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**Fostering Dissemination of Innovations in Vocational Education: Analysis of Theories on Organizations and Organizational Behaviour and a Delphi Study**

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## **Fostering Dissemination of Innovations in Vocational Education: Analysis of Theories on Organizations and Organizational Behaviour and a Delphi Study**

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### **Abstract**

Vocational education faces many challenges due to the dynamics in the context, the complexity of the system and the (ever changing) demands. Therefore, continuous responsiveness of VET is required, for VET that fits the demands and the characteristics of the target group, and the impact thereof on the development of innovations. For successful VET innovations need to be disseminated. How can this be fostered? A mixed methods design study was conducted consisting of (1) an analysis of theories on organizations and organizational behaviour and (2) a Delphi study. Characteristics of the innovations, involvement of stakeholders, and the context are mentioned to affect dissemination. To foster dissemination of innovations concrete suggestions are formulated in relation to the college as an organization, the learning organization, involvement of different actors, to teams and networks, and to boundary crossing. Tools are developed for the required analysis of the dissemination and the vocational college itself.

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## **Förderung der Verbreitung von Innovationen in der beruflichen Bildung: Analyse von Theorien über Organisationen und organisationales Verhalten und eine Delphi-Studie**

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Die berufliche Bildung steht aufgrund der Dynamik des Kontextes, der Komplexität des Systems und der (sich ständig ändernden) Anforderungen vor vielen Herausforderungen. Daher ist eine kontinuierliche Reaktionsfähigkeit der beruflichen Bildung erforderlich, damit sie den Anforderungen und den Merkmalen der Zielgruppe gerecht wird, was sich wiederum auf die Entwicklung von Innovationen auswirkt. Für eine erfolgreiche berufliche Bildung müssen Innovationen verbreitet werden. Wie kann dies gefördert werden? Dazu wurde eine Studie im Mixed-Methods-Design durchgeführt, bestehend aus (1) einer Analyse von Theorien über Organisationen und organisationales Verhalten und (2) einer Delphi-Studie. Die Merkmale der Innovationen, die Einbeziehung von Interessengruppen und der Kontext werden als Faktoren genannt, die die Verbreitung beeinflussen. Um die Verbreitung von Innovationen zu fördern, werden konkrete Vorschläge in Bezug auf die Berufsschule als Organisation, die lernende Organisation, die Einbeziehung verschiedener Akteure sowie in Bezug auf Teams, Netzwerke und Boundary Crossing formuliert. Instrumente für die erforderliche Analyse der Verbreitung und die Analyse der Berufsschule werden entwickelt.

**Keywords:** *Vocational education, Dissemination, Innovation, Organization and Organizational Behaviour Theories, Delphi study*

**Schlüsselwörter:** *Berufsbildung, Verbreitung, Innovation, Theorien zu Organisationen und organisationales Verhalten, Delphi-Studie*

# 1 Introduction

Discussions in society on for example the need for lifelong learning and 21<sup>st</sup> century skills challenge the system of vocational education. Vocational education faces many challenges. Firstly, since it is operating in the constantly changing context of society, including challenges due to its relatively low status in various countries. These have consequences for the demands put to the system of Vocational Education and Training (VET) in terms of the competencies that the students need to acquire for all kinds of jobs in all domains such as industry, healthcare and education. Furthermore, the changes in characteristics of the target group, the students, put demands on VET. Secondly, the VET system itself is a complex system consisting of different layers: the political frame (with its laws), the institutional level (with its stakeholders and qualification structure), the level of the organization (with its vocational colleges and companies) and the level of the teaching-learning arrangements (with its content, assessment, and on-the-job and off-the-job training) (e. g., Nieuwenhuis/Mulder/Van Berkel 2004).

The challenges demand responsiveness of VET (Nijhof 2004) which includes the development and implementation of innovations, also at the level of teaching-learning arrangements (e. g., OECD 2009). These innovations need to match the target groups and demands of society in terms of qualifications and competences. This has led to many innovations in the past in all parts of VET such as economical vocational education (e. g., Fürstenau 1994) and technical vocational education (e. g., Mulder 2003). Providing quality in VET requires evaluations of such innovations (e. g., Fürstenau 2008; Mulder 2004a). Furthermore, a prerequisite for providing high quality in VET in an efficient and sustainable way, is the dissemination of innovations. This means that innovations and experiences of colleges and people in developing and implementing innovations in VET, are transferred to new situations (contexts), by using them for the implementation and/or development of new innovations. The aim of this article is to provide information to VET colleges that can help them foster dissemination, in order to be able to meet future demands.

The Expertise Centrum Beroepsonderwijs (Expertise Centre for Vocational Education, ECBO) in the Netherlands recognized the importance of dissemination and assigned a study (Mulder 2011) with a mixed methods design to discover new insights into the possibilities to foster dissemination of innovations in VET. The purpose of this study was to support VET colleges in the Netherlands in disseminating innovations. Since this study delivered relevant insights that can be useful for VET in other countries as well, it is used as a basis for this article. The assignment consisted of distilling from theories on organizations and organizational behaviour, concrete possibilities for fostering dissemination of innovations in VET by focussing on the question how knowledge and experience developed in innovations can be used for new innovations in other locations in the same college, in other colleges and companies, in other courses, in education for other kind of jobs, etc. To enhance the development of concrete measures that fit the context of VET a Delphi study among different stakeholders was carried out. The analyses of the theories and the results of the Delphi study, which will be described in this contribution, are used for the development of concrete measures that VET colleges internationally can use to foster dissemination of innovations. In the next section innovation and dissemination

will be defined. Then the two parts of the study will be briefly described followed by the results, and tools to help VET colleges to analyse their organization to foster dissemination.

