In order to validate the constructs of the questionnaire in this phase of the research, with a rather low number of participants (n=179) items corresponding to each construct will be considered as separate questionnaires. So each construct or scale will be validated separately. The Kaiser-Meyer-Olkin measure will be conducted to indicate that patterns of correlations are relatively compact and thus factor analyses could yield distinct and reliable factors.

In addition, for each scale (factor) the internal consistency is determined by calculating Cronbach's alpha. Scales with Cronbach's alpha higher than .70 are considered as reliable. The item total statistics in combination with content analysis will be used to determine if an item have to be removed from the scale. First, the table "Cronbach's alpha if item deleted" will be inspected to detect items that will not consistent with the scale. Then, analyses on content will be conducted to underpin the findings in the table. Items will be removed if both the item total statistics and content analyses indicate that the item will not contribute to the scale.

After the validation phase the second phase will be started. In this second phase, descriptive statistics will be performed and relationships between the variables will be examined. Correlations, one-sample t-tests and ANOVA tests will be used to relate background characteristics to IWB.

## 4. Results

### *Validity of the measurement*

For the first exploration of the validity of the 20 added items of the new scale sustainability three approaches were chosen. A factor analyses was performed and reliability analyses were conducted. Content analyses in combination with the item total statistics were used to examine the items on their relatedness. All of the items contributed to the corresponding scale. In order to validate the constructs of the questionnaire in this phase of the research, items corresponding to each construct were considered as separate questionnaires. So each construct or scale was validated separately. The Kaiser-Meyer-Olkin measure shows scores above .78. Values between .70 and .80 indicate that patterns of correlations are relatively compact and so factor analyses should yield distinct and reliable factors. Factor analyses show factor loadings above .79 (for this sample size  $N > 100$  factor loadings  $> 0.512$  are significant) with communalities vary from .62 to .86 with a mean of .75. The reliabilities for all of the four scales are .88 or above. Explained variances vary from 72.35% to 80.75%. See appendix B for more detailed information.

### *Results*

As table 2 shows the scales to measure innovated work behaviour are interrelated, however the correlation coefficients are not too high, which implies that the various scales measure distinct dimensions of IWB. So the results of this study indicate that significant correlations are found between all original dimensions of Messmann (2012) and the added dimensions with respect to Idea sustainability.

Table 2. Descriptive statistics and correlations for the scales of innovative work behaviour

	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	5.	6.	7.	8.
<b>1. Opportunity exploration</b>	4.59	.77	(.76)							
<b>2. Idea Generation</b>	4.93	.86	.45**	(.71)						
<b>3. Idea Promotion</b>	4.68	.97	.51**	.79**	(.93)					
<b>4. Idea Realization</b>	4.10	1.07	.51**	.53**	.60**	(.93)				
<b>5. Idea Sustainability ISIO</b>	4.32	1.10	.48**	.46**	.53**	.78**	(.94)			
<b>6. Idea Sustainability ISDL</b>	3.82	1.36	.35**	.32**	.42**	.58**	.60**	(.92)		
<b>7. Idea Sustainability ISDD</b>	4.08	1.11	.53**	.44**	.52**	.73**	.78**	.65**	(.88)	
<b>8. Idea Sustainability ISV</b>	3.38	1.27	.43**	.31**	.43**	.67**	.69**	.72**	.74**	(.90)

Note. \* $p < .05$ , \*\* $p < .01$ .  $N = 179$ . Values for Cronbach's alpha are presented in parentheses in the diagonal of the correlation matrix.

First we will explore how teachers of different faculties score on the scales to measure innovative work behaviour. For reasons of convenience only the subscales are displayed that show statistically significant differences between the teachers of the three faculties. As table 3 shows only for the Opportunity exploration (OE) there appear to be differences between teachers of the different faculties. The scores of Healthcare teachers and teachers from the faculty of teacher education are quite similar, whereas the average score of the teachers of ICT appear to be significantly lower ( $f = 3.02$ ,  $p < .05$ ). For the scores of the teachers on the other dimensions see Appendix C.

Table 3. Significant mean score of teachers in different faculties on the scale of Innovative Work Behaviour

Faculty	Opportunity Exploration
Health teachers	4.62
Teacher education teachers	4.80
ICT teachers	4.17

Next we explore the relationship between individual and job characteristics influencing on the Innovative work behaviour of teachers in higher education.

