Entrepreneurial Information Search Behavior for Opportunity Recognition Measurement – Antecedents – Outcomes

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The President:

Prof. Dr. Thomas Bieger
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St. Gallen, August 2017

Philipp Wustrow
# Table of Contents

Acknowledgments............................................................................................................. I  
Table of Contents............................................................................................................. II  
List of Figures ................................................................................................................ VI  
List of Tables ................................................................................................................ VII  
List of Abbreviations ..................................................................................................... VIII  
Executive Summary ....................................................................................................... X  
Zusammenfassung ......................................................................................................... XI  

1. **Introduction** ........................................................................................................ 1  
   1.1. Overarching Topic and Structure ................................................................. 1  
   1.2. Definition and Explanation of Main Theoretical Concepts ....................... 2  
      1.2.1. Opportunity Recognition ................................................................. 2  
      1.2.2. Entrepreneurial Information Search Behavior ................................. 3  

2. **Overview of the Cumulative Dissertation** ...................................................... 6  
   2.1. Knowledge and Research Gaps ................................................................. 6  
   2.2. Research Methodology ............................................................................. 7  
   2.3. Framework and Main Characteristics of the Three Papers ..................... 9  

3. **Entrepreneurial Information Search Behavior for Opportunity Recognition:  
   Scale Development and Validation** ..................................................................... 12  
   3.1. Abstract ...................................................................................................... 12  
   3.2. Introduction ............................................................................................... 12  
   3.3. Information Search Behavior in Opportunity Recognition .................... 14  
      3.3.1. Passive Search ................................................................................ 16  
      3.3.2. Proactive Search ............................................................................ 17  
      3.3.3. Systematic Search .......................................................................... 18  
   3.4. Empirical Measures of Information Search to Recognize Opportunities ..... 20  
   3.5. Scale Development ................................................................................... 23
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5.1. Item Generation</td>
<td>23</td>
</tr>
<tr>
<td>3.5.1.1. Deductive Approach for Item Generation</td>
<td>23</td>
</tr>
<tr>
<td>3.5.1.2. Inductive Approach for Item Generation</td>
<td>24</td>
</tr>
<tr>
<td>3.5.2. Pre-Test and Pilot Study</td>
<td>25</td>
</tr>
<tr>
<td>3.5.3. Main Study</td>
<td>26</td>
</tr>
<tr>
<td>3.5.4. Principal Component Analysis</td>
<td>28</td>
</tr>
<tr>
<td>3.5.5. Confirmatory Factor Analysis</td>
<td>31</td>
</tr>
<tr>
<td>3.5.6. Evaluation of Internal Consistency</td>
<td>32</td>
</tr>
<tr>
<td>3.5.7. Assessment of Content Validity</td>
<td>33</td>
</tr>
<tr>
<td>3.5.8. Assessment of Construct Validity</td>
<td>35</td>
</tr>
<tr>
<td>3.6. Discussion and Conclusion</td>
<td>36</td>
</tr>
<tr>
<td>3.7. Limitations</td>
<td>38</td>
</tr>
<tr>
<td>3.8. Suggestions for Future Research</td>
<td>38</td>
</tr>
<tr>
<td>3.9. Implications for Practice</td>
<td>39</td>
</tr>
<tr>
<td>3.10. Appendix</td>
<td>40</td>
</tr>
<tr>
<td>4. Why Do Entrepreneurs Search for Information on Opportunities the Ways They Do?</td>
<td>49</td>
</tr>
<tr>
<td>4.1. Abstract</td>
<td>49</td>
</tr>
<tr>
<td>4.2. Introduction</td>
<td>49</td>
</tr>
<tr>
<td>4.3. Theoretical Foundations and Hypotheses</td>
<td>51</td>
</tr>
<tr>
<td>4.3.1. Regulatory Focus and Opportunity Recognition</td>
<td>51</td>
</tr>
<tr>
<td>4.3.2. Regulatory Focus and Entrepreneurial Information Search Behavior</td>
<td>53</td>
</tr>
<tr>
<td>4.3.3. Promotion Focus and Entrepreneurial Information Search Behavior</td>
<td>55</td>
</tr>
<tr>
<td>4.3.4. Prevention Focus and Entrepreneurial Information Search Behavior</td>
<td>57</td>
</tr>
<tr>
<td>4.3.5. Environmental Dynamism and Information Search Behavior</td>
<td>59</td>
</tr>
<tr>
<td>4.4. Method</td>
<td>61</td>
</tr>
<tr>
<td>4.4.1. Sample and Data Collection</td>
<td>61</td>
</tr>
<tr>
<td>4.4.2. Dependent Variables</td>
<td>62</td>
</tr>
<tr>
<td>4.4.3. Independent Variables</td>
<td>63</td>
</tr>
<tr>
<td>4.4.4. Control Variables</td>
<td>64</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.5. Results</td>
<td>64</td>
</tr>
<tr>
<td>4.5.1. Descriptive Data</td>
<td>64</td>
</tr>
<tr>
<td>4.5.2. Regression Models</td>
<td>66</td>
</tr>
<tr>
<td>4.5.3. Regression Results</td>
<td>66</td>
</tr>
<tr>
<td>4.5.4. Post Hoc Test</td>
<td>67</td>
</tr>
<tr>
<td>4.6. Conclusion and Discussion</td>
<td>69</td>
</tr>
<tr>
<td>4.7. Limitations and Suggestions for Further Research</td>
<td>72</td>
</tr>
<tr>
<td>4.8. Implications for Practice</td>
<td>74</td>
</tr>
<tr>
<td>4.9. Appendix</td>
<td>76</td>
</tr>
<tr>
<td>5. The Impact of Entrepreneurial Information Search Behavior on the</td>
<td>79</td>
</tr>
<tr>
<td>Innovativeness of Recognized Opportunities</td>
<td></td>
</tr>
<tr>
<td>5.1. Abstract</td>
<td>79</td>
</tr>
<tr>
<td>5.2. Introduction</td>
<td>79</td>
</tr>
<tr>
<td>5.3. Theoretical Foundations</td>
<td>81</td>
</tr>
<tr>
<td>5.3.1. Innovativeness of Opportunities</td>
<td>81</td>
</tr>
<tr>
<td>5.3.2. Information Search and the Innovativeness of Opportunities</td>
<td>82</td>
</tr>
<tr>
<td>5.3.3. Types of Entrepreneurial Information Search Behavior</td>
<td>84</td>
</tr>
<tr>
<td>5.4. Hypotheses</td>
<td>85</td>
</tr>
<tr>
<td>5.4.1. Passive Search and the Innovativeness of Opportunities</td>
<td>85</td>
</tr>
<tr>
<td>5.4.2. Proactive Search and the Innovativeness of Opportunities</td>
<td>86</td>
</tr>
<tr>
<td>5.4.3. Systematic Search and the Innovativeness of Opportunities</td>
<td>87</td>
</tr>
<tr>
<td>5.5. Method</td>
<td>89</td>
</tr>
<tr>
<td>5.5.1. Sample and Data Collection</td>
<td>89</td>
</tr>
<tr>
<td>5.5.2. Dependent Variable</td>
<td>90</td>
</tr>
<tr>
<td>5.5.3. Independent Variables</td>
<td>90</td>
</tr>
<tr>
<td>5.5.4. Moderator Variable</td>
<td>91</td>
</tr>
<tr>
<td>5.5.5. Control Variables</td>
<td>91</td>
</tr>
<tr>
<td>5.6. Results</td>
<td>92</td>
</tr>
<tr>
<td>5.6.1. Descriptive Data</td>
<td>92</td>
</tr>
<tr>
<td>5.6.2. Regression Models</td>
<td>94</td>
</tr>
</tbody>
</table>
Table of Contents

5.6.3. Regression Results ........................................................................................................... 94
5.6.4. Post Hoc Test: Interactive Effects of Search Behaviors and Environmental Dynamism ........................................................................................................... 95
5.7. Conclusion and Discussion ................................................................................................. 97
5.8. Limitations and Suggestions for Further Research ......................................................... 100
5.9. Implications for Practice .................................................................................................. 101
5.10. Appendix ......................................................................................................................... 104

6. Concluding Chapter .............................................................................................................. 107
6.1. Contributions .................................................................................................................... 107
6.2. Limitations ....................................................................................................................... 109
6.3. Future Research ............................................................................................................... 109
6.4. Conclusion ......................................................................................................................... 110

References .................................................................................................................................. 112
Curriculum Vitae ..................................................................................................................... 139
List of Figures

Figure 1. Framework of the Dissertation................................................................. 10
Figure 2. Classification of Search Behaviors............................................................ 20
Figure 3. Results of the Confirmatory Factor Analysis............................................. 31
Figure 4. Regulatory Focus in the Context of Opportunity Recognition .................. 52
Figure 5. Integrative Model ................................................................................... 61
Figure 6. Post Hoc Analysis .................................................................................. 69
Figure 7. Hypothesized Relationships ................................................................... 88
Figure 8. Interaction Effects .................................................................................. 96
List of Tables

Table 1. Classification of Information Search Behaviors ......................................................... 4
Table 2. Main Characteristics of the Three Papers ............................................................... 11
Table 3. Overview of Key Existing Scales .......................................................................... 21
Table 4. Sample Statistics ................................................................................................. 28
Table 5. Factor Loadings of the Final Items of the Main Study ........................................... 30
Table 6. Results of Content Validity Analysis .................................................................. 34
Table 7. Key Studies about Information Search for Opportunity Recognition .................. 40
Table 8. Sample Statistics ................................................................................................. 62
Table 9. Robustness Test for Passive Search Scale ............................................................ 63
Table 10. Means, Standard Deviations, Pearson Correlations ............................................ 65
Table 11. Regression Models of Information Search Behaviors ........................................ 66
Table 12. Contrast Tests: Proactive Search ....................................................................... 68
Table 13. Contrast Tests: Systematic Search ..................................................................... 68
Table 14. Entrepreneurial Information Search Behavior Scale ........................................... 76
Table 15. Regulatory Focus Questionnaire ......................................................................... 77
Table 16. Environmental Dynamism Scale ........................................................................ 77
Table 17. Sample Statistics ............................................................................................... 89
Table 18. Descriptives and Correlations of Variables ......................................................... 93
Table 19. Regression Models 1-2: Innovativeness of the Opportunity .............................. 95
Table 20. Regression Models 3-6: Innovativeness of the Opportunity ............................... 96
Table 21. Entrepreneurial Information Search Behavior Scale ......................................... 104
Table 22. Competitive Intensity Scale ............................................................................... 104
Table 23. Environmental Dynamism Scale ........................................................................ 105
Table 24. Innovativeness of Opportunities Scale .............................................................. 105
## List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMOS</td>
<td>analysis of moment structures</td>
</tr>
<tr>
<td>ASV</td>
<td>average shared squared variance</td>
</tr>
<tr>
<td>AVE</td>
<td>average variance extracted</td>
</tr>
<tr>
<td>β</td>
<td>correlation coefficient</td>
</tr>
<tr>
<td>CEO</td>
<td>chief executive officer</td>
</tr>
<tr>
<td>cf.</td>
<td>confer (compare)</td>
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<tr>
<td>CFA</td>
<td>confirmatory factor analysis</td>
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<tr>
<td>CFI</td>
<td>comparative fit index</td>
</tr>
<tr>
<td>CR</td>
<td>composite reliability</td>
</tr>
<tr>
<td>df</td>
<td>degrees of freedom</td>
</tr>
<tr>
<td>E.D.</td>
<td>environmental dynamism</td>
</tr>
<tr>
<td>EFA</td>
<td>exploratory factor analysis</td>
</tr>
<tr>
<td>e.g.</td>
<td>exempli gratia (for example)</td>
</tr>
<tr>
<td>et al.</td>
<td>et alii (and others)</td>
</tr>
<tr>
<td>etc.</td>
<td>et cetera (and so on)</td>
</tr>
<tr>
<td>H</td>
<td>hypothesis</td>
</tr>
<tr>
<td>i.e.</td>
<td>id est (that is)</td>
</tr>
<tr>
<td>IFI</td>
<td>incremental fit index</td>
</tr>
<tr>
<td>MBA</td>
<td>master of business administration</td>
</tr>
<tr>
<td>MLE</td>
<td>maximum likelihood estimation</td>
</tr>
<tr>
<td>MSV</td>
<td>maximum shared squared variance</td>
</tr>
<tr>
<td>N</td>
<td>number of observations</td>
</tr>
<tr>
<td>n.s.</td>
<td>not significant</td>
</tr>
<tr>
<td>OLS</td>
<td>ordinary least squares</td>
</tr>
<tr>
<td>p</td>
<td>probability (level of significance)</td>
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<td>p.</td>
<td>page</td>
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<tr>
<td>PCA</td>
<td>principal component analysis</td>
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<tr>
<td>PSED</td>
<td>panel study of entrepreneurial dynamics</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>research and development</td>
</tr>
<tr>
<td>RFQ</td>
<td>regulatory focus questionnaire</td>
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<tr>
<td>RMSEA</td>
<td>root mean square error of approximation</td>
</tr>
<tr>
<td>SD</td>
<td>standard deviation</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>SME</td>
<td>small and medium-sized enterprise</td>
</tr>
<tr>
<td>SPSS</td>
<td>statistical package for the social sciences</td>
</tr>
<tr>
<td>TLI</td>
<td>Tucker-Lewis index</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>U.S.</td>
<td>United States</td>
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<tr>
<td>VIF</td>
<td>variance inflation factor</td>
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<td>vs.</td>
<td>versus (against)</td>
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Executive Summary

Scholars agree on the central role of entrepreneurial information search behaviors in opportunity recognition processes. Despite its importance, however, key questions on entrepreneurial searches for information remain unresolved. This dissertation attempts to answer some of these fundamental questions by presenting a new instrument for measuring entrepreneurial information search behaviors and by investigating antecedents and outcomes of this important construct.