## **2 Innovation and dissemination**

Enhancing insight into possibilities for dissemination of innovations first requires clear positions and definitions, which will also steer the selection of, for this study relevant theories. Needed are definitions on innovation and dissemination suiting the context of vocational education, and it needs to be clear how these concepts relate. For both terms theories in different academic disciplines, such as sociology, management studies, and educational science, are used.

### **2.1 Innovation**

The results of an analysis of different positions on aspects of innovations such as the distinction between radical and incremental innovations (e. g., Nooteboom 2000; Nelson/Winter 1982), and the notion of the influence of the context on creativity and innovation (Ford 1996), is in accordance with Kanter's position on innovation, namely that innovations are considered as products or processes that are new, applicable and useful within a specific work context (Kanter 1983; 1988). Especially in the context of education, including vocational education, innovations can be new instructional objectives or didactical methods, changes in work processes such as collaboration between teachers, or new work tasks of teachers (Fullan 1991). Innovations are not restricted to the classroom however, but can include the wider context within and outside the college. Furthermore, innovations need to be developed for the requirements of a specific college and its context. Taking everything into account, and on the basis of West and Farr (1990), innovations are defined here as "products or processes that are new, applicable and useful for a certain individual, group or organi[z]ation. Innovations can differ with regard to the persons involved, the time required for its development and the range of persons affected by the innovation" (Messmann/Mulder/Gruber 2010, 22).

It is also important to realise that the development of innovations as such, is also of interest. Marinova and Phillimore (2003) found that research on innovation development has developed itself containing different approaches: considering innovations to be a black box, considering it an iterative process, followed by ecological approaches. It is important to realise that innovation development is a process, as is dissemination.

### **2.2 Dissemination**

Different perspectives were taken into account to determine what dissemination is. First, literature on transfer is used, where for instance far and near transfer are distinguished (Simons 1990). Bransford and Schwarz (1999) have emphasised that transfer needs to be considered a dynamic process with 'transfer in' factors such as prior knowledge, as well as characteristics of the context (e. g., learning and work environment) affecting transfer. The awareness of boundaries that can and need to be crossed stems from studies on boundary crossing (e. g., Tuomi-

Gröhn/Engeström 2008; Akkerman/Bakker 2011). Furthermore, insights from theories on innovations, innovating and diffusion of innovations (e. g., Kanter 1988; Rogers 2003) are used in determining what dissemination of innovations in vocational education is. This led to the following, for vocational education relevant, definition of dissemination: “Dissemination of innovations concerns the process of, planned or unplanned, transfer of (parts of) innovations in another setting, that is used in another form (adapted to the new context, or especially developed for the new context). The process of dissemination is dynamic, where the innovation is influenced by the characteristics of the involved actors (their knowledge, attitude, etc.) and the characteristics of the context. The process of transfer runs through communication and joined activities” (Mulder 2011, 26). This process can have a clear end, but it can also be an ongoing process. Furthermore, different objects of dissemination are identified (Mulder 2011), namely (1) the application of the original innovation with the same characteristics in another setting (adoption), (2) the use of the original innovation and adapting that to the new situation (adaptation), and (3) the use of the knowledge and experience gained in innovation, in another setting, which leads to a something new, something different from the original innovation (invention, new creation). In the present study the focus is, also based on the assumption that the first form (of adoption) is not sufficient for successful dissemination because characteristics of the new context are not considered, on adaptation (2) inventions and new creations (3).

### **3 The study**

This study has a mixed methods design containing a review of theories on organizations and organizational behaviour, and a Delphi study.

#### **3.1 Analysis of theories on the organization and on organizational behaviour**

The assignment of the ECBO consisted of analysing theories and models on organizations and organizational behaviour in order to gain new insights into possibilities of fostering dissemination of innovations in vocational education. Therefore, the first step was to select relevant theories. Due to the complexity of this topic, theories and models from different scientific disciplines and paradigms could be useful, such as economics, sociology, psychology, business, and anthropology. Moreover, also the overlap of content and models and the lack of clear borders between these disciplines, made including a wide variety of disciplines necessary. Some of the relevant theories can be considered as basic theories, such as bureaucracy and contingency theories, or postmodernism, others as a further development of these theories. All these theories were taken into account and their relevance determined. The analysis of the final selection of theories was conducted in two steps. First, the analysis of the focus of the theories and categorising them accordingly into the three levels individual, team, and organization, as well as the fourth perspective of knowledge, knowledge development and management (see 4.1). To reach this aim it is necessary to focus on deriving all possible ideas from the existing theories (instead of comparing the theories). Therefore, the second step consisted of determining the value of the content of these theories along different aspects with which dissemination

can be fostered such as the involvement of individuals and the characteristics of the organizations (see 4.2).

### **3.2 Delphi study**

A Delphi study was conducted to gain context specific information. In total 14 Dutch experts (with sometimes multiple functions) working in the domain of vocational education participated, representing academics, practice researchers, innovation managers, professors of universities of applied science, members of school management with a focus on pedagogy, educational consultants and policy makers.