As the analyses show work experience correlated significantly on the scale Idea Sustainability Improving and Optimising (ISIO) ( $r = .22$ ,  $p < .01$ , 2-tailed), Idea Sustainability Disseminating in Depth in the organization (ISDD) ( $r = .24$ ,  $p < .01$ , 2-tailed) and age ( $r = .63$ ,  $p < .01$ , 2 tailed). Tenure (level degree) shows no significant differences.

Finally the relationship between gender and innovative work behaviour was explored. With an average score of 4.24 females scored higher on Idea Realization than males ( $m=3.87$ ) ( $t= -2.09$ ,  $p < .05$ ). On the scale Idea Sustainability Improving and Optimising the average score of females was 4.50, whereas the average score of males was 4.24. ( $t= -2.38$ ,  $p < .05$ ), see table 4.

Table 4. Mean scores of gender on the scales of Innovative Work Behaviour

Gender	Idea Realisation (IR)	Idea Sustainability Improving and Optimising (ISIO)
Male	3.87	4.07
Female	4.24	4.50

Next to individual teacher characteristics, this study explored the relationship between innovative work behaviour and job characteristics as well.

As the analyses show the number of working hours correlated significantly on Idea Realization ( $r= .20$ ,  $p < .05$ , 2-tailed), and on three of the new added scales of Idea Sustainability, Idea Sustainability Improving and Optimising ( $r= .17$ ,  $p < .05$ , 2-tailed), Idea Sustainability Disseminating in Depth in the organization ( $r= .22$ ,  $p < .01$ , 2-tailed) and Idea Sustainability Visualisation ( $r= .22$ ,  $p < .01$ , 2-tailed).

There appear to be differences between jobs. Teacher jobs are ranked from junior teachers to teachers to senior teachers and head teachers. Beside these teachers positions there are teachers with a research function, research teachers. We compared teachers in junior positions with teachers in more senior positions. With regard to Idea Realization teachers with a more senior position, including the research teachers, scored higher compare to teachers and junior teachers ( $f= 3.20$ ,  $p < .01$ ). On the scale Idea Sustainability Improving and Optimising teachers with a more senior position (head teachers and senior teachers) scored higher compare to teachers, junior teachers and research teachers ( $f= 3.67$ ,  $p < .01$ ). Finally on the Idea Sustainability Visualisation scale again teachers with a more senior position, including the research teachers, scored higher compare to teachers and junior teachers ( $f= 5.34$ ,  $p < .01$ ), see table 5.

Table 5. Mean scores of teacher position on the scales of Innovative Work Behaviour

Teacher position	Idea Realization (IR)	Idea Sustainability Improving and Optimising (ISIO)	Idea Sustainability Visualisation (ISV)
Junior teachers	3.66	3.43	2.45
Teachers	3.88	4.10	2.90
Research Teachers	4.29	3.63	3.42
Senior teachers	4.19	4.49	3.52
Head teachers	5.08	5.25	4.53

With regard to Idea Generation teachers involved in a research group in the past or present, scored higher on their IWB compare to teachers not involved in a research group ( $f= 3.91, p < .05$ ). On the scale Idea Promotion and Idea Realization teachers involved in research groups score higher as well, respectively ( $f= 5.64, f= 8.69, p < .01$ ). On the added scales of Idea Sustainability, Idea Sustainability Improving and optimising ( $f= 3.97, p < .05$ ), Idea sustainability Disseminating on a larger scale in the organisation ( $f= 9.17, p < .05$ ) and Idea Sustainability Visualisation ( $f= 11.13, p < .01$ ) teachers involved in research groups in the past or present score higher compare to teachers not involved. Whereby teachers involved in research groups in present score higher compare to teachers involved in the past, see table 6.

Table 6. Mean scores of teachers involved in research groups on the scales of Innovative Work Behaviour

Teachers involved in research groups	Idea Generation (IG)	Idea Promotion (IP)	Idea Realization (IR)	Idea Sustainability Improving and Optimising (ISIO)	Idea Sustainability Disseminating on a larger scale in the organisation (ISDL)	Idea Sustainability Visualisation (ISV)
<b>Involved</b>	5.18	5.07	4.62	4.71	4.46	4.03
<b>Involved in the past</b>	5.31	5.06	4.11	4.26	4.15	3.58
<b>Not involved</b>	4.82	4.55	3.84	4.17	3.47	3.00

In this paper we want to explore the relationship between background characteristics (individual and job characteristics) and IWB, including the new added items on Idea sustainability. Table 7 contains a quick overview of the relationship between several background characteristics and the dimensions of IWB. To construct this table different tests were conducted (correlations, one-sample t-tests, and ANOVA tests).

