GENERAL DISCUSSION
As sketched in the introductory chapter to this thesis, people participating in the practice of specialty training are often dealing with innovations in this training. Most of these innovations are aimed at supporting training that is competency based and outcome oriented, which follows developments in healthcare and societal expectations about doctors’ performance. However, it is becoming clear that, in the practice of specialty training, it is challenging to deal with innovations in such a way that they contribute to their intended effects. In order to contribute to the desired changes to specialty training, the medical and medical education communities need an understanding of how innovation in the practice of specialty training evolves. Such an understanding has not been developed, mostly because research on innovations in specialty training has failed to follow up innovation processes to unravel what actually happens after the initial implementation. The aim of this thesis was to contribute to the understanding of how innovations in practice evolve to result in manifold effects. The central question was: how do people involved with the practice of specialty training deal with innovations in that training? In order to address this question we looked at a number of distinct aspects: approaches of those people in charge of training to bring about change, effects of an innovation in practice, and perceptions of the people involved with training regarding these effects. Furthermore, we studied links between implementation approach and effects of an innovation. In this chapter, I provide an overview of our main findings, leading to an answer to our central research question. This answer points towards the need for a different conceptualization of innovating specialty training. I propose a conceptualization that facilitates understanding the manifold effects that innovations in specialty training can bring about and discuss this conceptualization in light of existing literature. Furthermore, I reflect on our research approach, and propose suggestions for practice and future research.

Main findings

As reported in chapter 2, lead consultants approach educational change using idiosyncratic change strategies. They had individual ideas and beliefs about change that clearly influenced what they regarded as the best way to manage change. They differed in their degree of awareness of the strategies they used, and in the way in
which they reflected on their efforts. Differences in knowledge, task interpretation, and personal style also influenced their approaches, as did culture and customs in the department.

Chapter 3 illustrated that an innovation can bring about a variety of effects that extend beyond the range of the intended, expected, and desired effects. Trainees and consultants experienced effects of workplace-based assessment (WBA) in six domains of their professional lives: sentiments (affinity with the innovation and emotions), dealing with the innovation, specialty training, teaching and learning, workload and tasks, and patient care. Affinity with the innovation varied between users and appeared to be one of the influences on teaching and learning effects. Organisational support and the match between the innovation and practice were considered important to minimise additional workload and to ensure that the WBA was used in a way that is relevant for training. Dealing with WBA stimulated attention for specialty training and placed specialty training on the agenda of clinical departments. We noted that individuals clearly differed from each other with respect to which types of effects they experienced, and in which amount.

In chapter 4 we looked further into these different user perceptions of effects. In a Q study to determine perceptions of trainees and consultants regarding the effects of using WBA, we found five distinct perception-profiles: enthusiasm, compliance, effort, neutrality, and scepticism. The five perceptions were characterized by differences in the views on three main issues: the goals the innovation was intended to achieve, its applicability in practice, and its actual impact. Thus, we found that those involved in an innovation can vary substantially in their perceptions of effects of that innovation, even if they work in the same department and have similar characteristics like amount of experience or function.

To look into the mutual influence of approaches to, responses on, and effects of an innovation, in chapter 5 we focused on a case of introducing transparency and competition in specialty training electives. We found intertwined effects and features of the implementation approach in the themes transparency, competition, and obstacles for competition. For instance, the project team’s approach leaned on appealing to professional motivation, but was supplemented by pressure to participate. This did elicit use of the innovation by parties who had first resisted, but
in a way that was not conducive to the goals. Furthermore, the approach involved stakeholder involvement, which revealed obstacles for implementation, to which the approach was then adapted. Attending to these issues enabled the development of effects that went beyond the intentions, but that were relevant for training quality, for instance growing awareness of modern training principles.