This study consisted of three rounds with questionnaires sent per email. In the first round the respondents answered questions on their own experiences with innovations in vocational education, their involvement in innovations, on the extent to which dissemination of these innovations has occurred, and what the reasons were for why or why not dissemination has occurred (N=11). For all in the first round mentioned reasons, is (in the second round) investigated if these were factors that indeed foster or hinder dissemination, how important they were for the dissemination process, and which were most important (N=10). In the third round the outcomes of the second round were analysed and categorised into: the characteristics of the innovation itself, activities for professional development, the involvement of different internal and external stakeholders, and the (school and external) context. The questions posed to the respondents (N=6) was to mention the three most important factors out of the 18 selected most important factors, which factors of these 18 are impossible to combine, and which are not feasible. In addition, on the basis of the outcomes of the second round, a scenario consisting of a description of a situation (a case) that has all the characteristics that respondents have mentioned as the ‘most important dissemination fostering factors’. The accompanying questions were: “What characteristics, to realise this situation, should the vocational college have”, and “What should the different actors (students, teachers, school management, school leaders and external actors) do to realise this situation”. The answers were anonymised, the content of the answers was analysed and where possible means were calculated.

## **4 Results**

In this section insight is provided into which theories on organizations and organizational behaviour were selected, and what kind of information is extracted from them (4.1). In section 4.2 the possibilities that are distilled from these elements for fostering dissemination of innovations in VET are presented. The results of the Delphi study are briefly presented in 4.3.

### **4.1 Analysis of Theories**

First, after collecting and selecting all relevant theories and models, a structure was needed. The theories are categorised in the individual level, the team level and the level of the organization. Moreover, theories were found that focus on the object ‘knowledge’ that can be developed and disseminated. These form a separate, fourth category. From the theories only those

elements are selected that can be used as a basis for suggestions on what can be done to foster dissemination of innovations. The key elements of the theories are mentioned briefly in the following sections (based on Mulder 2011, 29-68).

#### *4.1.1 The individual*

According to the Transaction cost theory (Williamson, cited in Lammers/Mijs/Van Noort, 2000) people are inclined to opportunism and have bounded rationality. Bounded rationality fosters opportunism. Limited information, the complexity of information and limited cognitive abilities decrease rational behaviour. The Agency theory focuses on the economic exchange on the basis of contracts between partners, who both have limited information, and points out various forms of agency problems: limited information on the employees, on the intentions of the contract partners, the partner has more information and can use that in negotiations, and the employer cannot see the actual behaviour of the employee (only the results thereof). Decision-making theories point out the relevance of equilibrium. The employee contributes and the organization gives back material and/or financial compensation or prestige. Furthermore, behaviour depends on perceived alternatives to satisfy one's own needs (March/Simon 1958). Functionalism (Parsons, cited in Gherardi/Nicolini 2001) emphasises the importance of rational motives for actual behaviour. In relation to the contribution of psychology, Maier, Prange and Von Rosenstiel (2001) focus on learning and state that that is not always intentional, people can learn from (role) models (through observations), prior knowledge influences learning, and rules are developed based on prior knowledge. These rules are applied to new situations and actions. Furthermore, learning is motivated behaviour. There is a difference between learning and the performance that results from that, which is influenced by many factors such as characteristics of work tasks and the work team. All these aspects can be positive or negative, and can have positive or negative results. In addition, the Human relations movement, for which the Hawthorne studies were important, also showed that psychological factors influence performance. Furthermore, in work and organization psychology theories, many additional components are highlighted, such as job satisfaction, job motivation, stress, influence of team members, commitment, effects of technology on wellbeing, fit between persons and activities, and conflict management. These theories are not further discussed here, because they mainly focus on individual behaviour, and not the organization.

#### *4.1.2 The team*

Embedded in the organization are work teams, that set goals and boundaries and influence interaction with other units in the organization. Teams are existing of at least two persons among which social interaction take place, and have specific shared objectives (work tasks). The members are task interdependent, and teams have and maintain boundaries to other teams (Kozlowski/Bell 2003, 334). The socio cognitive approach emphasises that teams as well as individuals can have and use knowledge. In addition, knowledge can also be hold in documents. At team level different kinds of concepts of knowledge can be found in literature: shared cognition (Thompson/Levine/Messick 1999), group cognition (Akkerman et al. 2007), collective learning, transactive memory, team learning, information sharing, team mental model

(Mohammed/Dumville 2001). All terms emphasise the importance of knowledge and the sharing in teams. Important for knowledge sharing and learning in teams are cultural aspects in the teams for instance, learning culture (Marsick/Watkins 2003), feedback culture (London/Smither 2002), error culture (Rybowiak et al. 1999) are highlighted.

Of the sociocultural approaches the concept of Communities of Practice (CoP) (Wenger 1998) can be of help. CoPs are characterized by a shared repertoire, mutual engagement of the members who have an idea about what they (the CoP) are, and on the goal. The members communicate, learn, the CoP is spontaneously developed, there is no clear leadership, the boundaries are not fixed, they are not static. Such CoPs have led to innovations. In particular three dimensions show how flexible it is, and what the boundaries are: the amount of coordination, the transparency, and the possibilities of negotiation. Learning is seen as growing into the community, where negotiation of meaning and development of identity are pivotal aspects. And learning depends on the context (Lave/Wenger 1991).