Among other issues, existing measures of information search behavior appear to be severely limited in their abilities to differentiate between types of search behavior. This shortage of valid scales highlights the need for the development of a valid methodological tool. The first paper addresses this shortcoming by developing and validating a scale for consistently capturing different types of information search behavior, namely, passive, proactive and systematic search. The new measure will serve as a valuable tool for future empirical research on information search behavior.

Research findings provide preliminary evidence that cognition and contextual factors are related to individuals’ information search behaviors. In this regard, the second paper assesses how regulatory focus theory and environmental dynamism influence an entrepreneur’s preference for different forms of information search behavior. The investigations conducted confirm that promotion and prevention foci and environmental dynamism impact how entrepreneurs search for information.

A key unresolved question posed in entrepreneurship research concerns why some entrepreneurs identify innovative opportunities while others do not. To address this important question, the third paper investigates the role of entrepreneurial information search behaviors in the identification of innovative opportunities. The analyses reveal that passive search is positively and significantly associated with the innovativeness of opportunities identified. Further, under conditions of dynamic markets, the innovativeness of opportunities identified is positively related to proactive search.

Overall, this dissertation provides valuable contributions to the opportunity recognition and information search literature and furthers our understanding of entrepreneurial behavior. Moreover, the findings provide practitioners with important insights necessary to scrutinize and advance their information searches for promising opportunities.
Zusammenfassung


1. Introduction

1.1. Overarching Topic and Structure

Information search behaviors are a crucial element to the founding of new ventures (cf. Cooper et al., 1995) and to the identification of promising opportunities in general (e.g., Fiet, Norton, & Clouse, 2013; Gaglio & Katz, 2001; Ozgen & Baron, 2007). They explain differences in opportunity recognition processes and even differences in the number or quality of opportunities identified (DeTienne & Chandler, 2004; Fiet & Patel, 2008). Such insights are particularly relevant to entrepreneurship research, as scholars agree that entrepreneurs differ in the ways that they search for new opportunities (Krueger, Reilly, & Carsrud, 2000; Shrader & Hills, 2003). Moreover, entrepreneurial information search behaviors help explain key concepts of entrepreneurship research (e.g., entrepreneurial behavior) (Cooper et al., 1995; Gaglio & Katz, 2001). As such, information search behavior is closely related to entrepreneurial success and failure (cf. Baron, 2006), highlighting its importance to the domain of entrepreneurship from a theoretical and practical perspective.

However, despite growing scholarly interest in the field of entrepreneurial information search behavior, key questions remain unresolved to date. This is mainly attributable to a lack of valid measurement instruments available to operationalize this comprehensive construct. In light of its importance as a key concept in the domain of entrepreneurship, this cumulative dissertation seeks to contribute to a more comprehensive understanding of the nature and influence of different types of information search behavior. Each paper of the dissertation furthers our understanding of the entrepreneurial information search behavior construct and addresses specific unresolved research questions and knowledge gaps in this domain. The first paper attempts to develop and validate a scale for measuring entrepreneurial information search behaviors. Papers two and three further validate this new scale by investigating key antecedents and outcomes of information search behaviors. The analyses of all three papers build on the same sample of 128 owner-managers of medical technology companies located in Germany, Switzerland and Austria, warranting comparability. The data were self-collected and do not stem from a publicly available database. The contributions of this cumulative dissertation are manifold and relevant to opportunity recognition and information search literature and practitioners in particular.
The organization and comprehensiveness of this dissertation are ensured by the use of clearly structured and coordinated chapters. Chapter one introduces the overarching focus of the cumulative dissertation, illustrates its importance and provides further information on key theoretical constructs. Chapter two offers an overview of the three academic papers focusing on the addressed knowledge gaps and research methods. A tabular display compares the three academic papers with regard to key characteristics. Chapters three, four and five include the actual academic papers in full length. In chapter six, the author summarizes the main contributions of the three papers, their key limitations and avenues for further research before making general concluding statements.

1.2. Definition and Explanation of Main Theoretical Concepts

1.2.1. Opportunity Recognition

The nature of an entrepreneurial opportunity is still subject to considerable controversy (cf. Davidsson, 2015), and the term is perceived as an elusive construct (e.g., Shane & Venkataraman, 2000). However, most scholars agree on its key defining characteristics, which are namely newness, economic value, uncertainty, risk and desirability (Alvarez & Barney, 2007; Baron, 2006). A more comprehensive definition that has gained acceptance from scholars (cf. Fueglistaller et al., 2012) is offered by Casson (1982) who claims that opportunities are “situations in which new goods, services, raw materials and organizing methods can be introduced and sold at greater than their cost of production” (Shane & Venkataraman, 2000: 220).

The concept of opportunity recognition is prominently rooted in the entrepreneurship literature (Wang et al., 2013). A plethora of scholarly research is thus concerned with the question of how opportunities are identified, which lies at the heart of the entrepreneurship domain (cf. Ardichvili et al., 2003; Venkataraman, 1997). Baron (2006: 107) defines opportunity recognition “as the cognitive process (or processes) through which individuals conclude that they have identified an opportunity.” A more specific definition is offered by Grégoire, Barr, and Shepherd (2010: 415) who define the opportunity recognition process “as efforts to make sense of signals of change (e.g., new information about new conditions) to form beliefs regarding whether or not enacting a course of action to address this change could lead to net benefits (for instance, in terms of profits, growth, competitive jockeying, and/or
other forms of individual or organizational gains).” For Grégoire et al. (2010), opportunity recognition is thus associated with environmental change and with entrepreneurs’ abilities to process information. This definition conforms to the understanding of opportunity recognition processes presented in this dissertation. Opportunity recognition does not just involve an “Aha”-moment but much more of a recursive, iterative process involving knowledge creation, information acquisition and reflection on new findings (Lumpkin & Lichtenstein, 2005). Opportunity recognition can occur during the founding of new ventures or in already established firms (cf. Hayton, Chandler, & DeTienne, 2011). Past research findings indicate that the opportunity recognition process is significantly influenced by a variety of factors (cf. George et al., 2016) such as cognition (e.g., Tumasjan & Braun, 2012), social networks (García-Cabrera, & García-Soto, 2009), personality traits (e.g., Ardichvili et al., 2003), prior knowledge (Acs et al., 2009), environmental contexts (Tang, 2009) and the opportunity itself (Grégoire & Shepherd, 2012). Opportunity recognition is thus shaped by objective and subjective factors (Grégoire, Barr, & Shepherd, 2010). Despite many important findings made in the context of opportunity recognition, key questions remain unresolved (e.g., George et al., 2016). An entrepreneur attempting to recognize promising opportunities “must somehow perceive, gather, interpret, and apply information” (Ozgen & Baron, 2007: 175) on his environment. Entrepreneurs’ information search is thus closely related to opportunity recognition processes.

1.2.2. Entrepreneurial Information Search Behavior

As is implied by its wording, entrepreneurial information search behaviors explain how entrepreneurs search their environments for information in their efforts to recognize promising opportunities to launch an entrepreneurial project (e.g., Frese & Gielnik, 2014; Marvel, 2013).

Most scholars agree that entrepreneurs perform different types of information search behaviors to recognize promising opportunities (cf. Chandler et al., 2003; Tang et al., 2012). Previous research demonstrates the benefits of different types of information search behaviors (Fiet et al., 2013) or analyzes whether the nature of such behaviors is more active or passive (Tang, Kacmar, & Busenitz, 2012; van Gelderen, 2010), with the latter referring to a form of accidental opportunity recognition (Shah & Tripsas, 2007). Despite the fact that many different terms are used by scholars, three aspects of search behavior (intentionality, systematization and scope) serve as
common classification criteria (DeTienne & Chandler, 2004; Fiet, 2002). In this regard, three distinct types of information search behavior, namely, passive search, proactive search and systematic search, can be differentiated.

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<thead>
<tr>
<th>Information Search Behavior</th>
<th>Intentionality</th>
<th>Systematization</th>
<th>Scope</th>
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<tr>
<td>Passive Search</td>
<td>low</td>
<td>no</td>
<td>unrestricted</td>
</tr>
<tr>
<td>Proactive Search</td>
<td>high</td>
<td>partial</td>
<td>unrestricted</td>
</tr>
<tr>
<td>Systematic Search</td>
<td>high</td>
<td>full</td>
<td>restricted</td>
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Table 1. Classification of Information Search Behaviors

First, **passive search** is characterized by low levels of systematization and intentionality and unrestricted searching (DeTienne & Chandler, 2004; Foo et al., 2015; Kaish & Gilad, 1991; Kirzner, 1973). An entrepreneur’s search is thus not limited to any specific knowledge domains or information channels, and he does not intentionally seek to identify opportunities (DeTienne & Chandler, 2004; Patel & Fiet, 2009). The passively searching entrepreneur operates at a “consciously heightened state of sensitivity to the environment” (Chandler & DeTienne, 2004: 244) and combines new information with his prior knowledge (cf. Shane, 2000). The alert entrepreneur is able to identify opportunities previously unnoticed by others (Kirzner, 1979; Tang et al., 2012).

Second, due to its high levels of intentionality, **proactive search** is naturally more systematized and planned than passive search (cf. Hayton & Cholakova, 2011; Iyer & Miller, 2008). However, this search mode is not “fully systematized” as the search scope is unrestricted, implying uncertainty and in some cases a somewhat more random search approach (cf. Frese, 2009). The entrepreneur does not necessarily know where he is going to search next. This process can be initiated by a variety of factors (failure or specific problems) (Cyert & March, 1963). Proactive search is costly and involves the use of considerable resources described as “organizational slack” (Dahlqvist, Chandler, & Davidsson, 2004; March & Olsen, 1976).

Third, **systematic search** is, as the term implies, a highly systematized search behavior. This degree of systematization occurs because entrepreneurs’ search for opportunities is intentionally constrained to information channels that correspond with the entrepreneurs’ prior knowledge (Fiet et al., 2013). In his search for information,
the entrepreneur chooses domains for his search that he is familiar with and that he possesses specific knowledge in (Patel & Fiet, 2011). Systematic search is said to be less costly and more effective in contexts of opportunity recognition, as the entrepreneur relies on specific rather than generally available information (Fiet et al., 2005; Fiet, 2007).
2. Overview of the Cumulative Dissertation

2.1. Knowledge and Research Gaps

This dissertation addresses specific gaps in research identified in the entrepreneurship literature. Various research studies have confirmed and stressed the central role of entrepreneurial information search behaviors in opportunity recognition processes (e.g., Fiet, Norton, & Clouse, 2013; Ozgen & Baron, 2007). However, scholarly understanding of underlying processes and of how new opportunities are recognized remains severely limited to date (Tang et al., 2012). This limited understanding and knowledge can be attributed to a lack of valid instruments available for measuring such search behaviors. Among other issues, existing measurement instruments seem limited in their abilities to distinguish between different search behaviors while not considering the multidimensionality of information search behaviors. Furthermore, existing measures suffer from methodological issues (cf. Cortina, 1993) by only using one item to measure distinct information search behaviors (e.g., Chandler, DeTienne, & Lyon, 2003). Moreover, some existing scales do not consider the fact that information search behaviors can change from one opportunity to the next (Krueger, Reilly, & Carsrud, 2000; Shrader & Hills, 2003). As a result, to date, scholars are in need of a new and rigorous methodological instrument in their efforts to offer valuable advances on important “why” questions in the entrepreneurship literature. The concomitant research question of paper one of the dissertation is thus as follows: How can entrepreneurial information search be measured?

Paper two of the cumulative dissertation examines how two important antecedents, namely, regulatory focus theory and environmental dynamism, impact entrepreneurs’ preferences for certain types of information search behavior. Various scholars have noted that past empirical research addressing the question of why entrepreneurs prefer specific forms of information search behavior is severely fragmented (e.g., Amato, Baron, Barbieri, Bélanger, & Pierro, 2016; McGee & Sawyerr, 2003). Reasons for this limitation are manifold. To date, prior research has focused mainly on investigating outcomes of information search behaviors such as the quantity of opportunities identified (cf. Patel & Fiet, 2009) while neglecting the relevance of key antecedent drivers. Research findings provide preliminary evidence that cognition is related to information search behaviors without specifically assessing the effects of...
entrepreneurs’ regulatory focus (cf. Tumasjan & Braun, 2012). Furthermore, studies examining the role of environmental dynamism and its influence on information search behaviors are plagued by mixed results (cf. Casson & Wadeson, 2007; George et al., 2016). As a result, our knowledge of key antecedents influencing the onset of types of search behavior remains fragmented, limiting scholars’ abilities to provide practitioners with specific evidence-based recommendations. Hence, the overarching research question paper two aims to address is as follows: Why do entrepreneurs search for information on opportunities the ways they do?

The third academic paper investigates causes of innovative performance heterogeneity among entrepreneurs. Despite extensive past research efforts made, scholars have not provided convincing evidence on key processes impacting the perceived innovativeness of opportunities identified (D'Souza & Schenkel, 2011; Koellinger, 2008; Samuelsson & Davidsson, 2009). Research findings on information search behaviors and innovation have provided practitioners with inconsistent managerial implications. For example, scholars have found a positive relationship between types of search behaviors and firm innovativeness (Laursen & Salter, 2006). On the other hand, other researchers claim that types of search behavior are negatively related to process innovation (Terjesen & Patel, 2014). Moreover, scholars have relied on patent data as a measure for information search behaviors (e.g., Katila & Ahuja, 2002), although many scholars would acknowledge this as problematic (Laursen & Salter, 2006). Consequently, academics and entrepreneurs lack knowledge on important differences between search behaviors in regard to beneficial effects. The third paper thus attempts to address the following question: How are types of information search behaviors influencing the perceived innovativeness of opportunities identified?