**New conceptualization of innovating specialty training**

Coming back to our central research question of ‘how do people who participate in medical specialty training deal with innovations in this training?’, we can conclude that our answer to this question needs to consist of several components. The people involved in specialty training deal with innovations in a variety of ways and consequently innovations lead to a range of effects, which are again perceived in various ways. People’s approaches to innovations depend on an interplay between different factors, among the most prominent we uncovered were their affinity with the innovation, other personal factors like their individual ideas, beliefs and understanding of the innovation, and social and contextual factors like if it fits with routine practice, communication about the innovation, and department culture.

The dominant perspective on innovations in medical education that was explained in the introduction is an insufficient model for understanding the processes and outcomes of innovations in specialty training that resulted from the research in this thesis. A linear input - black box - output model (figure 1) is too simplistic to explain the complexities we unearthed. Even when the black box is supposed to contain all the processes related to introduction, diffusion and adoption of innovations that explain our findings, it doesn’t set realistic expectations about how future innovations might play out. It neglects the complex and iterative nature of the process, with effects that, as soon as they are developing, become influences and context as well, which again alters the implementation approaches and the developing effects.
Based on the findings in this thesis, I propose to abandon the dominant linear perspective on innovations in specialty training, and suggest a dynamic model that can account for, and anticipates, the complexities of such innovations. This model links the conceptual foundation of the innovation, its translation to practice, and effects in practice. Furthermore, in order to do justice to reality, it accentuates the notion of translation of a concept to practice, which is formed by the combination of proposed applications and activities to implement these in practice, see figure 2. In the following section, I explain this view on the translation of an innovative concept, and then proceed to describe the rest of the model by placing this translation in a dynamic relationship with the conceptual foundations of an innovation and its effects.
Translation of a concept to practice is made up by the combination of proposed applications and activities for implementation into practice

I propose to more consciously consider the notion of the translation of the conceptual foundation of an innovation to practice. This translation is made up by both the concrete application and implementation activities. As outlined in the introduction to this thesis, all kinds of concrete applications have been developed to use in practice of specialty training. These applications are part of the translations that make concepts operational for practice. For example, the concrete form of the mini-CEX is supposed to facilitate that feedback is documented, in addition to feedback being discussed verbally. In this way, it is supposed to translate to practice the principle of documenting training activities, which had as point of departure accountability of training. Yet, as the research in this thesis pointed out, the implementation of an innovation actually contributes to the translation of a concept to practice of specialty training as much as the concrete applications. Thus, the translation of the conceptual foundation of an innovation to practice is composed of both the concrete application and implementation activities. Effects in practice are brought about through this translation.

The conceptual foundation, its translation and effects of the innovation in practice are a dynamic system

The translation of the innovation’s concept as constructed by the application and implementation activities brings about effects in practice. As shown in this thesis, the effects are not all predefined, affect multiple domains of practice, and are perceived in idiosyncratic ways. Thus, the process of innovating specialty training does not stop when initial effects have come about. Since the effects have to do with how people involved handle the innovation, the nature of applications and the implementation approach are adjusted in reaction to these initial effects. This means that the translation is attuned, which leads to altered effects, and so on. For example, when in practice only minimal feedback is written down for mini-CEXs, both the implementation approach and the concrete application can be adjusted in all kinds of ways to address this. Examples of adjustments to implementation activities are stressing the importance of documentation or offering some kind of
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reward for each filled out mini-CEX. Adjustments to the concrete application could be adding suggestions of topics to standard forms, or abandoning standard forms and letting people find their own way to document. These adjusted implementations and applications will construct a different translation, and effects in practice will change, and so on. Moreover, the dynamics between practice and translation can penetrate the level of the innovative concept. For example, experience in practice can lead to the insight that accountability is mainly made up by transparency of expenses for training and only in a lesser part by insight into an individual’s training progress. This new concept will lead to other concrete applications, implementation activities, translation and effects.