Another approach focusses more on the relations between members (Granovetter 1985). Here it is argued that weak ties can foster innovations because chances on new input is higher than when there are strong ties among the members, where the chances that something new comes out of it are low due to people already knowing each other very well.

From Stacey (2007) we derive that there are restrictions on leadership because leaders cannot steer how employees interpret structures, plans, resources, etc. Therefore, it is necessary that leaders themselves are actively involved in the actions meant to improve the organization. Furthermore, diversity is of importance and people need to be made aware of that. There is also evidence on the importance of diversity in teams (e. g., Van Knippenberg/Schippers 2007) and that the effects of diversity depend on characteristics of job tasks and context variables (Jackson/Joshi/Erhard 2003).

#### *4.1.3 The organization*

This section contains theories on the structure of organizations, on the context of organizations, and on crossing boundaries. In addition, theories on the learning organization are promising. The first important theory in this respect is The Fifth Discipline (Senge 1990) where five different components, so-called disciplines, are distinguished that make an organization a learning organization. The first one is personal mastery. The second one is mental models, that refers to ideas and visions that people have that determine how they see the world and that influence their behaviour. Building a shared vision is also important for organizational development. In addition, team learning is an integral part of the learning organization. The last, and fifth discipline ‘systems thinking’ integrates all these disciplines. Moreover, the Learning Organisation (Argyris and Schön 1996) argues that people have personal theories that influence their behaviour. These theories can cause unintentional, defensive routines that lead to situations where no safety is experienced, no learning from errors happens, etc. They distinguish ‘espoused theories’, which are the theories that people say they have on their attitude, norms, and values. Furthermore, the ‘theories in use’ are the theories they have, which actually lead to their behaviour. Behaviour has certain consequences. In addition, it is important



to realise that single loop learning occurs when reflecting on consequences leads to changes in this behaviour. Double loop learning happens when consequences lead to changes in the 'theories of use', in for instance changes in norms and values. Deutero learning occurs when consequences lead to changes in 'espoused theories'. A difference between 'espoused theories' and 'theories in use' can be used to foster innovation. Consciousness about the discrepancy can for instance be achieved with the help of other persons.

In relation to the structure of the organization, the Structuration theory emphasises that the structure is not static, but that it is a process of production and reproduction activities and that structure consists of rules and resources and that these require actions of people (Giddens 1984). Furthermore, in the stream of postmodernism Foucault (cited in Gherardi/Nicolini 2001) emphasises participation in another way. Learning in organizations is considered a discursive practice, which requires discourse about the object (e. g., the organization).

From the Garbage can theory (Cohen/March/Olsen, cited in: Boerner/Macher/Teece 2001) can be determined that if employees at the middle or higher level have no opportunities to make decisions, this may hinder application of solutions developed in one context in another setting. When decisions are made at many levels, that can cost time and can lead to slow processes. However, when only a few are allowed to make decisions, that will not lead to good decisions (due to lack of detailed information) and there will be no commitment.

In relation to the organization of work, routines refer to production processes and procedures in the organization such as decision-making (Nelson/Winter 1982). Changes can be fostered by altering routines. This can be fostered by people from the organization or from outside. In relation to the context of organizations further theories can give impulses. There are the contingency theories (Lammers/Mijs/Van Noort 2000) where the assumption is that the organization is influenced by the context, for instance the culture of a country, or digitization. In this respect Mintzberg (1979) states that adhocracy, where professionals have a strong position and take part in formulating strategies, is most likely to foster innovations, but not necessarily dissemination. Such organizations are adaptive. Important is the fit between the context and the organization. Furthermore, neo-institutional organization theories emphasise the legitimacy of formal structures (Weber, cited in Walgenbach 2006). Reality is socially constructed based on the experiences of people. The expectations and demands of society determine what possible actions are. These expectations and rules influence formal structures of the organization, with which organizations develop themselves.

Luhmann (2008) does not see context as determining but as a framework in which decisions can be made, which however can cause chaos by its complexity. Routines, rituals, and informal and formal rules can help to deal with this complexity. Organizations consist of communication about decisions, which entail information and understanding. His way of thinking implies that it is important that a job fits to the person. Learning is considered a social process in a specific context and requires knowledge. An organization should understand itself, what are the goals, etc. which leads to further knowledge development.

In relation to crossing boundaries there are different approaches that deliver useful insights. Next to ‘activity systems’ of which is distilled that by changing instruments, division of labour, rules, and behaviour of subjects and the community, organizational development can be fostered (Engeström 1987; 2001), boundary crossing is emphasised with which the boundaries of different activity systems can be crossed. Communication takes place on the object (such as work tasks, behaviour, artefacts) and what crosses borders depends on the interpretation of the people involved. That is how new information gets into another group. Reflection on these objects cause so-called expansive learning. Boundary crossers can bridge different activity systems. Wenger (1998) also pays attention to the role of people and defines brokers with different types thereof: boundary spanners, roamers, outposts and pairs. Furthermore, there are boundary objects, such as artefacts, processes, and thirdly there are boundary encounters.