2.2. Research Methodology

It should be noted that all empirical analyses presented in the three papers build on the same sample of 128 owner-managers of medical technology companies located in Germany, Switzerland and Austria. The medical technology industry is faced with short product life cycles and with intense pressures to innovate (Hofrichter & Dümmler, 2014). The owner-managers studied are thus constantly searching for new opportunities, rendering the industry especially suitable for examining information search behaviors.
In the first paper, the authors develop and validate a new instrument for measuring entrepreneurial information search behaviors following common scale development procedures (cf. Hinkin, 1995). To generate the candidate items, deductive (extensive literature review) and inductive (interviews with entrepreneurs) approaches are combined (cf. Hinkin, 1995). As a result, 22 items were generated and were then pre-tested on the owner-managers from medical technology companies and on academic professionals regarding unclear formulations or inaccurate wording. Further, a pilot study was conducted with 211 entrepreneurship students to examine the preliminary factor loadings of the 22 items through a principal component analysis. Finally, the authors tested the measure’s structural validity by conducting a survey on 128 owner-managers from medical technology companies. A confirmatory factor analysis was performed to evaluate the model fit and to scrutinize the results further. Moreover, the authors assessed the measure’s internal consistency and content validity with 51 business students through a content analysis survey.

The second paper of the cumulative dissertation examines how regulatory focus theory and environmental dynamism relate to preferences for certain types of information search behavior. It uses Higgins et al.’s (2001) measure to capture the participants’ regulatory foci. The instrument provided by Jansen et al. (2006) is used to measure environmental dynamism. The authors control for non-response and common method bias (Schriesheim, 1979). Moreover, additional robustness tests are conducted to further scrutinize the data. Firm size, CEO gender and CEO age variables are used as common control variables. Ordinary least squares (OLS) regression models are employed to test the hypotheses. Further statistical tests reveal that the data are not subject to autocorrelation (cf. Tabachnick & Fidell, 2007) or multicollinearity (cf. Hair et al., 2010). A contrast analysis is used in a post hoc test to assess the effects of different combinations of promotion and prevention focus (cf. Kammerlander et al., 2015).

The third paper investigates how types of information search behavior are related to the perceived innovativeness of opportunities identified. Perceived innovativeness is measured using the instrument developed by Marvel and Lumpkin (2007). CEO share, firm age and competitive intensity variables serve as control variables. To test the hypotheses, OLS regression models are applied. Statistical tests show that multicollinearity, autocorrelation and heteroscedasticity are not an issue in the data (cf. Hair et al., 2010). Further, an analysis was conducted to test for the presence of
significant outliers (cf. Tabachnick & Fidell, 2007). The methodological approach was complemented by the use of a post hoc test assessing interaction effects of information search behaviors and environmental dynamism via a regression analysis.

2.3. Framework and Main Characteristics of the Three Papers

Figure 1 illustrates the overall framework of the cumulative dissertation. It shows how the overarching construct of entrepreneurial information search behavior is embedded in the three distinct academic papers. Table 2 then compares the three papers according to common criteria such as applied methods and main contributions (cf. Burger, 2017; Sieger, 2011).
Figure 1. Framework of the Dissertation
### Table 2. Main Characteristics of the Three Papers

<table>
<thead>
<tr>
<th>Authorship</th>
<th>Research gap</th>
<th>Main theoretical constructs</th>
<th>Main method(s) and sample</th>
<th>Main (theoretical) contribution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paper 1: Entrepreneurial Information Search Behavior for Opportunity Recognition: Scale Development and Validation</strong></td>
<td>Philipp Wustrow, Alexander Fust, Denis Grégoire, &amp; Urs Fueglistaller</td>
<td>Lack of valid scales for measuring different types of entrepreneurial information search behavior</td>
<td>Empirical scale development methodology (CFA, EFA, etc.); 128 owner-managers of medical technology companies</td>
<td>Opportunity recognition and information search literature; offering a new valid and reliable measurement instrument for scholarly research</td>
</tr>
<tr>
<td><strong>Paper 2: Why Do Entrepreneurs Search for Information on Opportunities the Ways They Do?</strong></td>
<td>Philipp Wustrow, Alexander Fust, &amp; Urs Fueglistaller</td>
<td>Cognitive and contextual factors as antecedents of entrepreneurial information search behavior</td>
<td>OLS regression analysis; contrast analysis; 128 owner-managers of medical technology companies</td>
<td>Opportunity recognition, information search, cognition, and regulatory focus literature; explaining why entrepreneurs search for information the ways they do</td>
</tr>
<tr>
<td><strong>Paper 3: The Impact of Entrepreneurial Information Search Behavior on the Innovativeness of Recognized Opportunities</strong></td>
<td>Philipp Wustrow</td>
<td>Differences regarding beneficial effects (outcomes) of types of information search behavior</td>
<td>OLS regression analysis; moderation analysis; 128 owner-managers of medical technology companies</td>
<td>Opportunity recognition, information search, innovation literature; explaining why some entrepreneurs identify opportunities of deviating quality</td>
</tr>
</tbody>
</table>
3. Entrepreneurial Information Search Behavior for Opportunity Recognition: Scale Development and Validation

3.1. Abstract

The manner in which entrepreneurs search for (new) information influences their abilities to identify promising venture ideas. Despite its theoretical and practical importance, however, the academic understanding of the nature and consequences of information search behaviors remains hindered by an important challenge: the dearth of consistent methodological tools for documenting specific forms of information search behaviors. For this reason, past research has faltered in its effort to augment our understanding of the reasons why some entrepreneurs come to favor some particular forms of information search behaviors; why some of these information search behaviors might be better adapted to particular circumstances, industries and/or knowledge domains; and why the reliance on different information search behaviors has different consequences for the success of entrepreneurial efforts. To address this important shortcoming, we build on prior research on entrepreneurial opportunities and information search theory to develop and validate a new survey instrument for capturing the reliance on three information search behaviors, namely, passive, proactive and systematic search. In doing so, we contribute theoretical refinements about the nature of different search behaviors and an expanded set of methodological tools to examine their influence on entrepreneurship.

3.2. Introduction

Over and above the multitude of idiosyncratic stories on this subject, the identification of a promising idea for a new venture is typically much less of a “eureka” experience than the resulting fruit of a somewhat more complex and often implicit long-term process (e.g., McMullen & Dimov, 2013; Shrader & Hills, 2003; Vogel, in press). Various information sources (Dimov, 2007; Ramos-Rodríguez, Medina-Garrido, Lorenzo-Gómez, & Ruiz-Navarro, 2010; UCbasaran, Westhead, & Wright, 2007), diverse information search intensities (Li, Maggitti, Smith, Tesluk, & Katila, 2013; Pineda, Lerner, Miller, & Phillips, 1998; Weinzimmer & Nystrom, 2015) and different types of entrepreneurial information search behaviors (e.g., Chandler, DeTienne, &
Lyon, 2003) influence the unfolding of such processes – not to mention their outcomes.

Among the broad corpus of studies interested in entrepreneurs’ efforts to recognize promising opportunity ideas (cf. Davidsson, 2015; George, Parida, Lahti, & Wincent, 2016; Short, Ketchen, Shook, & Ireland, 2010), a number of past studies have emphasized the central role of entrepreneurs’ information search behaviors (e.g., Fiet, Norton, & Clouse, 2013; Gaglio & Katz, 2001; Ozgen & Baron, 2007). As the expression implies, entrepreneurial information search behaviors consist of the manner how entrepreneurs search for information in their environment to imagine or identify promising ideas for launching an entrepreneurial project (e.g., Frese & Gielnik, 2014; Marvel, 2013). In general, most scholars acknowledge that entrepreneurs can perform different types of information search behaviors in their efforts to ‘come up’ with opportunity ideas (cf. Chandler et al., 2003). Recent research highlights the benefits of different search behaviors (e.g., Fiet et al., 2013), or it examines whether such behaviors are active or passive in nature (Tang, Kacmar, & Busenitz, 2012; van Gelderen, 2010), accidental or deliberate (Shah & Tripsas, 2007). In turn, other studies have investigated the consequences of different information search behaviors for the types of opportunities identified (Chang, Cha, & Moon, 2013), the number of venturing ideas identified (e.g., Patel & Fiet, 2009; Shepherd & DeTienne, 2005) or the innovativeness of such ideas (DeTienne & Chandler, 2004).

Despite its practical and theoretical relevance, the academic understanding of the nature and consequences of entrepreneurial information search behaviors remains hindered by important difficulties and challenges (cf. Dyer, Gregersen, & Christensen, 2008; Tang et al., 2012). Among other issues, the profusion of closely related terms (such as passive search, reactive search or alertness) and their sometimes indiscriminate use (such as interpretations of alertness and systematic search) have induced some measures of theoretical ambiguity – if not confusion – about the nature of information search behaviors. In much the same vein and perhaps even more importantly, prior studies have suffered from a lack of valid measurement instruments for consistently capturing different information search behaviors – and this has prevented prior efforts from rigorously establishing the differences between particular forms of information search behaviors – and their consequences. For example, several items targeting the two distinct constructs of alertness (Tang et al., 2012) and systematic search (Kreiser, Patel, & Fiet, 2013) show strong similarities despite their...
assumed theoretical distinctiveness. As a result, it becomes almost impossible to assess what construct is actually being measured – or to draw insights about the respective effects of these constructs. In parallel, other studies use only one item to capture different search behaviors (e.g., Chandler et al., 2003; Tang, 2009), even if most methodologists would acknowledge that this approach is problematic (Cortina, 1993). Furthermore, many studies tend to target their measurement efforts toward respondents’ general search behavior, assuming that such behavior is constant over time and independent of the situation at hand – even if many studies agree that the early stages of entrepreneurship rely on complex processes that can change over time (Krueger, Reilly, & Carsrud, 2000; Shrader & Hills, 2003). Because of such limitations, the extant entrepreneurship research is ill-equipped to offer meaningful advances on important questions such as why some entrepreneurs come to favor some particular forms of information search behaviors, why some of these information search behaviors might be better adapted to particular circumstances, industries and/or knowledge domains, or whether and why the reliance on different information search behaviors has different consequences for the success of entrepreneurial efforts, among others.

To address this important shortcoming, we build on prior research on entrepreneurial opportunities and information search theory to develop and validate a new survey instrument for capturing people’s reliance on three distinct entrepreneurial information search behaviors, namely, passive, proactive and systematic search. By doing so, we make a twofold theoretical contribution to entrepreneurship research. First, we establish important theoretical nuances between different forms of information search behaviors. By drawing increased attention to what unites and distinguishes different forms of information search, we bring useful clarity to the conceptual landscape that has emerged from the parallel evolution of different research streams. Second, we equip scholars in entrepreneurship and other disciplines with rigorous methodological tools to examine the prevalence and mobilization of different information search behaviors, where, when, why, and with what consequences.

3.3. Information Search Behavior in Opportunity Recognition

Numerous scholars in many research disciplines have sought to better understand the nature and influence of information search behaviors. From a theoretical perspective,
the importance of information search behaviors stems from cognitive science’s early efforts (in the 1940s and 50s) to model human thinking in terms of an analogy with early computers – whereby the brain and its sensory captors (that is, the hardware) use a host of cognitive processes (the software) to “process, mobilize and use” information (the data) relevant to humans’ efforts to thrive in their environment (cf. Johnson-Laird, 2006; Pinker, 1997; Thagard, 2005). Viewed from the perspective of this powerful analogy, information-related processes thus play a determinant role in human behavior. This view has led to the pursuit of countless studies examining the nature and impact of information search behaviors on decision-making (Liberman-Yaconi, Hooper, & Hutchings, 2010; Payne, 1976), problem-solving (Tippmann, Mangematin, & Scott, 2013), consumer choices (Punj & Staelin, 1983) or internet search processes (Peterson & Merino, 2003).

In the broad managerial sciences, the interest in information search behaviors has primarily focused on how firm leaders sense opportunities and threats from the environment (Helfat & Peteraf, 2015; Pandza & Thorpe, 2009). By integrating information search as integral components of a firm’s dynamic capabilities (cf. Pelaez et al., 2009; Tripsas & Gavetti, 2000), these studies have fostered a deeper understanding of managerial cognition (Helfat & Martin, 2015).

Within the domains of entrepreneurship studies and small business research, scholars have tended to devote more attention to the influence of information search behaviors (see table 7 in appendix for key studies about information search) on individual efforts to imagine/identify ideas for new products, services, business models and other innovations. Academics began to note important variations in the intensity with which different individuals searched their environment to obtain useful information (Pineda et al., 1998). Moreover, research examined how search behaviors explain the differences among entrepreneurs and executives (Cooper, Folta, & Woo, 1995; Kaish & Gilad, 1991; Pineda et al., 1998). Furthermore, scholars have studied which information channels entrepreneurs use with respect to strategic planning (e.g., Smeltzer, Fann, & Nikolaisen, 1988), environmental scanning in uncertain contexts (McGee & Sawyerr, 2003), internationalization activities (Wennberg & Holmquist, 2008), information search to generate new product ideas (Peterson, 1988) or, more recently, opportunity recognition (Fiet et al., 2013; Marvel, 2013).
Examining these activities in more depth, cognition-inspired scholars have noted that human actors have a host of different means and strategies for obtaining information relevant to their different pursuits. Some are more direct than others; some are more involved or demanding than others; some are broader than others; etc. These differences and distinctions have progressively come to the fore, along with the emergence of different research streams. In this regard, different terms have emerged to explain the types of information search behavior linked to entrepreneurship such as fortuitous search (Dahlqvist, Chandler, & Davidsson, 2004), accidental discovery, passive search (Simon & Houghton, 2002), problemistic and slack search (Iyer & Miller, 2008), purposeful search (Ardichvili, Cardozo, & Ray, 2003), deliberate search (Shrader & Hills, 2003), active search (Simon & Houghton, 2002), search-based discovery (Marvel, 2013), experiential and cognitive search (Hsieh, Nickerson, & Zenger, 2007), proactive and reactive search (Dahlqvist et al., 2004), serendipity (Alsos & Kaikkonen, 2004; Dew, 2009) or purposive search (Agarwal, 2015).