Comparison to the literature
In the adjacent domain of implementation science, there is a shift in emphasis in research about innovations for healthcare, which is in congruence with the above proposed acknowledgement of complexity of innovation processes. Innovations studied in this field are for instance evidence-based practice and guidelines and digital recording and prescribing systems. Numerous studies have been conducted in the past decades that aimed to point out best strategies or barriers and facilitators to implement these kinds of innovations. These individual studies have resulted in valuable insights into factors influencing the implementation of innovations in healthcare. Greenhalgh and colleagues performed an extensive review of this literature on diffusion of service innovations and composed a comprehensive conceptual model in which the separate determinants of innovation processes are united. This model features principal findings from across different research traditions, ranging from key attributes of the innovation, to adoption by individuals and the system, contextual features and readiness, and implementation approaches. It also provides some guidance as to how these components are linked. According to these and other authors, at this stage of knowledge more studies that concentrate on separate elements will not suffice to further understanding of the innovation process. This has led them to call for acknowledging the complexity of innovation processes and for placing this complexity at the centre of attention of further research. Still, these pleas in this field of implementation science refer mainly to
understanding the black box’s complexity in a linear view on the process, in which
successful implementation of an application will produce predefined and measurable
outcomes. This is illustrated by Grol’s call for “more research on mechanisms that
determine whether a specific innovation will be successful in a particular health
setting.” (page 125).48

As outlined in the introduction to this thesis, in the field of postgraduate medical
education few studies about innovations have focused on the process of innovating.49
The majority of studies about innovations in this field concern the use of a specific
application (e.g. portfolios, simulation-based education or in-training assessment),
its effects, or both. Accordingly, the research is usually designed with the application
as point of departure. Despite this focus on applications and their effects, the
influence of implementation activities on the application’s impact in practice is
increasingly pointed out for the field of postgraduate medicine. As Van der Vleuten
and Verhoeven stated in their paper on in-training assessment developments, “the
concern is more with the actual implementation of change than with the assessment
technology per se. If we fail in our efforts to implement real change, postgraduate
education may be at risk for bureaucratization and trivialization.”.21 In this way, the
importance of the combination of application and implementation to translate a
concept to practice is penetrating the postgraduate medical education field. The
above proposed new conceptualization of innovation processes corresponds with
the desire for understanding innovation processes as translations of a concept to
practice, instead of as the uptake of a method or tool.

The new conceptualization of issues in specialty training as complex and dynamic
seems not to be confined to the subject of this thesis. For instance, the notion of
transfer of learning, which has been an important concept for education since long50,
has been undergoing a similar development. In the traditional view on transfer, it
was considered a static concept independent of its context that can be measured
as a specific behaviour. In the contemporary view, the dynamics between changing
individuals and changing context are regarded more important, which also means that
measuring transfer is regarded more difficult. For instance, a recent review to identify

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gaps in research on transfer of medical communication skills signalled the following: that the traditional approach and its resulting insights have significantly advanced research in the field, but appear somehow limited in their possibility to explain the remaining challenges, and that research should be complemented with perspectives that take into account real life complexity.\textsuperscript{51} The background of this similarity of developments in conceptualization of various elements in medical education seems to be that researchers in the field of medicine who study educational topics continue to loosen the ties with the traditionally positivist paradigm of biomedical research, and are more and more taking up post-positivist viewpoints.\textsuperscript{52}

**Reflections on methodology**

The research in this thesis has not led to a detailed manual for dealing with innovations in specialty training. In my opinion, there are two reasons why striving for composition of such a manual isn’t really appropriate: one relates to the complexity of innovation processes in specialty training, the other relates to my constructivist view on research. Firstly, as set out above, I have come to appreciate innovation in specialty training as a dynamic process with involvement of a variety of interdependent elements. Consequently, it seems far-fetched to compose a decision model that captures all possible situations. Yet, the insight gained through the four studies in this thesis has led to a different conceptualization of innovating specialty training. This conceptualization can support future research as well as practice, which I will discuss in the concerning paragraphs below.