Kanter (1988) argues that active agents can foster dissemination by organizing communication. Groups that have the task to disseminate innovations can be formed. In addition, the context where the innovations is disseminated into, needs to be prepared (anticipation), so that these employees are open for new ideas, are able to adopt new ideas, and use the innovation. Otherwise, resistance is possible. This implies that in line with Rogers (2003), centralisation and concentration of power is considered good for dissemination of innovations when the innovations are complex. Furthermore, from Rogers (2003) can be derived that that requires high expertise, and that less complex innovations can disseminate decentralised through non-experts that themselves are (or become) the users.

The approach of Open innovations (Chesbrough/Vanderhavenbeke/West 2006) distinguishes three different processes in streams of knowledge: from outside to inside, from inside to outside, and the combined process. Knowledge brokers are used to get information from outside. From inside information and ideas are (on purpose) given to external parties outside the organization. The combination strategy leads to for instance joint ventures.

#### *4.1.4 Knowledge development and management*

First of all, different types of knowledge are distinguished. Sticky knowledge for instance stays with a person, and leaky knowledge is knowledge that leaks to other persons and settings (Brown/Duguid 2001). Leaky knowledge is primarily codified explicit knowledge at the organization level. And sticky knowledge refers to implicit knowledge at for instance the team level. Furthermore, fluid competences (referring to processes of distilling from knowledge and skills the necessary problem solving of new problems) and crystallized competences (referring to partly automatized patterns of problem solving) are distinguished with the notion that innovative knowledge communities (IKC) are needed to develop innovations (Hakkarainen et al. 2004).

In addition, explicit and tacit knowledge are distinguished. Where the latter refers to the knowledge that we are using but are not aware of. Development of knowledge occurs in the SECI model of Nonaka and Takeuchi (1995) through socialisation (where tacit knowledge is developed), externalisation (where tacit knowledge is made explicit), combination (where explicit knowledge is combined) and internalization (where explicit knowledge changes into tacit). That is followed by socialisation again, and so on. This runs from the individual level, to

team level and to organization level. This model explains knowledge development and the diffusion of knowledge.

Knowledge can be managed (Probst/Raum/Romhardt 2006). Different components are distinguished that are relevant, namely identifying knowledge, gaining knowledge, development of knowledge, sharing knowledge, using knowledge, and saving knowledge. These components are considered central activities of knowledge management, and they interact. It is important that knowledge goals are formulated, that knowledge is assessed, and the relationships between these two and the other six components are of importance.

## **4.2 Meaning of theories and models for dissemination**

After the relevant elements of the different theories were selected, the implications thereof for suggestions to foster dissemination of innovations in VET were distilled. These concrete suggestions were merged into five different categories which form the structure in this section.

### *4.2.1 Characteristics of the organization*

To achieve low transaction costs, a hierarchical structure of the organization is preferable. This also goes for fostering the dissemination of complex innovations. On the other hand, dissemination of less complex innovations can occur decentralised through non-experts that themselves are (or become) the users. This fits the idea that for good decision-making, information on details is required. Positive and negative consequences of decision-making at the different hierarchical levels are revealed. However, good decision-making costs time. Therefore, time as a resource needs to be provided. In adhocracies (leading to innovations), specialists carry out tasks, they also take care of tasks of middle management and these specialists are involved in strategic decision-making.

Furthermore, it is emphasised that contracts are of importance with which a balance can be realised between the satisfaction of an employee and the employee's costs. Important is to reduce complexity and insecurity. This can be established through organizing division of labour, standardisation of processes, clear power and hierarchy, and communication. Moreover, a good person-job fit is preferable. In relation to the organization of work it can be suggested to change routines, by people from inside or outside the organization, which will lead to changes in behaviour.

Possibilities for further development of the organization, and consequently also actions in the organization depend on characteristics of the context outside the organization. Organizations need to take that into account and use that information on the developments in society. For further knowledge development it is also important that an organization understands itself, knows what the goals are, etc. Organizational learning is a social process in a specific context and requires knowledge.

### 4.2.2 *Learning organization*

Enhancing personal mastery, mental models, shared visions, team learning and systems thinking offer possibilities to foster organizations that develop themselves, which seems to foster dissemination because the employees understand how an organization as a system works and can use that knowledge. A concrete measure to foster systems thinking is for instance the use of a systems map consisting of diagrams that show the most important parts of the organization and how different departments are related. In addition, insight in routines and reflection on the organization and the consequences of behaviour all foster the development of the organization with increasing chances of dissemination to happen. Therefore, all this needs to be fostered. In addition, making visible the differences between ‘espoused theories’ and ‘theories in use’ offer opportunities for new insights and behavioural change, which are needed for dissemination to occur. Here, leaders can play an important role. Furthermore, it is suggested that leaders have to be developers of policy, strategy and systems and act as stewards where they explain the sense of what they are doing and what is happening, for instance by storytelling. They have to be aware of their role as ‘teacher’ which is meant as facilitating and creating possibilities for learning. They are seen as responsible for the development of shared mental models, for learning and for shared leadership.

In addition, focusing more on knowledge development, it can be argued that it has to be taken into account that there are different kinds of knowledge with different functions and different outcomes. And that different aspects of these have to be fostered. Knowledge development can be fostered by different kinds of measures such as storytelling, using concept maps (to make tacit knowledge explicit for instance), sharing experiences, increasing awareness and understanding of the competences that are required for specific tasks by discussing them among colleagues, use of metaphors and analogies as a basis for dialogue, foster learning-by-doing, and collect and save information in databases and make them available for other employees. Next to this saving of information and the development of knowledge, the identification of knowledge, the use and sharing knowledge needs to be fostered which needs to be accompanied by the formulation of knowledge goals and assessment of knowledge.