Building on recent research developments in entrepreneurship theory (Fiet et al., 2013; Hayton & Cholakova, 2012; Murphy, 2011), we subsume the three major search behaviors of passive, proactive and systematic search and include sub-categories of search behaviors (such as problemistic or slack search) indicated in the literature.

3.3.1. Passive Search

First, passive search is used in different research disciplines with various definitions. The common denominator of most definitions is the unintentional motivation to acquire information (Ardichvili et al., 2003; Daft & Weick, 1984; DeTienne & Chandler, 2004; Kirzner, 1973; Wilson, 1997) and the absence of clear information searching goals (DeTienne & Chandler, 2004; Kaish & Gilad, 1991). Passive search is thus an unintentional search for information often resulting in accidental discoveries of some opportunity ideas (Simon & Houghton, 2002).

The notion of passive information search stems from research on how organizations sense and process information provided by the environment (Daft & Weick, 1984; Weick, 1979). In this context, organizations accept the environment as “given” and are receptive to it, in contrast to firms that actively influence the environment (Daft & Weick, 1984; Weick, 1979).
Kirzner (1979) introduced the term “entrepreneurial alertness” as one particular form of passive search, defining it as “the ability to notice without search opportunities that have hitherto been overlooked” (1979: 48). Kirzner (2009) insists that individuals cannot search for something that they do not know actually exists. Alertness refers to the sensitivity of entrepreneurs to changes in their environment (Gaglio & Katz, 2001). Alert entrepreneurs recognize opportunities because they are receptive to new information that is combined with prior knowledge and experience (Dew, 2009; Ozgen & Baron, 2007; Shane, 2000). Passive search, therefore, focuses on the role of entrepreneurs’ processing information, particularly by their sensitivity to combining new information with their prior knowledge.

Interestingly, more recent research perceives entrepreneurial alertness as more active in nature. For Busenitz (1996) and Tang et al. (2012), entrepreneurial alertness has a more active and intentional searching component. Scholars describe it as a continuous search for information by undirected scanning (Busenitz, 1996). However, this interpretation of alertness as being more active contradicts statements by Ardichvili et al. (2003). Ardichvili et al. (2003) perceive entrepreneurial alertness in a more passive and unintended manner. It seems as though there is disagreement over the definition of alertness as being passive in nature. Furthermore, other terms and concepts have emerged around passive search such as spontaneous, accidental or serendipitous recognition (Dew, 2009; Shah & Tripsas, 2007). They argue that the recognition of opportunities occurs somewhat spontaneously due to the availability of new information that is contingent on prior knowledge (Dew, 2009). We follow the tradition of Kirzner (1979) and Ardichvili et al. (2003), who imply that entrepreneurial alertness is passive in nature and thus, as a concept, is closely related to passive search behavior.

3.3.2. Proactive Search

Second, proactive search is defined as intentional search for relevant information, which can include environmental scanning, goal setting, strategic planning or competitive analysis (Baum, Locke, & Smith, 2001; DeTienne & Chandler, 2004; Dess, Lumpkin, & Covin, 1997; McDougall, Covin, Robinson, & Herron, 1994). Individuals actively seek information because they intend to find missing or new information for a certain purpose (Wilson, 1997).
The notion of proactive information search originates in strategic management research, notably in observations that (some) managers actively scan their organization’s environment for strategically relevant information such as trends (Hambrick, 1982). This information and the corresponding managerial actions are relevant to surviving in competitive contexts (Hambrick & Mason, 1984).

Other scholars argue that information for solutions is searched for because of problems at hand, a lack of performance or failure (Cyert & March, 1963; Levinthal & March, 1981). These search processes are often referred to as problemistic search. The search itself is triggered by specific problems (Rosenkopf & Nerkar, 2001; Tushman & Anderson, 1986). Such signals can include a request by a customer to solve a specific problem or even to find the right application to use an existing technology. Further examples include new laws or regulations that cause top executives to search for new information and new solutions to address the regulatory challenges (Sine & David, 2003).

Similarly, proactive search can be stimulated by available but unutilized resources, referred to as “organizational slack” (Wennberg & Holmquist, 2008). Such organizational slack is defined as “the difference between existing resources and activated demands” (March & Olsen, 1976: 87) or the “supply of uncommitted resources” (Cyert & March, 1963: 54) and “resources funneled into the satisfaction of individual […] objectives” (Cyert & March, 1963: 98). Thus, (organizational) slack includes the workforce, financial resources or underused facilities (Greve, 2003), causing executives to search for information and ways to use these resources more productively. It differs from problemistic search because it is broader in scope and not restricted to a certain problem that must be solved.

Problemistic and slack search show strong similarities to the concept of proactive search behavior and can therefore be construed as characteristics or sub-categories of proactive search behavior (cf. Chandler et al., 2003).

3.3.3. Systematic Search

Third, systematic search is a constrained information search that concentrates on the means (search of known information channels) rather than the effects (unknown venture ideas) (Fiet, 2007). Information search is maximized within a constrained
domain that is influenced by prior knowledge (Fiet, 2002, 2007). Therefore, systematic search is an efficient and effective information search (Fiet, 2007; Fiet et al., 2005).

Systematic search has its roots in informational economics. Hayek (1945) argues that individuals who possess specific information have an advantage compared to others. Such information can relate to, for example, information about circumstances, conditions or people (Hayek, 1945). Fiet (2002) states that some individuals are more capable of perceiving the characteristics of certain information signals because of their prior experience and knowledge, which can consist of general and specific information. Furthermore, such signals can reduce risk and increase profit by combining them with an individual’s prior knowledge (Fiet, 2002). Additionally, Fiet, Piskounov and Patel (2005) use Bayesian logic to explain the theoretical foundations of systematic search and how uncertainty can be reduced. They argue that prior knowledge helps entrepreneurs identify the information channels with the maximum potential for venture idea recognition (Fiet et al., 2005). The most promising group of information channels is defined as a “consideration set” (Fiet, 2002, 2007; Fiet et al., 2005). An information channel is defined as “a frequent, low-cost source of signals. A signal is new information that changes our ideas about a future state” (Fiet, 2002: 53). An entrepreneur’s consideration set is dynamic, given that it can be updated depending on the information that these channels provide (Fiet et al., 2005).

The merits of systematic search lie in its prescriptive nature (Fiet, 2002). The somewhat formal method of screening the environment is an intentional sourcing of ex ante nonexistent information (Ardichvili et al., 2003; Kirzner, 1997). In particular, experienced entrepreneurs constrain their search to preferred information channels (Fiet et al., 2013; Gaglio, 1997; Westhead et al., 2005). Doing so can be superior compared to other search behaviors with respect to the amount of recognized venture ideas (Patel & Fiet, 2009). Fiet and Patel (2009) show that when entrepreneurs constrain their search to specific information channels, the likelihood of identifying venture ideas increases compared to entrepreneurs who rely solely on unintentional or passive search
3.4. **Empirical Measures of Information Search to Recognize Opportunities**

A variety of employed measures of entrepreneurial information search exist in the literature, of which hardly any could be considered ‘established’ in terms of scholarly citations or applications. This situation could be an indication of underlying issues in terms of the validity and reliability of the existing measurement instruments. Even for the same construct of interest, different measures exist, which further underlines the apparent disagreement among scholars. For example, Kaish and Gilad (1991) measure entrepreneurial alertness with 7 items, compared to Tang et al. (2012), who derive 24 items. Researchers are unable to draw on the results of existing studies, and the process of theory building is thus restrained. Theory-building is only able to progress if appropriate measurement instruments exist (e.g., Nunnally, 1978); therefore, valid and applicable measures are crucial to enable meaningful research findings and to advance scholars’ understanding of key opportunity recognition processes.
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Number of items</th>
<th>Name(s) of concept(s)</th>
<th>Sample</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chandler et al. (2003)</td>
<td>4</td>
<td>- Problemistic search - Proactive search - Fortuitous discovery/passive search - Creation</td>
<td>- CEOs (n=22)</td>
<td>- Assessing search behavior used to identify the major product/product line of the firm - Only one item for each type of search behavior (inadequate for content validity) (cf. Hinkin, 1995) - Wording is very general/unspecific - References to concept of systematic search are missing</td>
</tr>
<tr>
<td>Kaish &amp; Gilad (1991)</td>
<td>7</td>
<td>- Alertness</td>
<td>- Founders of companies (n=51) - Executives (n=36)</td>
<td>- Assessing general information search behavior - Differentiation from other scales measuring search behavior remains unclear (e.g., problemistic and proactive search)</td>
</tr>
<tr>
<td>Tang et al. (2012)</td>
<td>24</td>
<td>- Alertness</td>
<td>- CEOs (n=291) - Entrepreneurs (n=109)</td>
<td>- Assessing general information search behavior - Differentiation from other scales measuring search behavior remains unclear (e.g., passive search)</td>
</tr>
<tr>
<td>Dyer et al. (2008)</td>
<td>19</td>
<td>- Innovative behavior</td>
<td>- Entrepreneurs (n=72) - Executives (n=310)</td>
<td>- Assessing general behavior - No specific differentiation between search behavior</td>
</tr>
<tr>
<td>Patel &amp; Fiet (2009)</td>
<td>3</td>
<td>- Systematic search</td>
<td>- Entrepreneurship scholars (n=492)</td>
<td>- Differentiation from other scales measuring search behavior remains unclear (e.g., proactive search) - Wording is very general</td>
</tr>
<tr>
<td>Puhakka (2007)</td>
<td>3</td>
<td>- Proactive search</td>
<td>- Entrepreneurs (n=107)</td>
<td>- Wording is very general - Items leave a considerable amount of space for individual interpretation</td>
</tr>
<tr>
<td>Marvel (2013)</td>
<td>3</td>
<td>- Search-based discovery</td>
<td>- Founders (n=166)</td>
<td>- Wording is general - Author analyzes the motivation to find business ideas ex ante and not the search process itself</td>
</tr>
<tr>
<td>Shrader &amp; Hills (2003)</td>
<td>10</td>
<td>- Alertness and deliberate search</td>
<td>- Entrepreneurs (n=240)</td>
<td>- Wording is general - Assessing general discovery - Use of knowledge sources - Foundation of the scale development remains unclear</td>
</tr>
<tr>
<td>Westhead, Ucbasaran, Wright &amp; Binks (2005)</td>
<td>8</td>
<td>- Source of opportunity</td>
<td>- Novice (n=200), serial (n=66), portfolio entrepreneurs (n=88)</td>
<td>- Assessing the discovery of a particular opportunity - The information search behavior is mainly addressed by two questions</td>
</tr>
</tbody>
</table>
Furthermore, most scholars measure only one particular information search behavior (e.g., entrepreneurial alertness in Tang et al., 2012) and do not consider a wider scope, although many scholars claim that meaningful variations in information search behaviors exist (e.g., Dahlqvist et al., 2004; DeTienne & Chandler, 2004). In particular, such comparisons between different information search behaviors can enhance our understanding of entrepreneurial information search behavior and opportunity recognition processes by examining the antecedents and outcomes of different search behaviors. Exceptions include the studies by Fiet (2007), who compares the outcome of systematic search and entrepreneurial alertness, or Chandler et al. (2003), who develop one item for each serendipitous discovery, problemistic and proactive search. However, Chandler et al. (2003) do not consider systematic search as a separate information search behavior. In addition, from a methodological perspective, the use of only one item per construct is problematic (cf. Cortina, 1993) because it does not entail adequate content validity (Hinkin, 1995; Kenny, 1979; Nunnally, 1976). The low number of scholarly citations seems to reflect this issue and emphasizes the apparent weaknesses of the study. Overall, no known study successfully manages to put all three major and conceptually distinct information search behaviors into relation to each other to advance our understanding of how information search behavior affects opportunity recognition processes.

Finally, most instruments measure information search as a general behavior or a belief of how entrepreneurs would act (e.g., Tang et al., 2012). Suggested items such as “I search actively for business ideas” (Tang et al., 2012) are not very specific and might be confused with other types of information search behavior such as proactive search. This approach can be criticized, given that it is questionable or even implausible that entrepreneurial information search behavior is constant over time and that it does not experience any changes or adaptations in different contexts or over time. Studies in others contexts such as consumer information or online search behavior have shown, for example, that the behavior itself or the frequency of usage of previously utilized information channels changed over time (Johnson, Moe, Fader, Bellman, & Lohse, 2004; Peterson & Merino, 2003). This behavior adaption could also imply that entrepreneurs change their information search behavior from one recognized opportunity to another. For the moment, scholars are clearly in need of a measurement instrument that is able to capture meaningful variations in search behaviors and patterns. The ambiguous and frequently confused understanding of
different terms and scales can be attributed to a considerable extent to the lack of an applicable measurement instrument. In summary, there is an apparent need to deepen our knowledge and to develop distinct scales of entrepreneurial information search behavior for opportunity recognition that rely on search behavior related to specific opportunities.

3.5. Scale Development

We developed the measurement instrument following suggested standard procedures (cf. DeVellis, 2012; Hinkin, 1995). In the first step, we generated a series of theoretically relevant candidate items, combining deductive and inductive approaches. In the second step, we performed pilot studies to obtain preliminary evidence of the instrument’s validity and to further refine the item pool. Finally, we conducted a survey of SME (small and medium-sized enterprise) owner-managers to assess the instrument’s structural validity.

3.5.1. Item Generation

To generate the items for our measure, we combined deductive and inductive approaches, as recommended by the extant literature (Hinkin, 1995). We first deductively conducted an extensive literature review to identify existing measures and their theoretical anchors. Accordingly, we identified and adapted a number of items from different measures targeting distinct search behaviors. We also developed our own set of supplementary items to capture conceptual dimensions and categories omitted by existing scales. In addition, we interviewed 31 small business owner-managers who recognized and successfully exploited 59 opportunities for inductive purposes, and we analyzed the interviews to generate further candidate items. As a result, we generated a pool of 22 items.