The second reason I would not strive for a detailed manual for dealing with innovations is that I have a constructivist view on research\textsuperscript{52}, as mentioned in the separate chapters. This means that I consider it impossible to establish a presentation of one single truth through research, because, even if one single truth exists, knowledge about it is created between an observer and the observed. Thus, presented knowledge is influenced by the characteristics of the observer. Furthermore, a reader of the presented findings again creates his own knowledge in interaction with the presented findings, and is influenced by his own characteristics. This constructivist view on research means that findings never present one single truth that counts for everyone at all times. This does not mean that the findings in this thesis are untrue.
or irrelevant, but that individuals should use these findings in a way that is relevant to their own situation. Moreover, the findings can and need to be added to by others through observations from different points of view.

Following on these reflections, there are some specific strengths and limitations of the work presented in this thesis that readers should be aware of. This thesis combines studies about different parts of the process of innovating specialty training: implementation approach, effects in practice, perceptions of people involved, and the mutual influence of these elements, in order to answer the central research question of 'how do people who participate in medical specialty training deal with innovations in this training?'. The main strengths of this thesis relate to the relevance of this research, the approach that we took in studying this topic, and the methodological rigour of our research. As explained in the introductory chapter, there currently is a paucity of knowledge about the evolvement of innovations in specialty training, while many innovations are introduced into practice and many meet with mixed success. Thus, at this time, a knowledge base about the subject is needed, so that suggestions and expectations can be realistic, and the handling of innovations can be rewarding. The findings in this thesis add to this knowledge. With respect to the approach that we took, combining studies on distinct aspects that are involved with innovation enabled to formulate an answer to the central research question. At the same time, the explorative nature of the research question and of the separate studies allowed for acknowledging that a new conceptualization innovating specialty training is needed for further advancement of the topic. The proposed conceptualization does not reject the value of existing theories. Rather, it stimulates contemplating how these theories relate to each other and can be applied to the field of postgraduate medical education. Regarding the methodological rigour the separate studies were based on existing theory from adjacent fields like sociology and implementation science. This answers to the call within the medical education research community to use theories and conceptual models for the design and interpretation of research. The use of existing theory in our studies supports the relevance of our findings and the understanding of innovation processes. Furthermore, we used Q methodology when it was relevant, although it is relatively new to the field of medical education. Finally, three studies have been published (or
accepted for publication) in international peer-reviewed journals so far. Sharing our findings in this way allows others to apply our findings to practice, and to build on our research, challenge and add to our findings, and thus strengthen the knowledge on the subject of innovations in medical education.

Some limitations of the research in this thesis should be considered as well. Among these are sources of possible bias and the transferability of our findings. Several factors might have biased how we have come to regard innovations in postgraduate medical education. Firstly, my collaborators and I have a mainly medical or medical education background. Although we have explicating this in the research process, this may have led to underexposing certain other views, for example patients’ perspectives and organizational issues. Secondly, since this thesis focuses on the people who participate in medical specialty training, we have conducted most research among trainees and medical specialists. Still, other people - ranging from administrators to medical students - are involved in the process as well, albeit to a lesser extent. The findings in this thesis may be biased because people involved other than trainees and consultants were studied to a lesser extent. For better inclusion of varying views in research, a shift away from the currently dominating approaches seems necessary, as will be discussed further in the next paragraph. The study in chapter 5 is the only one that also covered stakeholders from other groups. Thirdly, the findings in chapter 2, 3 and 4 were based on individual’s perceptions and report of those, which might have led to underexposure or overrepresentation of certain elements, such as sensitive or social-desirable ones. Furthermore, we conducted the studies of chapter 2 and 3 among various medical specialties and training departments, and of chapter 4 among various departments of one specialty. Although this approach ensured some variability in participants, the transferability of the findings to other contexts or specialties is limited. All studies were conducted in the Netherlands, where the setting of implementation of innovations and culture in postgraduate medical training differs from the rest of the world. These limitations to the transferability of findings apply even more to the study described in chapter 5, since this was a case study.
Implications for research