### 4.2.3 *Involvement of individuals in the organization*

Dissemination of innovations requires the involvement of the individuals in the organization. They have to actively participate in the dissemination. There are several suggestions derived from the theories that can increase involvement of employees in innovations and dissemination processes, such as emphasising the importance of the innovations and dissemination. Required behaviour can furthermore be fostered by emphasising the discrepancy between behaviour and desirable behaviour, fosters changes in behaviour. Moreover, employees need to be motivated, can be supported with organizing the right (learning, feedback and error) climate, provide a situation of trust, employees develop identity which is important. Furthermore, aspects as job satisfaction need to be fostered, and stress and uncertainty reduced. Leaders must understand they are a role model, and have to be aware of the importance of the mentioned factors as well as of the rules they develop and that learning is also influenced by errors which can lead (by accumulation) to more severe negative behaviour. Besides, steering learning processes and

using prior knowledge is important. This can be fostered by for instance, specific forms of learning such as learning-by-doing (e. g., academic learning for absorbing new knowledge from outside) that can foster innovations, and spillover learning (where external knowledge absorbing occurs and practices of competitors are imitated).

#### *4.2.4 Teams and networks*

An important benefit of this team and network perspective is that development is seen as a social and cultural process, as well as a cognitive (learning) process. Networks that share a practice need to be organized to foster knowledge and competency development for solving new problems, developing new routines, and capturing new innovations. This can consist of people with similar jobs in different organizations, or temporarily built teams with a specific task. The importance of the knowledge of the team and how it is shared is emphasized (spread in the heads of all the members), of shared beliefs on what the team is, of the objectives of the teams, shared values and norms etc. This requires information acquisition, and aspects such as the culture in the team, feedback and learning culture. Participation in social learning processes should be fostered. For diffusion of knowledge, networks are important as is making knowledge more leaky. It helps when people understand each other, for instance because they have similar jobs and work tasks or have a shared practice.

Development of the team, sharing knowledge which requires trust, team learning and team mental models, and cultures where these can prevail need to be fostered. Negotiation of meaning can increase the integration of members in a team, as can expansiveness, which means for instance membership of more than one team. Fostering strong relationships, involving people, and increasing interaction can be of help. Leaders can organize this and have to be involved themselves in innovations and dissemination. Furthermore, there should be awareness of the role of the diversity and other characteristics of a team, communication about it, and diversity can be used (e. g., cognitive diversity in a team). Employees need the capacity to change and to act responsive. However, leaders should realise that the people themselves interpret the situation, realise his/her limitations in steering people, foster communication, actively participate in communication, be reflective and search for better ways to act.

Teams need the opportunity to grow. Particularly for innovations the ties between the team members should not be too strong, so that innovations can occur. On the other hand, strong ties are supposed to be good for the sharing knowledge which requires trust. It is important to work in networks and forming strategic alliances. That decreases the problem of ‘not invented here’.

#### *4.2.5 Boundary crossing*

Several suggestions were posed for fostering boundary crossing, which is required for fostering dissemination. First, there is the possibility for people to act: active agents can increase the willingness in a new setting to change. Boundary crossers can create relationships between different contexts. So-called boundary spanners that focus on a specific boundary for a period of time, roamers that make contacts between different departments, outposts who bring new knowledge into the group, and pairs that have good contacts with others in other teams can all

foster boundary crossing. Furthermore, suggestions are made such as decrease group thinking, avoid fragmentation of tasks, and the awareness that boundary crossing requires social interaction. Cross disciplinary projects can be of help.

### **4.3 Delphi study**

This section focuses on that part of the results of the Delphi study that concerns the factors that foster and/or hinder dissemination of innovations in VET. In the following table a selection of factors is listed, namely the ones that had the highest scores on the question if the posed factor was hindering or fostering dissemination. The range runs from ‘not at all’ (1) to ‘very strong’ (4). The mean values represent the answers of 10 persons. Table 1 contains an overview of the most important factors for either fostering or hindering dissemination. Of the selected factors all values are listed.

The results indicate that different categories of factors can be distinguished: the characteristics of the innovation itself, the involvement of different internal and external stakeholders, and the (school and external) context. The results show that factors relating to activities for professional development (such as training) were not mentioned as ‘most important’ in fostering or hindering dissemination.