3.5.1.1. Deductive Approach for Item Generation

An extensive literature review on opportunity recognition (e.g., Kontinen & Ojala, 2011) served as the basis for the deductive approach to generate items, which increases content validity (Nunnally & Bernstein, 1994). Three main types of information search behavior can be theoretically differentiated.
First, entrepreneurs search for information proactively to recognize entrepreneurial opportunities (Frese, 2009). The initiative to search therefore emanates from the entrepreneur’s own decision. Reasons for such a decision could arise from the need for approval or need for independence (cf. Scheinberg & MacMillan, 1988) so that one is the master of one’s fate (cf. Skinner, 1997). Unemployment or the failure of a project can be further reasons (Chandler et al., 2003). There are different manifestations of proactive search. Entrepreneurs search for trends that could help recognize new opportunities (cf. Baron, 2006; Frese, 2009; Puhakka, 2007), learn by trial and error (Simon & Houghton, 2002) or search for opportunities in foreign markets (cf. Di Gregorio, Musteen, & Thomas, 2008; Kontinen & Ojala, 2011). In summary, proactive search is a type of information search behavior of entrepreneurs in opportunity recognition where the intent of individuals to recognize opportunities is high.

Second, opportunities are often identified by chance, which does not require any form of planned activity (Nordman & Melén, 2008; Shah & Tripsas, 2007). This unintended information search can be achieved as entrepreneurs observe foreign markets (Nordman & Melén, 2008) or search newspapers or magazines (Hills & Shrader, 1998) without the explicit intent of opportunity recognition. This somewhat passive search is another type of information search behavior of entrepreneurs in opportunity recognition where there are no specific problems at hand and opportunity recognition is not the purpose of searching for information.

Finally, studies show that systematic search is superior to passive search in recognizing opportunities (Fiet, 2007), which leads to the third type of information search behavior of entrepreneurs. Entrepreneurs are motivated to recognize opportunities, but they restrict their information search to the most promising information channels (Fiet et al., 2013). Based on the work of Fiet (2002), we generated two items for measuring systematic search.

3.5.1.2. Inductive Approach for Item Generation

The inductive approach for item generation was initiated with 31 interviews with practitioners. Most of them had different professional backgrounds such as marketing, construction or brewing, to name only a few. The entrepreneurs were interviewed for 45 to 90 minutes. They were instructed to reflect upon opportunities that they previously identified. The following statement is an example from a master electrician who explained how he recognized an opportunity in the past: “A customer approached
me a few years ago. He wanted to protect his house from electromagnetic radiation. However, I lacked knowledge in this respect, so I decided to advance my knowledge in this field. Then, I began with experiments in my own home and my firm to find potential solutions according to the customer’s needs."

The conducted interviews were transcribed verbatim. Afterwards, we followed commonly recommended classification procedures (cf. Kolvereid, 1996; Terpstra & Olson, 1993). Specifically, two raters independently labeled and sorted the statements about how the opportunities were identified that were made in the interviews. As a result, 22 distinct groups were obtained according to the criteria of comprehensiveness and distinctiveness. Two doctoral students and one graduate business student then conducted a classification procedure the other way around, assigning the 22 groups to the distinct statements made about the opportunity recognition processes. The use of students in such procedures is regarded as appropriate by the extant literature (cf. Schriesheim & Hinkin, 1990). This procedure yielded in a sufficiently high interrater reliability of .67 measured by Krippendorff’s alpha (Hayes & Krippendorff, 2007).

3.5.2. Pre-Test and Pilot Study

We pre-tested the generated 22 items by interviewing seven academic professionals and three executives from medical technology companies (cf. Netemeyer et al., 2003). We chose this specific industry because our main study was conducted with owner-mangers from medical technology companies for reasons explained below (see section 3.5.3). We took into account the views of the persons consulted regarding unclear formulations and general inaccuracies of the proposed items. Furthermore, the experts were asked whether the items are suitable for a survey in the medical technology industry. As a result, three items were edited to enhance their clarity and readability.

The conducted pilot study was a survey with entrepreneurship students from a Swiss business school. The survey was sent to a total of 727 individuals who were specifically chosen due to their relationship with entrepreneurship because they either enrolled in entrepreneurship classes or entrepreneurship-related graduate programs or had already successfully exploited opportunities. We obtained 425 survey responses. Of these, 211 were fully completed questionnaires, which we used for our analyses. Therefore, the response rate reached 29%. The sample size of 211 fulfills the required
item-to-response rate of 1:10 (Schwab, 1980) recommended for scale development purposes. We asked the respondents to think of their previously recognized entrepreneurial opportunity to minimize the risk of success or retrospective biases (Golden, 1992).

Seven out of the 22 items showed higher loadings across domains and were thus adjusted after consultation with the survey participants. The results of the survey were analyzed using principal component and confirmatory factor analyses. The obtained preliminary factor loadings and validity tests showed promising results.

### 3.5.3. Main Study

Finally, building on the above studies, we assessed the measure’s structural validity through an e-mail survey with owner-managers using Qualtrics. We collected the data from June to July 2015. The survey included multiple pages and a brief cover letter written in German. The participants could provide their answers on a Likert-type scale ranging from 1 (does not apply at all) to 5 (fully applies). To assess our measure’s relationship with other constructs, we included additional target and control variables such as: age of the entrepreneur, age of the respective company, gender, percentage of ownership of the respective company, number of employees, perceived innovativeness of the opportunity, openness, competitive intensity, environmental dynamism and position in the company (e.g., CEO). According to the underlying ORBIS database (Bureau van Dijk) and our own investigations, our questionnaire was sent to 17,044 medical technology companies based in Germany, Austria and Switzerland. Specifically, we chose companies that manufacture medical and dental instruments and supplies. The companies were small and medium-sized enterprises (SMEs) with less than 250 employees. Companies operating in the medical technology industry face increasing competitive pressure and shortened product life cycles as well as high regulatory requirements (Hofrichter & Dümmler, 2014). Therefore, they are compelled to enhance their efforts to identify and, consequently, to search for opportunities, making this sector an ideal dynamic context for studying opportunity recognition processes in general and information search in particular. Beforehand, we conducted interviews with managers from medical technology companies who stated that the process of opportunity recognition in such SMEs is inextricably linked to the
information search behavior of the owner-manager. Furthermore, CEOs or managers are said to be the most knowledgeable regarding important activities and initiatives in their company (Auh & Menguc, 2005). Hence, we relied on the key informant approach (Kumar, Stern & Anderson, 1993) and included only owner-managers in our survey.

We offered an incentive to participate, with all participants being included in a drawing for two tickets to a special event. Over the course of four weeks, we sent two reminders. We received a total of 856 answers, amounting to a response rate of 5.0%. The somewhat low response rate can be attributed to the long and complex questionnaire. Other studies targeting SMEs have shown similar response rates (cf. Dehlen et al., 2014). All questionnaires that were not fully completed and that were not completed by the owner-manager himself were deleted. As a result, 728 responses had to be excluded. Hence, our final sample contained 128 full responses from owner-managers. This sample size is sufficient for testing the developed scale (Schwab, 1980). We could not identify significant differences between late and early respondents regarding the variables as we checked for sources of non-response bias within our sample (cf. Kammerlander et al., 2015). We asked the respondents to think about their last recognized opportunity rather than any recognized opportunity in the past, which implies that possible retrospective biases are an inherent part of the model. Furthermore, this procedure made it simpler for the respondents to recall their specific information search behavior, given that the moment at which they recognized the opportunity occurred in the more recent past. We also accounted for the fact that opportunity recognition is a complex process that can change over time (Krueger, Reilly, & Carsrud, 2000; Shrader & Hills, 2003). Thus, retrospective bias is unlikely to influence our data.
Table 4. Sample Statistics

<table>
<thead>
<tr>
<th>Sample Statistics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of survey participants(^1)</td>
<td>128</td>
</tr>
<tr>
<td>CEO age (years)</td>
<td>55.9</td>
</tr>
<tr>
<td>CEO gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>11.7%</td>
</tr>
<tr>
<td>Male</td>
<td>88.3%</td>
</tr>
<tr>
<td>Firm size</td>
<td></td>
</tr>
<tr>
<td>0-9 employees</td>
<td>55.7%</td>
</tr>
<tr>
<td>10-49 employees</td>
<td>34.9%</td>
</tr>
<tr>
<td>50-249 employees</td>
<td>9.4%</td>
</tr>
<tr>
<td>Mean of employees</td>
<td>19.9</td>
</tr>
<tr>
<td>Firm age (years)</td>
<td>25.1</td>
</tr>
</tbody>
</table>

\(^1\)All participants are owner-managers from medical technology companies.

3.5.4. Principal Component Analysis

In the first step, we evaluated the factorability of the provided data. The Kaiser-Meyer-Olkin statistic is a useful measure for assessing the appropriateness of the data for factoring (Stewart, 1981). We obtained a value of 0.732 which is considered sufficient (Kaiser & Rice, 1974). Additionally, Bartlett's test of sphericity showed significance (p < .000), as recommended (Bartlett, 1950). The diagonal values of the anti-image correlation matrix showed values of .648 or higher, exceeding the recommended threshold (Neill, 1994).

After the first analyses indicated great factorability, we ran a principal component analysis with the 22 items because this is a commonly used method (cf. Pruzek & Rabinowitz, 1981), particularly for scale development procedures (cf. Cardon, Grégoire, Stevens, & Patel, 2013; Kaish & Gilad, 1991). Varimax rotation, which is the prevalent orthogonal rotation method (Gorsuch, 1983; Moosbrugger & Hartig, 2002), was used. Seven items had to be eliminated due to low loadings or higher loadings across domains (Worthington & Whittaker, 2006). We relied on items showing factor loadings above .52 which clearly exceeds the recommended threshold of .40 (Hair, et al., 2010).

After eliminating the items with higher cross loadings or lower loadings, a three-factor solution was indicated. The respective Eigenvalues were 3.099, 1.761 and
1.143. The total variance explained by these factors was 54.6%. The factors match the theoretically developed dimensions of passive (5 items), proactive (4 items) and systematic search (2 items). Therefore, the final instrument targeting the three search behaviors includes a total of 11 items. The conducted literature review provided some indications that a three-factor solution could be expected from an exploratory factor analysis (EFA). Therefore, we turned our focus to a confirmatory factor analysis (CFA).
## Table 5. Factor Loadings of the Final Items of the Main Study

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor 1: Proactive search</th>
<th>Factor 2: Passive search</th>
<th>Factor 3: Systematic search</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro1: I intentionally searched for customer needs for which I have developed a solution subsequently.</td>
<td>.684</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pro2: I intentionally took time to search for a business idea.</td>
<td>.694</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pro3: I intentionally questioned existing solutions (own and/or competitors’ solutions) in order to identify a business idea.</td>
<td>.763</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pro4: The intention of the search was to leverage my company’s strengths to develop a business idea.</td>
<td>.670</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pas1: I studied general topic-related information (such as trade fairs or specialized literature) while not intentionally searching for a business idea.</td>
<td></td>
<td>.565</td>
<td></td>
</tr>
<tr>
<td>Pas2: While I wasn’t intentionally searching for a business idea, I identified a business idea in conversations with people known and/or unknown to me.</td>
<td></td>
<td></td>
<td>.636</td>
</tr>
<tr>
<td>Pas3: I can’t tell exactly how I identified the business idea; rather, I spontaneously came up with the idea.</td>
<td></td>
<td></td>
<td>.524</td>
</tr>
<tr>
<td>Pas4: Employees unrequestedly approached me with new information, which then led to a business idea.</td>
<td></td>
<td></td>
<td>.772</td>
</tr>
<tr>
<td>Pas5: Suppliers unrequestedly approached me with new information, which then led to a business idea.</td>
<td></td>
<td></td>
<td>.556</td>
</tr>
<tr>
<td>Sys1: I intentionally restricted my search for a business idea to particular information channels (e.g., internet, journals, personal network).</td>
<td></td>
<td></td>
<td>.815</td>
</tr>
<tr>
<td>Sys2: I intentionally restricted my search for a business idea to particular information channels that relate to my specific knowledge.</td>
<td></td>
<td></td>
<td>.833</td>
</tr>
</tbody>
</table>

**Note.** Principal Component Analysis (PCA) with Varimax rotation with Kaiser normalization. Pro=proactive search; Pas=passive search; sys=systematic search.
3.5.5. Confirmatory Factor Analysis

We assessed the 11-item scale by conducting a confirmatory factor analysis (CFA) using AMOS 23 as well as maximum likelihood estimation (MLE) procedures.

On the basis of the pilot study, a proposed three-factor model was assessed. The CFA was conducted using different fit indices such as the root mean square error of approximation (RMSEA) (Byrne, 2001), the Tucker-Lewis index (TLI) (Hair, Anderson, & Tatham, 1991), the incremental fit index (IFI) (Fan et al., 1999) and the comparative fit index (CFI) (Bentler, 1990). The CFI and IFI were specifically chosen because they are applicable for comparatively small sample sizes. It is suggested that a RMSEA between 0.08 and 0.05 is indicative for a reasonable fit (e.g., Browne & Cudeck, 1993). With regard to the CFI, IFI and TLI, a value exceeding .90 is perceived to reflect a reasonable model fit (Hu & Bentler, 1999; Schreiber et al., 2006). The selected fit indices are commonly used in scale development processes (cf. Cardon et al., 2013).

The chi-squared of the three-factor model showed the following result: $\chi^2 = 49.955$; degrees of freedom = 41; $p = .159$. The close-fit index values were as follows: CFI = .964, IFI = .965 TLI = .951 and RMSEA = .041. Overall, the results indicate that the CFA supported a three-factor model. All indices show an adequate fit.