Table 7. Overview of individual and job characteristics influencing the dimensions of IWB

	OE	IG	IP	IR	ISIO	ISDD	ISDL	ISV
<b>Faculty</b>	*							
<b>Individual characteristics</b>								
Work experience					*	*		
Age								
Gender				*	*			
Tenure								
<b>Job characteristics</b>								
Working hours				*	*	*		*
Job position				*	*			*
Involvement in research group		*	*	*	*		*	*

## 5. Discussion and Conclusion

This paper addresses the measurement of the concept of innovative work behavior and how this concept is related to different individual and job characteristics.

As the literature showed, not all important aspects of innovative work behavior were included in the scales proposed by Messmann (2012) and therefore the first aim of this paper was to develop new scales to ensure that all important aspects of innovative work behavior can be measured.

Informed by literature four new scales were developed: improving and optimizing, dissemination on larger scale, dissemination deeper in organization, and visualization, respectively. The first exploration of the psychometric quality of these four scales showed promising results (see appendix A) and also the reliabilities of these scales were satisfactory. In addition the correlation matrix indicated that the four new scales measured distinct aspects of innovative work behavior, since the correlation coefficients with the already existing scales proposed by Messmann (2012) were significant but not too high, which indicate the new scales measured aspects not already covered by Messmann's existing scales.

Finally, to explore whether the scales to measure innovative work behavior are able to discriminate between different groups, the relationship between these scales and various individual and job characteristics were analyzed.

The results for individual characteristics indicated that age and tenure did not correlate with any of the scales (see table 7). Work experience did make some difference, and also the faculty to which teachers belong did make some difference with regard to innovative work behavior. Also gender appeared to be linked to innovative work behavior since female teachers scored, on average, higher at two aspects of innovative work behavior.

The results for job characteristics showed that the number of working hours was linked with four aspects of innovative work behavior. Job position and the participation in research groups also did make a difference with regard to the scores on the innovative work behavior scales. In general, the job characteristics showed more links with the various scales to measure innovative work behavior compared to the individual characteristics. Moreover, the fact that age was not linked with innovative work behavior at all indicates that innovation is not a matter of age, which seems to be contradictory to general beliefs about older teachers that may also be present in higher education institutes.

The findings presented in this paper should be seen as a very first step in the further development, theoretically and statistically, on the concept of innovative work behavior. We intent to further expand the existing dataset which will allow us to perform more advanced statistics and also will provide opportunities to include all new developed scales into one factor analyses. The present numbers of respondents did not offer these kinds of opportunities. On the other hand, the first exploration did show that the new scales contribute to the further progress of this important concept, since they cover dimensions that were not foreseen in the existing scales proposed by Messmann (2012).

Next to the work on the psychometric quality of the scales, there is ample room for further exploring the factors linked to innovative work behavior. Our first exploration, described in this paper, offers some hints that context factors (i.e. job characteristics) appear to have more impact than individual characteristics did.