Table 1: Results of the Delphi Study: Selection of most important fostering and hindering factors (Mulder 2011, 125 [selection])

	<b>Fostering Mean</b>	<b>(SD)</b>	<b>Hindering Mean</b>	<b>(SD)</b>
<b>Characteristics of the innovation</b>				
<i>Characteristics of innovation</i>				
Scale of innovation	2.0	(1.07)	2.6	(0.70)
Innovation is solution for a problem	3.8	(0.76)	1.1	(0.33)
Innovation has clear goals	3.5	(0.53)	1.4	(0.52)
Innovation is on primary process	3.2	(0.75)	1.4	(0.52)
Focus on realising goals	3.1	(0.69)	1.4	(0.74)
Results of the innovation are clearly visible	3.4	(1.06)	1.7	(1.10)
Complexity innovation	1.5	(0.53)	2.9	(0.57)
Space for reflection in the innovation	3.4	(0.74)	2.0	(1.00)
Efficient use of time, money and staff	3.1	(0.38)	1.6	(0.92)
Innovation is evaluated	3.2	(0.41)	1.6	(0.74)
Exchange between actors in innovation	3.1	(0.99)	1.6	(1.01)
<i>Conditions</i>				
Available finances	3.3	(0.89)	2.8	(1.20)
Employee turnover (large)	1.5	(0.76)	3.4	(0.84)
Available time (lot, little)	3.1	(1.13)	3.4	(0.53)
<i>Innovation process</i>				
Start innovation is bottom up	3.0	(1.15)	1.9	(1.05)
Top-down innovation	1.5	(0.84)	2.8	(0.89)
<i>Context</i>				
Embedded in curriculum	3.1	(0.90)	2.1	(1.10)
Innovation implemented in whole curriculum/study	2.9	(0.70)	1.9	(1.05)
<i>Dissemination process</i>				
Selection of only nice aspects	1.8	(1.10)	2.5	(0.76)
Adopting aspects of a certain innovation	2.2	(0.75)	2.4	(0.92)
Space for making innovation tailor made innovation	2.9	(0.99)	2.0	(1.22)
Availability of information on how the innovation can be adapted to the demands of another context	3.1	(0.90)	1.8	(1.04)
Freedom to adapt innovation to own context	3.4	(1.06)	1.6	(1.01)
Participation in dissemination process is voluntary	1.9	(0.69)	3.0	(0.76)
<b>Actors</b>				
<i>Internal</i>				
Involvement students	3.6	(0.53)	1.3	(0.50)
Involvement teachers	3.4	(1.13)	1.8	(1.30)
Support/ behaviour school leaders	3.3	(1.11)	2.9	(1.45)
Support (middle) management of school	3.4	(1.06)	2.9	(1.17)
Vision of school leaders	3.3	(1.04)	2.1	(1.27)
Fear for change	1.6	(1.19)	3.6	(0.70)
Feel of urgency for change of teachers	3.5	(1.07)	1.9	(1.36)
<i>External</i>				
Feedback of researchers on the innovation	3.1	(0.38)	1.5	(0.76)
<b>Characteristics of the context</b>				
<i>School</i>				
School size (large)	1.6	(0.53)	2.4	(0.88)
Innovation culture	3.3	(1.04)	2.3	(1.12)
<i>External</i>				
External demands according exams	2.0	(1.12)	2.7	(1.00)
Position of innovation in the organization	3.3	(1.04)	2.6	(1.01)

In all categories, except in the category professional development, factors are indicated that hinder dissemination. For instance, highly complex and large innovations, high employee

turnover, little time, participation is on voluntary basis, focussing on only the nice aspects of an innovation, fear of change of the people involved, large colleges, external demands, and a weak position of the innovation in the organization are especially considered factors that hinder dissemination. On the other hand, many other factors are indicated that foster dissemination, such as if the innovation is the solution for a specific problem or has clear goals, there is space to adapt the innovation, involvement of students and teachers, teachers feel a sense of urgency, the existence of an innovation culture in school, and a strong position of the innovation in the school, are among others factors that foster dissemination of innovations.

## 5 Tools for fostering dissemination

The results of the analysis of the theories, as well as the results of the Delphi study, including the most important hindering and fostering factors, are combined and used for the development of concrete tools that vocational colleges can use in order to foster dissemination of innovations. The conclusion is that a proper analysis of the situation as well as the targets (in terms of results of the innovation and dissemination) is the first step in fostering dissemination. Therefore, in this project (Mulder 2011) two different checklists were developed that colleges can use to analyse the aim of the dissemination, and to analyse their organization. Both types of information are required to successfully foster dissemination of innovations. The answers to all questions provide a solid foundation for concrete measures that the colleges can develop and carry out.

Table 2 contains a brief overview of the questions that need to be answered in relation to the dissemination, and in addition some issues to be considered are mentioned to make clearer what the answers to questions of the checklist could and/or should contain (based on Mulder 2011, 92).

Table 2: Checklist for analysing the objective of the dissemination (Mulder 2001, 92)

Questions	Issues to be considered
(1) What is the object of dissemination?	Characteristics of the innovation, objectives, relevant actors, etc.
(2) What is the dissemination? What is disseminated? (e. g., part of an innovation). What is the target of dissemination? What is the fit of the dissemination with characteristics and objectives of innovation?	Objectives innovation, objectives dissemination, fit between the two
(3) What are the implications of the chosen form of dissemination for the decision/determination of targets of the dissemination? What are the targets of the dissemination? What are the indicators of evaluation of reaching the targets?	Choices need to made, e. g., clear targets (e. g., dissemination is realised, or experience of prior experience in innovations is used in new setting, or dissemination led to decrease of drop out), and the sequences for the changes that need to be made
(4) What kind of problems need to be solved with the dissemination? And for what problems in the new context is the innovation that will be dissemination indeed a solution?	Dis/similarity problems in different contexts, ownership of problem/s of organization and/or people involved in dissemination (of both: dissemination likelier)
(5) Does the dissemination fit in the organization?	To the goals and characteristics of the organization
(6) Does the dissemination fit in the context of the organization?	Education system, society



It is important that the answers on all these questions are coherent. In addition, the college, as an organization, needs to be analysed to be able to understand if this organization already contains all required characteristics and/or what needs to be realised to be able to foster dissemination. Table 3 contains this checklist (based on Mulder 2011, 95).