Further research on innovations in medical specialty training might contribute to determining which investments should be made. The proposed new conceptualization can support this research for several reasons. Firstly, as explained in the introduction to this thesis, quite some research on innovations in medical education up to now has focused on applications. The findings of this thesis facilitate a research focus on translation of an innovative concept instead. This implication is not limited to the field of postgraduate medical education, but may pertain to other fields where translation of a concept and philosophy are eventually more important than use of a certain application, like other types of education, business, psychology, or life-coaching. Related to this shift in focus from applications to translation of concepts, a new angle to the study of innovation effects is needed. Assessments of medical education innovations have been mainly directed at their intended effects, or at both intended and unintended effects within the educational domain. The dynamic model proposed here points out that this kind of confined evaluation will not help us to build a complete picture of the full impact of an innovation. It is insufficient to keep measuring usage rates of an application or effectiveness on predefined outcomes. This thesis has contributed to the knowledge about any other effects that might be expected, but research that uses the new conceptualization is needed to further the understanding of development of various effects in practice. This should include research in other settings than those studied in this thesis.

The above implicates that future studies need a methodology that is suited to study dynamics between educational concept, translation through application and implementation, and effects. Thus, approaches are needed that are suitable for studying complex systems. However, researchers in the field of medical education may not be well equipped yet to conduct complexity research, although some exceptions exist. There are other fields that are more familiar with this kind of research, for example systems innovation in agriculture through reflexive monitoring in action. Moreover, conducting research in transdisciplinary teams including non-scientific actors is needed to ensure that the variety of viewpoints involved is taken into account. For studying innovation in their field, medical education researchers

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1 This section is based on: Assessing the assessment of interventions: we’re not there yet. JPI Fokkema, PW Teunissen. Med Educ 2013;47:954-6
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should take up these kinds of approaches. Likewise, both scientific journals and funders of research need to acknowledge these research approaches as relevant.

Implications for practice
The practice of innovating medical specialty training could find support in insights from this thesis. First of all, the conceptualization of this topic that resulted from the presented work has implications for the approach to developing innovations in specialty training. When striving for translation of a concept to practice, not only applications need to be developed, but designing implementation approach elements is needed as well. Moreover, the dynamic nature of the process requires that implementation and application should be developed synchronous and in an iterative manner instead of sequential. These are relevant insight for designers of innovations for specialty training. However, current relevant training programmes for this area, like educational studies or management, do not cover both kinds of elements and mainly take linear approaches. Thus, the content of these kinds of training programmes should be updated in order to fit to these needs, and to introduce reflexive methods to the innovation professionals of the future.

All studies in this thesis have shown to some extent that most people who are involved with innovations in medical specialty training are learners in this area. This ranges from experienced leaders who get the responsibility for introducing an innovation to insecure first year trainees who have to ask for feedback. Additionally, it seemed that pressuring them to take up an application risks meaningless use of well-intended tools. These findings imply that those involved deserve dedicated time, practice and guidance to get to meaningful translation of a concept to practice. This is important to realize, for example when planning elements like support, time span, costs and evaluation of an innovation in medical training.

All involved with innovations in specialty training need to be aware of the complexity. This will prevent them from expecting unambiguity, clear-cut use of applications, and immediately reaching expected effects. This counts for individuals as well as for organizations or projects, ranging from local initiatives to large scale projects like the Dutch example studied in chapter 5. The complexity of the subject should be respected in order to support meaningful interpretation of aspects like targets, requirements, conditions and evaluation of effects.
And finally, the proof is in the pudding
People who struggle with innovations in specialty training and hoped to find in this thesis the perfect recipe that guarantees success might be disappointed by the absence of such a recipe. Hopefully, the open approach to this challenging subject, the findings and the new conceptualization will support people to get cooking themselves. Dealing with innovations in specialty training means considering what ingredients one is provided with, and putting together the sometimes unusual combinations in such a way that the product is worth the effort and suits the moment. Conceptualizing innovation processes as proposed in the dynamic model can support people in considering what should work for them, the ingredients, and the moment.
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