## 6. References

- Amabile, T. M. (1988). A model of creativity and innovation in organizations *Research in organizational behaviour* (Vol. 10, pp. 187-209). Greenwich, CT: JAI Press.
- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *The academy of Management Journal*, 39(5), 1154-1184.
- Baer, M., Oldham, G., & Cummings, A. (2003). Rewarding creativity: When does it really matter? *Leadership Quarterly*, 14, 569-586
- Coffey, J. H., & Horner, R. H. (2012). The sustainability of Schoolwide Positive Behavior Interventions and Supports. *Council for Exceptional Children*, 78(4), 407-422.
- De Jong, J., & Den Hartog, D. (2010). Measuring Innovative Work Behaviour. *Creativity and Innovation Management*, 19(1), 23-36.
- Dorenbosch, L.W., Van Engen, M.L., & Verhagen, M. (2005). On-the-job innovation: The impact of job design and human resource management through product ownership. *Creativity and Innovation Management*, 14(2), 129-141.
- Eesley, D. T., & Longenecker, C. O. (2006). Gateways to Intrapreneurship. *Industrial Management, januari*, 18-24.
- Farr, J., & Ford, C. (1990). Individual innovation. In M. West & J. Farr (Eds.), *Managing innovation*. London: Sage.
- Fullan, M. (2002). The change. *Educational Leadership*, May, 16-20.
- Fullan, M. (2007). *The new meaning of educational change* (4e ed.). New York: Teachers College Press.
- Gannaway, D., Hinton, T., Berry, B., & Moore, K. (2013). Cultivating change: disseminating innovation in higher education teaching and learning. *Innovations in Education and Teaching International*, 50(4), 410-421.
- Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: systematic review and recommendations. *Milbank Quarterly*, 82(4), 581-629.
- George, L., & Sabapathy, T. (2011). Work motivation of teachers: Relationship with Organizational Commitment. *Canadian Social Science*, 7(1), 90-99.
- Hattie, J. (2009). *Visible learning. A synthesis of over 800 meta-analyses relating to achievement*. London: Routledge.
- Janssen, O. (2000). Job demands, perceptions of effort-reward fairness and innovative work behaviour. *Journal of Occupational and Organizational Psychology*, 73, 287-302.
- Janssen, O. (2005). The joint impact of perceived influence and supervisor supportiveness on employee innovative behaviour. *Journal of Occupational and Organizational Psychology*, 78(4), 573-579.
- Janssen, O., Van de Vliert, E., & West, M. (2004). The bright and dark sides of individual and group innovation: a Special Issue introduction. *Journal of Organizational Behaviour*, 25, 129-145.
- Johnson, K., Hays, C., Center, H., & Daley, C. (2004). Building capacity and sustainable prevention innovations: a sustainability planning model. *Evaluation and Program Planning*, 27- 135-149.
- Kanter, R. (1988). When a thousand flowers bloom: structural, collective, and social conditions for innovation in organizations *Research in organizational behaviour* (Vol. 10, pp. 169-211). Greenwich, CT: JAI Press.
- Kleysen, R.F., & Street, C.T. (2001). Toward a multi-dimensional measure of individual innovative behavior. *Journal of Intellectual Capital*, 2(3), 284-96.
- Loh, L.C., Friedman, S.R., & Burdick, W.P. (2013). Factors promoting sustainability of education innovations: A comparison of faculty perceptions and existing frameworks. *Education of Health*, 26(1), 32-38.

- Messmann, G.M.A. (2012). *Innovative work behaviour: Investigating the nature and facilitation of vocational teachers' contributions to innovation development*. Regensburg: Universität Regensburg.
- Messmann, G., & Mulder, R. H. (2012). Development of a measurement instrument for innovative work behaviour as a dynamic and context-bound construct. *Human Resource Development International*, 15(1), 43-59.
- Messmann, G., & Mulder, R. H. (2014). Exploring the role of target specificity in the facilitation of vocational teachers' innovative work behaviour. *Journal of Occupational and Organizational Psychology*, 87(1), 80-101.
- Messmann, G. & Mulder, R. H. (2011). Innovative Work Behaviour in vocational colleges: Understanding how and why innovations are developed. *Vocations and Learning*, 4(1), 63-84.
- Reay, T., Chreim, S., Golden-Biddle, K., Goodrick, E., Williams, B. E., Casebeer, A., & Hinings, C. R. (2013). Transforming new ideas into practice: An activity based perspective on the institutionalization of practices. *Journal of Management Studies*, 50(6), 963-990.
- Scott, S. G., & Bruce, R. A. (1994). Determinants of Innovative behaviour: A path model of individual innovation in the workplace. *Academy of Management journal*, 37(3), 580-607.
- Van der Klink, M. (2012). *Bekwaam innoveren voor een toekomstbestendig hoger beroepsonderwijs*. Heerlen: Zuyd Onderzoek: Lectoraat Professionalisering van het Onderwijs: inaugurale rede.
- Van der Klink, M., & Boon, J. (2003). Competencies: the triumph of a fuzzy concept. *International Journal of Human Resources Development and Management*, 3(2), 125-137.
- Van Eekelen, I. M., Vermunt, J. D., & Boshuizen, H. P. A. (2006). Exploring teachers' will to learn. *Teaching and Teaching Education*, 22, 408-423.
- Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management Science*, 32(5), 590-607.
- West, M. A., & Farr, J. L. (1989). Innovation at work: psychological perspectives. *Social behaviour*, 4, 15-30.