Table 3: Checklist for profile analysis of the organization (Mulder 2011, 95)

Questions	Issues to be considered
(1) What choices are/will be made according the structure of the organization	Hierarchy, decision-making, autonomy
(2) What is the organization?	Characteristics, objectives, values and norms, various forms of culture
(3) How is diffusion of knowledge and development of knowledge organized, stimulated, facilitated?	
(4) How does learning of the employees need to be fostered?	How people learn, decreasing opportunism, valuing and motivating people, reduction of uncertainty
(5) How is learning in and of teams and networks fostered and organized?	Trust, communication, facilitation of learning, sharing knowledge
(6) What are the characteristics of the teams and networks?	Knowledge in teams/networks, values and norms, cultural and cognitive diversity, shared experiences, possibilities for communication
(7) How is the relationship between teams/networks with other parts of the system?	Other stakeholders/actors, the innovation, rules, values and norms, instruments, objectives, coherence
(8) What is the task of the team/network?	Analysis of relations with problem and targets of dissemination, art/kind of work
(9) What is the structure of the team/network?	Leader, tasks and responsibilities, division of labour, autonomy, decision-making
(10) What is the culture in the team/network?	Collective identity, onboarding, socialisation, feedback- error- and learning culture, power
(11) (Context) what is the organization in relation to the context?	Analysis of organization, comparison with results of analysis of context, opportunities and responsibilities, possibility to influence/change context
(12) How is the communication with the context?	Components and actors that can cross boundaries
(13) To what extend do all choices and all characteristics fit?	Coherence and consistency

It is important to realise that in principle there are no right or wrong answers to these questions. For every innovation and dissemination of that specific innovation the answers can differ. Pivotal however is that the information collected by answering all these questions needs to be consistent and coherent. If so, this information can provide a solid base for making choices in the dissemination process and for developing and using concrete measures. Since contexts and consequential demands are changing over time, these checklists can be used periodically for sustainable positive results.

## 6 Conclusion

Operating in a context with ongoing developments and subsequent changing demands, and being a complex system in itself, vocational education always needs to develop new solutions in the form of innovations (e. g., OECD 2009). The aim of this study was to increase insight into possibilities for fostering dissemination of innovations that can be used for the development of concrete measures by vocational colleges. Dissemination is understood as a dynamic, non-

linear process, which is influenced by the characteristics of the context and by all actors involved. Furthermore, dissemination can be completed at some point, but can also be a long-lasting process. In the process of dissemination, knowledge and experience is gained by those involved, and new knowledge can be developed. The disseminated innovation will be different in the new situation, needs to fit to the target group, to the required outcomes, and the characteristics of the context.

The precondition for dissemination within or between organizations is not only that organizations survive, but also that they can prosper. The analysis of the theories on organizations and organizational behaviour revealed different points for enhancing dissemination, namely in relation to the characteristics of the organization, learning organization, teams and networks, boundary crossing, and involvement of individuals. The Delphi study indicated that what experts experience as relevant factors in fostering or hindering dissemination of innovations in VET relate to the characteristics of the innovation itself, the involvement of different internal and external stakeholders, and the (school as well as the external) context. Based on all outcomes it can be concluded that dissemination can be fostered through a wide variety of factors such as characteristics of the organization, (e. g. learning organizations) and characteristics of the innovations itself. In addition, the involvement of people in the innovation and dissemination is pivotal for successful dissemination. There are for instance different tasks identified that can be carried out to foster boundary crossing (e. g., Wenger 1998). Boundary crossing has already been proved to be important and possible in VET (e. g., Fürstenau 2008; Tuomi-Gröhn/Engeström 2008).

The results of both parts of this study deliver a wide variety of aspects with which, when they increase, dissemination of innovations can be fostered. These can be carried out by leaders, and other stakeholders involved in innovations and organizational development. Furthermore, the need for analysis of the dissemination and the vocational college itself as an organization was identified. Checklists are developed that can be used by vocational colleges to provide a solid basis for fostering processes of dissemination. The intensity of the use can vary, which determines the quality of this basis. Furthermore, it can be used regularly, as tools for quality assurance, to continuously develop solutions in an ever-changing world. Since the only thing that seems stable is that change will always occur, it seems unlikely that innovations and dissemination can be considered processes that can be completed. Instead, they might need to be considered ongoing processes of knowledge development, changes in behaviour of individuals, teams and networks, in the context of organizations, to be able to sustainably provide successful vocational education.

This study did not take empirical studies into account which may be considered a limitation. However, although evaluations of innovations in VET exist (e. g., Fürstenau 2008; Ludvigsen/Havnes/Lahn 2008), there still is a need for good studies. Not only on determining if objectives of the innovations and dissemination are achieved, but also to gain more insights into successful processes of innovation development and dissemination. For instance, to learn why VET-teachers participate in innovations (e. g., Messmann/Mulder 2011). If these processes are not successful, the (learning) goals cannot be achieved. Such studies can use frameworks for

analysis of innovations processes (e. g., Mulder 2004b) for fostering sustainable high quality vocational education.

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