![Figure 3. Results of the Confirmatory Factor Analysis](image)

*Note.* $e =$error term; Proac = proactive search; Passiv = passive search; Syst = systematic search
We also compared the fit of the three-factor model with an alternative model that contained identical indicators with different path specifications (cf. Cardon et al., 2013; Edwards, 2001). We collapsed all measures of the three-factor model into a single factor (Harman’s one factor test). The values for a one-factor model were as follows: chi-square = 126.378, CFI = .644, IFI = .679, TLI = .581, RMSEA = .121, degrees of freedom: 41; p = .000. The fit indices indicate a poor model fit, showing that a three-factor solution is superior compared to a one-factor solution. The significant chi-square difference comparing the three-factor and one-factor model (Δχ² = 76.423; Δ in degrees of freedom: 3; p = .000) illustrates that the survey participants were clearly able to distinguish between the three constructs.

The results of Harman’s one-factor test already indicate that the data were not subject to common method bias (Schriesheim, 1979). The CFA shows that no single factor emerged, which further supports that common method bias is not an issue. The results of the conducted principal component factor analysis can also be considered to further scrutinize these indications. In this regard, the unrotated factor solution suggested a three-factor solution with Eigenvalues greater than one where the first factor accounted for only 28.2% of the variance. Therefore, the items load on different factors, and common method bias is very unlikely. We also mitigated the possibility of socially desirable answers by ensuring full anonymity and confidentiality within the context of the survey (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

3.5.6. Evaluation of Internal Consistency

We used Cronbach’s alpha, item-total correlations and composite reliability (CR) as indicators of the reliability of our measure. The recommended threshold of Cronbach’s alpha is .70 (Nunnally, 1978). In terms of the item-total correlations, values of .35 are considered sufficient (Saxe & Weitz, 1982). Additionally, according to Hair et al. (2010), the CR should be larger than .70 for sufficient reliability.

Before deleting any items, the values of Cronbach’s alpha were as follows: proactive search (.78), passive search (.71), and systematic search (.69). After deleting items with unintended loadings, Cronbach’s alpha for the four proactive search items is .72. The two items for systematic search disclose a Cronbach’s alpha value of .75. Additionally, the five items of passive search constitute a Cronbach’s alpha value of .62. Cronbach’s alpha could not be improved further by the deletion of any items. At
first glance, the reliability for passive seems low. However, in exploratory studies, values of .60 or greater are considered sufficient (Hair, Anderson, Tatham, & Black, 1998; Robinson, Shaver, & Wrightsman, 1991). Because our study can be classified as exploratory, a Cronbach’s alpha value of .62 seems sufficient. Further, we ran additional robustness checks. We performed calculations with (a) all five items, (b) only four and (c) only three items of the passive search measure (cf. Kammerlander, Burger, Fust, & Fueglistaller, 2015). We correlated the passive search scale (a) and its modified versions (b, c) with three other constructs (proactive search, systematic search, environmental dynamism) and asserted that the effects remained stable with regard to their significance, direction and magnitude. This result provides further evidence that the passive search measure exhibits sufficient reliability.

The item-total correlations for proactive and systematic search are above or close to .50. As expected, only the item-total correlation for passive search shows a value slightly beneath the recommended threshold of .35.

These findings are also reflected in the values of composite reliability (CR): proactive search: .73; systematic search: .75; and passive search: .63. In this case, proactive search and systematic search are above the recommended threshold of .70. The CR value for passive search does not quite reach .70. Overall, the findings suggest good reliability for proactive and systematic search. In the case of passive search, our additional robustness checks showed that sufficient reliability can be assumed as well.

3.5.7. Assessment of Content Validity

In another step, we examined the content validity of our final 11-item measure. We conducted a study with 51 entrepreneurship students from a major Swiss university to establish that the candidate items effectively matched their intended search behaviors. We used paired-samples t-tests to compare the mean ratings of each search behavior item on its envisaged domain (proactive search, passive search, systematic search) compared to the ratings on the other two domains (cf. Cardon et al., 2013). Table 6 also shows the percentage of participants who assigned the respective item to its intended domain in a separate forced-choice assignment (cf. Cardon et al., 2013). The results support the content validity of our measure.
Table 6. Results of Content Validity Analysis

<table>
<thead>
<tr>
<th>Target domain, item numbers and item wordings</th>
<th>PRO mean ratings (p-value of paired samples t tests with ratings for target domain)</th>
<th>PAS % forced-choice association with target domain</th>
<th>SYS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proactive search</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pro 1 I intentionally searched for customer needs for which I have developed a solution subsequently</td>
<td>4.59*** 1.14*** 2.47***</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>Pro 2 I intentionally took time to search for a business idea</td>
<td>4.76*** 1.10*** 1.76***</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Pro 3 I intentionally questioned existing solutions (own and/or competitors’ solutions) in order to identify a business idea</td>
<td>4.69*** 1.18*** 2.47***</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Pro 4 The intention of the search was to leverage my company’s strengths to develop a business idea</td>
<td>4.42*** 1.28*** 2.00***</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td><strong>Passive search</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pas 1 I studied general topic-related information (such as trade fairs or specialized literature) while not intentionally searching for a business idea</td>
<td>2.00*** 4.04 2.43***</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>Pas 2 While I wasn’t intentionally searching for a business idea, I identified a business idea in conversations with people known and/or unknown to me</td>
<td>1.45*** 4.75 1.59***</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Pas 3 I can’t tell exactly how I identified the business idea; rather, I spontaneously came up with the idea</td>
<td>1.41*** 4.69 1.29***</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Pas 4 Employees unrequestedly approached me with new information, which then led to a business idea</td>
<td>1.40*** 4.28 1.58***</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Pas 5 Suppliers unrequestedly approached me with new information, which then led to a business idea</td>
<td>1.29*** 4.17 1.53***</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td><strong>Systematic search</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys 1 I intentionally restricted my search for a business idea to particular information channels (e.g. internet, journals, personal network)</td>
<td>3.18*** 1.24*** 4.78</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Sys 2 I intentionally restricted my search for a business idea to particular information channels that relate to my specific knowledge</td>
<td>3.18*** 1.22*** 4.70</td>
<td>97</td>
<td></td>
</tr>
</tbody>
</table>

Note. Participants: academic experts and entrepreneurship students (n = 51). Pro = Proactive search; Pas = Passive search; Sys = Systematic search. % = Percentage of participants that assigned the respective item to its intended domain in a separate forced-choice assignment. Significance levels *** p ≤ .001.
3.5.8. Assessment of Construct Validity

We assessed construct validity (convergent and discriminant validity) by calculating and comparing the average variance extracted (AVE), average shared squared variance (ASV) and maximum shared squared variance (MSV) (Hair et al., 2010). According to Hair et al. (2010), convergent validity is supported if the AVE is above .50 and smaller than the CR value. Discriminant validity is evident when the values of both the ASV and the MSV are smaller than the value of the AVE.

All values of the AVE (proactive search: .40; systematic search: .60; passive search: .27) are smaller than the values of the CR, which is a first indication of convergent validity. Nevertheless, only in the case of systematic search did the AVE reach higher than .50. Therefore, we performed further investigations to test for the convergent validity of our measures. We correlated the developed scales with other scales with which we expect the scales to be correlated. We expect that all three search behaviors are positively correlated with environmental dynamism because change creates pressure for the entrepreneur to search for opportunities (cf. Baron & Tang, 2011). This assumption is endorsed by the results of the Pearson correlation analysis, which provides further evidence for the convergent validity of our measure: passive search (.249**), proactive search (.421**), and systematic search (.246**). Moreover, all items load only on the theorized factor, which implies convergent validity as well (cf. Liñán & Chen, 2009).

To test for discriminant validity, we examined the values of the ASV (proactive search: .19; systematic search: .21; passive search: .10) and the MSV (proactive search: .30; systematic search: .30; passive search: .12). Clearly, all values are lower than the AVE, which is an indication of discriminant validity. Furthermore, we analyzed the strength of the correlations between the three identified constructs. The results show significant correlations with correlation coefficients of low magnitude (cf. Shepherd et al., 2009). Although significant, correlation coefficients of low magnitude indicate discriminant validity (Shipp et al., 2009). In addition, the assessment of the item-construct correlations demonstrated that all items correlated more strongly with their theoretical construct than with others (Messick, 1988). This result provides further support for the discriminant validity of our measure (Liñán & Chen, 2009). The CFA also provided evidence for discriminant validity, given that the three-factor model was shown to be superior compared to the alternative model (cf. Bagozzi, Yi, &
Phillips, 1991). To further scrutinize these findings, we assessed the distinctiveness between measures that we did not expect to correlate strongly (Hinkin, 1995). Systematic search is a search behavior that is constrained to specific information channels. The entrepreneur only searches within a known knowledge domain (Patel & Fiet, 2009). Therefore, we did not expect openness and systematic search to correlate strongly. Indeed, the data support this assumption (.057) and provide evidence of discriminant validity. Overall, the findings indicate adequate construct validity of our measure.

3.6. Discussion and Conclusion

Owing to the parallel emergence of different information search concepts and measures, the extant research on information search behaviors has come to present an arguably confusing picture. Different concepts exist alongside one another. Their nature or their similarities and differences are not always clear. Various studies measure distinct forms of information search behaviors, frequently using completely different means of observations. Additionally, as a result, comparison of empirical results across studies becomes ambivalent. All of these issues hinder knowledge construction and theoretical advances.

To help address these issues, we built on prior research on entrepreneurial opportunities and information search theory to clarify the similarities and distinctions between different concepts, and subsequently develop a new survey instrument for capturing people’s reliance on three distinct entrepreneurial information search behaviors, namely, passive, proactive and systematic search. The empirical results demonstrate the validity of the proposed instrument and its potential for examining the antecedents and consequences of mobilizing different information search behaviors under different circumstances. By doing so, our work makes two important contributions to the extant research on information search behaviors in entrepreneurship specifically and to the broader strategy and management literatures on such activities.

Our first contribution is we present important theoretical nuances between different forms of information search behaviors. Not all search behaviors are equal. They differ not only in terms of their intentionality (passive vs. proactive/systematic) but also in terms of their level of systematization (passive vs. proactive vs. systematic) and scope.
(passive/proactive vs. systematic). Passive information search is unintentional and not constrained to any specific information channels or knowledge areas (DeTienne & Chandler, 2004; Patel & Fiet, 2009). It is characterized by low levels of systematization (cf. Kaish & Gilad, 1991; Kirzner, 1973). Proactive search, on the other hand, is conducted intentionally, it is partly systematized, and the search scope is wide (cf. Frese, 2009; Hayton & Cholakova, 2011; Iyer & Miller, 2008). Systematic search is intentionally constrained to specific “consideration sets” that require and allow for a strongly systematized search behavior (cf. Fiet, 2002; Fiet et al., 2013). By drawing increased attention to what unites and distinguishes different forms of information search, we bring useful clarity to the conceptual landscape that had emerged from the parallel evolution of different research streams.

Our second contribution is that we equip scholars in entrepreneurship and other disciplines with rigorous methodological tools for examining the prevalence and mobilization of different information search behaviors, where, when, why, and with what consequences. More concretely, the measure that we developed and validated enables scholars to empirically assess key questions of entrepreneurship theory such as: How are new opportunities recognized by entrepreneurs? In this regard, research can show how entrepreneurs recognize opportunities that are particularly promising in terms of innovativeness or even why some entrepreneurs recognize more opportunities than others (e.g., DeTienne & Chandler, 2004; Fiet & Patel, 2008). Furthermore, such research can advance our understanding of how entrepreneurs can influence, learn or improve their search behavior to recognize opportunities with higher value creation potential.

On this note, information search behavior may explain why some entrepreneurs recognize distinct opportunities whereas others do not. Thus, we lay the groundwork for further research investigating the antecedents of opportunity recognition or, more specifically, information search behavior. In addition, information search could be the missing link between human capital or entrepreneurial traits and opportunity recognition (e.g., Shane, 2000; Zahra et al., 2006). Such hypotheses or assumptions can be tested with the help of our measure, promoting comprehensive theory-building.

Furthermore, as entrepreneurial processes vary with respect to time (Shrader & Hills, 2003), information search may determine how well the recognized opportunity is defined or how much improvement is still required to make the opportunity a
“good” opportunity (Herron & Sapienza, 1992). For example, entrepreneurs recognize opportunities that could be labeled “poor” and that are somewhat undefined, only addressing aspects of the opportunity such as customers’ needs and thus omitting, for instance, technical or pricing aspects. Under such circumstances, entrepreneurs might be tempted to search for further information to identify means to the recognized ends. Thus, extended information search behavior leads to an opportunity with a higher degree of definition.

3.7. Limitations

Although we have carefully developed our measures according to best methodological practice, our study is not without limitations. We performed several pilot studies with different samples; however, further validation and refinement studies are required. The context studied may not be representative for all industries and countries. For example, the developed measures might be applicable only within established firms and not in the context of start-up businesses (cf. Cooper et al., 1995). This could mean that the existing items need to be revisited or that additional items must be included while testing the applicability of our measure in different cultural contexts or industries.

Although the conducted additional robustness tests regarding the scale of passive information search behavior imply sufficient reliability of that measure, we reiterate that the reliability is low. Hence, further studies must investigate how the reliability can be further improved or whether the Cronbach’s alpha value significantly improves in different contexts or with different samples.