Appendix A: *Background characteristics of the respondents*

Variable	Category	N
Age*	-	47.48 (10.00)
Work experience*	-	12.96 (9.82)
Working hours*	-	0.78 (0.21)
Gender	Male	53
	Female	95
Faculty	Health	101
	Teacher education	21
	ICT	24
Job position	Educational assistant	1
	Junior teachers	5
	Teachers	61
	Senior teachers	51
	Head teachers	15
	Researchers	3
	Other	12
Involvement in Research group	Involved	45
	Involved in the past	13
	Not involved	89

Note. N= varies from 141 to 148 due to missing values \* Means and standard deviations are reported in years

Appendix B: *Factor loadings*

Table 1. Factor loadings from Principal Component Factor Analysis: Communalities, Eigenvalue and percentages of variance for items of the IWB questionnaire, scale Idea sustainability improving and optimising (ISIO)

Item	Factor loading	Communality
ISIO 1	.79	.63
ISIO 2	.86	.73
ISIO 3	.90	.80
ISIO 4	.86	.74
ISIO 5	.88	.78
ISIO 6	.79	.62
ISIO 7	.88	.77
ISIO 8	.85	.73
<b>Eigenvalue</b>	5.79	
<b>% of variance</b>	72.35	

KMO= 0.91

Table 2. Factor loadings from Principal Component Factor Analysis: Communalities, Eigenvalue and percentages of variance for items of the IWB questionnaire, scale Idea sustainability Disseminate on Larger Scale (ISDL)

Item	Factor loading	Communality
ISDL 1	.87	.76
ISDL 2	.88	.78
ISDL 3	.93	.86
ISDL 4	.91	.83
<b>Eigenvalue</b>	3.23	
<b>% of variance</b>	80.75	

KMO= 0.84

Table 3. Factor loadings from Principal Component Factor Analysis: Communalities, Eigenvalue and percentages of variance for items of the IWB questionnaire, scale Idea sustainability Disseminate Deeper in the organization (ISDD)

Item	Factor loading	Communality
ISDD 1	.84	.70
ISDD 2	.88	.78
ISDD 3	.89	.79
ISDD 4	.83	.69
<b>Eigenvalue</b>	2.96	
<b>% of variance</b>	73.91	

KMO= 0.78

Table 4. Factor loadings from Principal Component Factor Analysis: Communalities, Eigenvalue and percentages of variance for items of the IWB questionnaire, scale Idea sustainability Visualization (ISV)

Item	Factor loading	Communality
ISV 1	.83	.69
ISV 2	.91	.82
ISV 3	.91	.83
ISV 4	.87	.75
<b>Eigenvalue</b>	3.09	
<b>% of variance</b>	77.16	

KMO =0.82

## Appendix C: mean score of teachers in different faculties on the scale of Innovative Work Behaviour

<b>Dimension of IWB</b>	<b>Faculty</b>	<b>Scores</b>
<b>Opportunity Exploration*</b>	Health teachers	4.62
	Teacher education teachers	4.80
	ICT teachers	4.17
<b>Idea Generation</b>	Health teachers	5.07
	Teacher education teachers	4.98
	ICT teachers	4.57
<b>Idea Promotion</b>	Health teachers	4.83
	Teacher education teachers	4.67
	ICT teachers	4.47
<b>Idea Realization</b>	Health teachers	4.19
	Teacher education teachers	4.25
	ICT teachers	3.65
<b>Idea sustainability Improving and Optimising</b>	Health teachers	4.43
	Teacher education teachers	4.49
	ICT teachers	3.93
<b>Idea sustainability Disseminate on Larger scale</b>	Health teachers	3.94
	Teacher education teachers	3.70
	ICT teachers	3.55
<b>Idea sustainability Disseminate Deeper in the organisation</b>	Health teachers	4.12
	Teacher education teachers	4.24
	ICT teachers	3.84
<b>Idea sustainability Visualization</b>	Health teachers	3.39
	Teacher education teachers	3.49
	ICT teachers	3.24

\* Score significant

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