3.8. Suggestions for Future Research

We suggest further research that replicates and validates the measure in other contexts such as developing countries or different industries, for instance, in contexts of low environmental dynamism and slow technological changes compared to the fast-changing medical technology industry. Furthermore, the instrument can advance our understanding of the characteristics of entrepreneurial opportunities. There is a consensus that information search behavior affects the characteristics of identified new business ideas such as usefulness or profitability (e.g., Peterson, 1988). Hence, we suggest further research that compare the outcomes of different entrepreneurial
information search behavior such as newness, financial performance or the number and types of identified or exploited opportunities. We think that this is a particular fruitful avenue to analyze which information search processes are responsible for the recognition of radical or potentially promising opportunities. Moreover, because the opportunity recognition of experienced and novice entrepreneurs differs in various aspects (e.g., Ucbasaran, Westhead, & Wright, 2009; Westhead, Ucbasaran, & Wright, 2009) entrepreneurship research could benefit by future studies of the information search processes of serial, portfolio and novice entrepreneurs. This effect can be researched in contexts of existing and new firms. Furthermore, specific entrepreneurial traits or motivational cues can be relevant antecedents to how entrepreneurs search for information to recognize opportunities. Finally, longitudinal studies that investigate whether and under what circumstances entrepreneurs adjust or change their information search behavior can yield interesting findings.

3.9. Implications for Practice

Practitioners can benefit from our research in two ways. First, because specific entrepreneurial search behaviors can be learned and improved (e.g., DeTienne & Chandler, 2004; Fiet & Patel, 2008), entrepreneurship education is supported by the developed measure, given that lecturers are provided with a tool for evaluating which information search behavior to teach entrepreneurship students to recognize promising entrepreneurial opportunities. Thus, the likelihood of successfully recognizing promising opportunities can be increased.

Second, entrepreneurs are inspired to critically reflect upon their personal information search behavior. This process could lead to more elaborate, rational and possibly more successful entrepreneurial information search behavior.
### 3.10. Appendix

<p>| Table 7. Key Studies about Information Search for Opportunity Recognition |
|-------------------------------------------------|-------------------|-------------------------------------------------|
| <strong>Author(s)</strong> | <strong>Key Constructs</strong> | <strong>Key Statement(s) / Results</strong> | <strong>Method / Sample</strong> |
| Kaish &amp; Gilad (1991) | Alertness | They find differences among entrepreneurs and executives in the exposure to information, the information sources used and the evaluation of information cues. Entrepreneurs exhibit more general alertness and invest more time searching for information through nonverbal scanning in their spare time. | 51 founders of companies and 36 executives |
| Herron &amp; Sapienza (1992) | Information search | The type of information search is affected by the combination of the skills and the aspiration level of the entrepreneur. Furthermore, they argue that dissatisfaction (e.g., about the pay raise) can cause information search for something new. | Conceptual |
| Cooper, Folta, &amp; Woo (1995) | Information search practices, intensity of search, use of professional and personal sources | Entrepreneurs widely use six sources of information, i.e., accountants, friends, other business owners, bankers, lawyers and books and manuals. Less experienced entrepreneurs search for more information. They further vary their information search depending on the familiarity of the domains. Experienced entrepreneurs do not vary their search patterns. The degree of confidence in success leads to less information search. | 1176 entrepreneurs |
| Pineda, Lerner, Miller, &amp; Philips (1998) | Information search intensity, use of external and internal sources | They find that the search intensity is higher when making product-related decision compared to employee-related and technical decisions. Small business managers tend to rely more on internal information sources compared to external sources. | 131 small business owners |</p>
<table>
<thead>
<tr>
<th>Reference</th>
<th>Search Activities</th>
<th>Description</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chandler, Dahlqvist, &amp; Davidsson (2004)</td>
<td>Proactive search, reactive search and fortuitous search</td>
<td>Proactive search leads to opportunities that were developed more quickly. Fortuitous discovery leads on average to more profitable opportunities compared to those of the other search processes.</td>
<td>Longitudinal panel study (phone and mail survey) with 121 Swedish firms that were initiating new products and services.</td>
</tr>
<tr>
<td>Simon &amp; Houghton (2002)</td>
<td>Active, passive search, personal, impersonal, external and internal information sources</td>
<td>Firm age is proposed to negatively affect active search. The authors suggest that firms that introduce pioneering products are searching more actively. Moreover, active search is proposed to positively affect the illusion of control.</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Ardichvili et al. (2003)</td>
<td>Passive search, purposeful search, entrepreneurial alertness</td>
<td>The authors state that entrepreneurial alertness can explain how entrepreneurs discover opportunities. They argue that entrepreneurial alertness may be a more powerful determinant of discovery. Furthermore, they explain that some entrepreneurs actively search and others discover opportunities accidentally from a heightened entrepreneurial alertness, which is referred to as passive search.</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Chandler, DeTienne, &amp; Lyon (2003)</td>
<td>Proactive search, problemistic search, fortuitous discovery, opportunity creation</td>
<td>Systematic search in the presence of slack resources was not the source of any of the opportunities. The entrepreneurs had trouble indicating one specific search behavior. Spinoffs should be another category of search. Education was important. Most of the entrepreneurs found opportunities related to either their educational background or an industry background.</td>
<td>Grounded theory. Phone interviews with 22 executives of young firms either in the surgical medical instruments or the electrical measurement instruments industries.</td>
</tr>
<tr>
<td>Study</td>
<td>Type</td>
<td>Description</td>
<td>Data Collection</td>
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<td>-------------------------------</td>
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<td>----------------------------------------------------------------------------</td>
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<tr>
<td>Sine &amp; David (2003)</td>
<td>Problemistic search</td>
<td>Environmental shocks such as new regulations can be a trigger for problemistic search.</td>
<td>Interviews with 25 executives from utilities and non-utility firms as well as other officials. Furthermore, documents were used as data sources.</td>
</tr>
<tr>
<td>Shrader &amp; Hills (2003)</td>
<td>Deliberate search, alertness</td>
<td>Entrepreneurs view themselves as being “entrepreneurially alert”. Some opportunities are recognized accidentally, others proactively.</td>
<td>Comparing two groups of entrepreneurs</td>
</tr>
<tr>
<td>Alsos &amp; Kaikkonen (2004)</td>
<td>Serendipity or deliberate and active search</td>
<td>Opportunity search in industries other than farm-based industries because they want to have more income than farming can give. Active search for “known” opportunities fitting the entrepreneurs’ competence, situation and resources. Serendipitous occurrence because of the entrepreneurs’ special skills, knowledge or resources. The opportunities seem to be more innovative, and they are only marginally related to farm resources. They somewhat replace the farm as a business activity. Prior knowledge is important for these opportunities.</td>
<td>Interviews with 31 farm-based entrepreneurs in Finland and Norway</td>
</tr>
<tr>
<td>DeTienne &amp; Chandler (2004)</td>
<td>Active search, passive search and fortuitous discovery</td>
<td>Active search builds on the presupposition that the opportunity can be specifically defined. Passive search is unintended and without clear goals. The authors show that a training intervention had an effect on the ability to generate more business ideas and more innovative ideas.</td>
<td>130 senior-level undergraduates in the U.S.</td>
</tr>
<tr>
<td>Fiet et al. (2005)</td>
<td>Systematic search</td>
<td>Constrained systematic search is able to guide entrepreneurs in their information search. They use consideration sets and show with mathematical formalism a maximal search sequence.</td>
<td>Conceptual and mathematical formalism</td>
</tr>
</tbody>
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Table 7. (Continued)

<table>
<thead>
<tr>
<th>Source of opportunity</th>
<th>The authors compare novice, serial, and portfolio entrepreneurs. They show that some novice entrepreneurs could be associated with some deficiencies in terms of skills and knowledge that might influence information search.</th>
<th>Survey of 200 novice, 66 serial and 88 portfolio entrepreneurs in Scotland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Westhead, Ucbasaran, Wright, &amp; Binks (2005)</td>
<td>Source of opportunity</td>
<td>The authors compare novice, serial, and portfolio entrepreneurs. They show that some novice entrepreneurs could be associated with some deficiencies in terms of skills and knowledge that might influence information search.</td>
</tr>
<tr>
<td>Baron (2006)</td>
<td>Active and passive search</td>
<td>Changes, events and trends in the external world are perceived through cognitive frameworks. Alertness and active search are important to perceive patterns in these (seemingly unrelated) changes, events and trends. Prior knowledge affects the cognitive prototypes and frameworks to connect seemingly independent events. Alertness, active search and prior knowledge may be interrelated.</td>
</tr>
<tr>
<td>Fiet (2007)</td>
<td>Systematic search</td>
<td>Development of a prescriptive model of a constrained and systematic entrepreneurial search. Information channels are grouped into consideration sets. It is argued that systematic search is superior to alertness in terms of the number and the wealth-creating potential of discovered opportunities.</td>
</tr>
<tr>
<td>Fiet, Norton, &amp; Clouse (2007)</td>
<td>Systematic search, alertness</td>
<td>Systematic search has pedagogical advantages. The systematic search group recognizes more commercially viable ideas than the alertness group. It also uses specific knowledge to recognize more venture ideas than the alertness group.</td>
</tr>
<tr>
<td>Hsieh, Nickerson, &amp; Zenger (2007)</td>
<td>Cognitive search, experiential search, recognition</td>
<td>Experiential search relates to trial-and-error. It is less beneficial when problem complexity increases. Then, cognitive search via theorizing becomes more beneficial. The authors link the two modes of opportunity discovery, i.e., search and recognition, to entrepreneurial organizational forms.</td>
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### Table 7. (Continued)

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Search Behavior</th>
<th>Methodology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puhakka (2007)</td>
<td>Proactive search, competitive scanning, collective action</td>
<td>Survey of 107 new ventures in Finland</td>
<td>Proactive search and competitive scanning positively influenced the newness value of ventures.</td>
</tr>
<tr>
<td>Dyer et al. (2008)</td>
<td>Information search behavior of innovative entrepreneurs</td>
<td>Semi-structured interviews with 25 innovative entrepreneurs and 25 executives of large firms. Moreover, a sample of 512 participants from MBA programs were surveyed.</td>
<td>There are differences in search behavior or social networks. Innovative entrepreneurs are actively engaged in information search (e.g., through observation or interactions with the social network) to change the current state of affairs. They also showed distinct behaviors such as experimenting, questioning, observing and idea networking.</td>
</tr>
<tr>
<td>Fiet &amp; Patel (2008)</td>
<td>Systematic search, alertness</td>
<td>Experiment with 52 graduate students in entrepreneurship. They were either trained to search systematically by using consideration sets or instructed to stay alert to recognize opportunities.</td>
<td>Although alert students identified more ideas, the group that was trained to use systematic search generated more ideas with wealth-creating potential (fit, value, rarity and inimitability).</td>
</tr>
<tr>
<td>Iyer &amp; Miller (2008)</td>
<td>Problemistic search, slack search</td>
<td>8 case studies of Born Global firms in the biotech industry</td>
<td>Performance below aspiration level induces companies to conduct problemistic search. Slack search occurs when firms have excess resources that induce experimentation.</td>
</tr>
<tr>
<td>Nordman &amp; Melen (2008)</td>
<td>Proactive search</td>
<td>8 case studies of Born Global firms in the biotech industry</td>
<td>Discoveries of foreign market opportunities can be driven by proactive search behavior. They find that Born Industrials search somewhat proactively. In contrast, Born Academics discover opportunities somewhat by chance rather than because of planned activities.</td>
</tr>
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Table 7. (Continued)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Methodology</th>
<th>Description</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Dew (2009)</td>
<td>Systematic exploration, serendipitous discovery, spontaneous recognition, pre-discovery</td>
<td>Serendipity is a “search leading to unintended discovery” (p. 735). It is a function of the domain of search, prior knowledge and contingency. Systematic search is based on the purposeful search of knowledge corridors. Spontaneous recognition refers to a surprise. Pre-discovery is defined as the discovery of something, but there is a lack of knowledge to make an evaluation.</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Patel &amp; Fiet (2009)</td>
<td>Systematic search</td>
<td>The systematic search for opportunities is constrained to specific &quot;consideration sets&quot;. It results in more founding activities than alertness. Systematic search further improves the use of social capital and reduces the negative effect of environmental uncertainty on firm founding.</td>
<td>817 U.S. nascent entrepreneurs from PSED</td>
</tr>
<tr>
<td>Kirzner (2009)</td>
<td>Alertness</td>
<td>The term “alertness” and its link to the Schumpeterian opportunity and creativity are clarified. Kirzner (2009) highlights the notion that “we cannot deliberately search for something if we have no inkling of its very existence” (p. 151).</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Heinonen, Hytti, &amp; Stenholm (2011)</td>
<td>Proactive searching, competitive scanning</td>
<td>Creativity influences creative opportunity search strategies based on knowledge acquisition and the perceived viability of the business idea.</td>
<td>117 students are surveyed in a pre-program and post-program.</td>
</tr>
<tr>
<td>Kontinen &amp; Ojala (2011)</td>
<td>Active search, passive search, alertness</td>
<td>The authors observe that a high level of alertness led to the recognition of international opportunities through formal search.</td>
<td>Case studies of 8 family-owned SMEs</td>
</tr>
</tbody>
</table>
## Table 7. (Continued)

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Methodology</th>
<th>Search Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murphy (2011)</td>
<td>Conceptual</td>
<td>Deliberate search, serendipitous discovery</td>
<td>Murphy (2011) creates a 2x2 matrix and differentiates between deliberate search, legacy, eureka and serendipitous discovery. Deliberate search is characterized by a desire to discover an idea, systematic research activity. Serendipitous discovery is characterized by a desire to start a venture, surprised by discovery, the need for creative solutions and unexpected phenomena.</td>
</tr>
<tr>
<td>Patel &amp; Fiet (2011)</td>
<td>Conceptual</td>
<td>Systematic search</td>
<td>They propose that family firms identify more valuable opportunities than nonfamily firms. They reason that family firms are able to use greater economies of scope in combining diverse consideration sets. Moreover, they are better able to improve their search routines compared to nonfamily firms.</td>
</tr>
<tr>
<td>Tang, Kacmar, &amp; Busenitz (2012)</td>
<td>Conceptual</td>
<td>Alertness</td>
<td>The authors develop a scale of entrepreneurial alertness with three distinct elements, i.e., scanning and search, association and connection, and evaluation and judgment.</td>
</tr>
<tr>
<td>Fiet, Norton &amp; Clouse (2013)</td>
<td>Phenomenological</td>
<td>Systematic search</td>
<td>The authors find support for Fiet’s model of constrained, systematic search and develop propositions (e.g., the selection of specific information channels that provide the generation of low-cost signals to systematic search for venture ideas).</td>
</tr>
<tr>
<td>Gruber, MacMillan, &amp; Thompson (2013)</td>
<td>Conceptual</td>
<td>External search for market opportunities</td>
<td>The authors show that technological experience positively moderates the relationship between the breadth of external knowledge sourcing and the variety of market opportunities identified prior to market entry.</td>
</tr>
<tr>
<td>Marvel (2013)</td>
<td>Conceptual</td>
<td>Search-based discovery, alertness, systematic search</td>
<td>“Search-based discovery is defined as when the desire to start a venture precedes discovery, thus individuals search to find an appropriate opportunity” (2013: 403). He finds that professional experience and education are negatively related to search-based discovery. Entrepreneurs with professional experience and higher education discover them accidentally.</td>
</tr>
<tr>
<td>Study (Year)</td>
<td>Methodology</td>
<td>Findings</td>
<td>Sample Size</td>
</tr>
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<tr>
<td>Gielnik, Krämer, Kappel, &amp; Frese (2014)</td>
<td>Active information search</td>
<td>The authors find that active information search moderates the relationships between entrepreneurial experience and divergent thinking on opportunity identification.</td>
<td>100 business owners in South Africa</td>
</tr>
<tr>
<td>Weinzimmer &amp; Nystrom (2015)</td>
<td>Actively performed environmental scanning</td>
<td>The degree of search intensity is differentiated. Extreme cases of how small business owners search are outlined, and the model is applied to two cases.</td>
<td>Conceptual</td>
</tr>
</tbody>
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4. Why Do Entrepreneurs Search for Information on Opportunities the Ways They Do?

4.1. Abstract

Entrepreneurs employ different types of information search behavior to recognize promising opportunities. They search passively, proactively or systematically. Despite the importance of information search in opportunity recognition, we lack knowledge about why entrepreneurs search the way they do. Specifically, our knowledge is fragmented regarding two key drivers of entrepreneurial behavior, namely, regulatory focus theory and environmental dynamism, which both influence the mobilization of particular types of information search behavior. As a result, academic understanding of the role played by information search behaviors in entrepreneurship remains severely limited, making it difficult to provide practitioners with sound evidence-based recommendations. To address this research gap, we develop and test a model of the key antecedent drivers of different types of information search behavior. We found that entrepreneurs’ regulatory focus and environmental dynamism significantly impact their preferences for some types of search behavior.

4.2. Introduction

Entrepreneurial information search behavior helps explain how and why entrepreneurs recognize opportunities (Baron & Ensley, 2006; Fiet, Norton, & Clouse, 2013; Gaglio & Katz, 2001; Ozgen & Baron, 2007). It not only explains differences in opportunity recognition processes but also differences in the quality or quantity of recognized opportunities (e.g., DeTienne & Chandler, 2004; Fiet & Patel, 2008). The literature has acknowledged three main types of information search behavior: passive search, proactive search and systematic search (Tang, Kacmar, & Busenitz, 2012; van Gelderen, 2010).

Although entrepreneurship researchers are aware of important differences amongst information search behaviors regarding their beneficial or detrimental effects, studies considering why entrepreneurs have specific preferences for types of information search behavior are fragmented (e.g., Amato, Baron, Barbieri, Bélanger, & Pierro, 2016; Beal, 2006; Frese & Gielnik, 2014; McGee & Sawyerr, 2003). Past studies have focused mainly on outcomes of information search behaviors such as the number
(Patel & Fiet, 2009) or the tacitness and codification (Smith, Matthews, & Schenkel, 2009) of opportunities identified. However, studies investigating antecedent drivers of distinct information search behavior are limited (Tang, 2009). As a result, we as researchers do not provide entrepreneurs with enough information about important antecedents determining how entrepreneurs can influence, learn about or improve their information search behavior (DeTienne & Chandler, 2004; Fiet & Patel, 2008).

Studies show that cognition explains why some entrepreneurs process opportunity recognition differently (e.g., Baron, 2004). Self-regulation (regulatory focus theory) is a key cognitive factor (Higgins, 1998) and plays an important role in entrepreneurial behavior in general (Brockner, Higgins, & Low, 2004) and in determining how entrepreneurs recognize opportunities in particular (Tumasjan & Braun, 2012). Regulatory focus helps explain the entrepreneurial process and the question of why entrepreneurs behave the way they do (Brockner, Higgins, & Low, 2004; Higgins, 1998; Hmieleski & Baron, 2008; Kammerlander, Burger, Fust, & Fueglistaller, 2015). Researchers have begun to study how self-regulation impacts one particular information search type, such as proactive search (cf. Amato et al., 2016). However, there is no profound empirical evidence to our knowledge that explains how entrepreneurs’ regulatory focus impacts the entrepreneur’s preference to mobilize different types of information search behavior. Such insights are especially relevant, as entrepreneurs differ in the way they search, and their search behavior can change from one opportunity identification to the next (Krueger, Reilly, & Carsrud, 2000; Shrader & Hills, 2003).

Furthermore, the context determines whether and how entrepreneurs recognize opportunities (e.g., Ma, Huang, & Shenkar, 2011). Past research has shown that environmental dynamism significantly influences opportunity recognition processes (e.g., Casson & Wadeson, 2007; Tang et al., 2012). Although such findings led us to assume that environmental dynamism is related to information search behavior, there is a dearth of research investigating how different types of search behaviors are influenced by a fast-changing environment.

Our research question consequently addresses how the entrepreneur’s regulatory focus and environmental dynamism impact the preference for different information search behaviors. On these grounds, we conducted a survey with 128 owner-managers from medical technology companies.
We mainly contribute to entrepreneurship research in three ways. First, we contribute to regulatory focus theory by advancing research linking regulatory focus to opportunity recognition (e.g., Tumasjan & Braun, 2012). We show to what extent promotion and prevention foci affect the preference for types of information search behavior. We thereby advance entrepreneurial cognition research by outlining an important effect of regulatory focus in entrepreneurship research.

Second, our results provide further clarification about the ongoing debate of why some individuals recognize opportunities while others do not (George et al., 2016; Hsieh & Kelley, 2016; Shane & Nicolaou, 2015; Vandor & Franke, 2016). Moreover, our research builds on existing studies (e.g., Baron, 2006) trying to unfold the entrepreneurial process, and it helps to explain differences among individual types of entrepreneurial opportunity recognition processes.

Third, we provide a more advanced explanation of why entrepreneurs search for information the way they do. Along with different regulatory foci, we show how environmental conditions influence the entrepreneur’s preference for particular information search behaviors. We thereby advance research about how external factors such as characteristics of the environment affect opportunity recognition processes (cf. Gaglio & Katz, 2011).

Furthermore, our research supports entrepreneurs in their daily business. We provide them with key insights into how to optimize their individual information search behavior for opportunity recognition. Entrepreneurial education can likewise benefit, as courses could draw entrepreneurs’ attention towards their regulatory foci and their potential impact on entrepreneurial behavior, especially within the context of opportunity recognition.

4.3. Theoretical Foundations and Hypotheses
4.3.1. Regulatory Focus and Opportunity Recognition
Past studies have thoroughly examined factors influencing opportunity recognition processes (e.g., George et al., 2016). For example, prior knowledge (e.g., Ardichvili et al., 2003), social capital (Aldrich & Cliff, 2003) and social networks (García-Cabrera, & García-Soto, 2009) influence opportunity recognition.
Recently, scholars have found that cognition – and, more specifically, self-regulation – influences the core process of opportunity recognition (Ardichvili, Cardozo, & Ray, 2003; Gaglio & Katz, 2001; Grégoire, Barr, & Shepherd, 2010; Li, Maggitti, Smith, Tesluk, & Katila, 2013; Miao & Liu, 2010; Tumasjan & Braun, 2012; Zahra, Yavuz, & Ucbasaran, 2006). Self-regulation and, thus, regulatory focus theory therefore address a particularly fruitful avenue to study why entrepreneurs behave the way they do (Brockner et al., 2004; Kammerlander et al., 2015).

Regulatory focus theory is concerned with personal goal orientation (Higgins, 1997). It builds upon the hedonic principle that individuals seek pleasure and avoid pain (Crowe & Higgins, 1997; Higgins, 2000). It contrasts two foci of self-regulation: promotion and prevention focus (Higgins, 1997). Various empirical studies propose that people differ in their choice of adopting a promotion or prevention focus (e.g., Higgins & Silberman, 1998; Kammerlander et al., 2015). Individuals with high promotion focus are concerned with advancement, growth, and accomplishment (Brockner et al., 2004). On the other hand, persons with a high prevention focus intent to look for responsibility and safety (Brockner et al., 2004). When promotion focused, individuals rely on approach strategies, whereas prevention focus is associated with avoidance strategies (Wang & Lee, 2006). Entrepreneurs are sensitive to their principal regulatory focus, and they seek strategies that correspond to their regulatory state (Higgins, 2000).

According to signal detection theory (Tanner & Swets, 1954), individuals adopting a high promotion focus try to accomplish “hits” and avoid errors of omission (“miss”) (Brockner et al., 2004). Individuals with high prevention focus try to attain “correct rejections” and avoid “false alarms” (Crowe & Higgins, 1997) (see Figure 4).

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Promotion Focus</th>
<th>Prevention Focus</th>
</tr>
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<tbody>
<tr>
<td>Entrepreneur</td>
<td>exists</td>
<td>does not exist</td>
</tr>
<tr>
<td>identifies opportunity</td>
<td>«hit» (attain)</td>
<td>«false alarm» (avoid)</td>
</tr>
<tr>
<td>does not identify opportunity</td>
<td>«miss» (avoid)</td>
<td>«correct rejection» (attain)</td>
</tr>
</tbody>
</table>

**Figure 4.** Regulatory Focus in the Context of Opportunity Recognition

Sources: Adapted from Tang (2009)
Researchers apply this logic to opportunity recognition theory (cf. Tang, 2009) and show how entrepreneurs’ regulatory focus impacts entrepreneurial opportunity recognition (Tumasjan & Braun, 2012). Four strategic inclinations can be differentiated that illustrate what individuals with different regulatory foci try to accomplish (Crowe & Higgins, 1997; Tang, 2009). In this case, a (1) “hit” would constitute a situation where an entrepreneur recognizes an opportunity that exists. In case of a (2) “miss”, the entrepreneur does not act upon a potential promising opportunity, only to find out that the opportunity did exist. When an entrepreneur decides to pursue what he thinks is a promising opportunity only to find out he was mistaken, we call it a (3) “false alarm”. (4) “Correct rejections” occur when individuals correctly conclude that an opportunity is not present when it is indeed absent (cf. Baron, 2002).

4.3.2. Regulatory Focus and Entrepreneurial Information Search Behavior

Previous research has provided preliminary indications that regulatory focus influences entrepreneurial information search behavior (e.g., Brockner et al., 2004; Tumasjan & Braun, 2012). Studies show that regulatory focus acts as a filter to process information and that it influences the information search behavior of individuals (Wang & Lee, 2006). More specifically, individuals prefer to search for information that fits their regulatory goals (Wang & Lee, 2006). Different types of information search behavior entail diverse perceived risks and search outcomes (cf. Fiet, 2007; Förster, Higgins, & Bianco, 2003; Patel & Fiet, 2009). The regulatory focus of individuals is especially dependent on their attitude towards risks and goals (Brockner et al., 2004). This suggests that individuals’ regulatory focus is likely to influence their preference for different types of information search behavior. Pech and Cameron (2006: 61) state that entrepreneurs “persistently and continually seek opportunity-laden information in order to satisfy internal motivators such as need for achievement and the fulfilment of competitive urges”. This statement indicates that information search behavior could be the “missing link” explaining the interplay between goal orientation (i.e., regulatory focus) and opportunity recognition.

Extant literature differentiates among various information search behaviors (Bhave, 1994; Dahlqvist, Chandler, & Davidsson, 2004; Fiet et al., 2013; Murphy,
Despite the different terms used, there are three aspects of search behavior that act as common denominators, namely, systematization, scope and intentionality (DeTienne & Chandler, 2004; Fiet, 2002). Based on our literature review, we can differentiate three types of information search behavior: passive, proactive and systematic search.

First, *passive search* is unintentional and lacks the clear goal of recognizing opportunities (DeTienne & Chandler, 2004; Patel & Fiet, 2009). The entrepreneur is not searching for information for the purpose of discovering a potential venture idea. Scholars refer to such unintended search with terms like fortuitous, accidental discovery and entrepreneurial alertness (Ardichvili et al., 2003; DeTienne & Chandler, 2004; Kirzner, 1997; Shah & Tripsas, 2007). Alert entrepreneurs combine new information with their prior knowledge and experience (Kirzner, 1997; Shane, 2000). In Kirzner’s (2009: 151) words, alertness is “the sense to notice that which has hitherto not been suspected of existing at all”. Entrepreneurial alertness corresponds to a high awareness of relevant information.

Second, *proactive search* refers to an intended search that is unfocused in scope (Chandler et al., 2003; Dahlqvist, Chandler, & Davidsson, 2004). An entrepreneur’s search intention often stems from the desire to discover a new opportunity (Bhave, 1994; Murphy, 2011). Frese (2009) even states that entrepreneurs constantly search proactively for opportunities without specific reasons. Proactive search generates information that is available for entrepreneurial information processing (Frese & Gielnik, 2014).

Third, *systematic search* refers to information search behavior constrained by the entrepreneur’s prior knowledge (Fiet, 2007). Systematic search is more focused compared to proactive search, as entrepreneurs narrow their search to the most fruitful information channels (referred to as consideration sets, Fiet, 2007). By observing serial entrepreneurs, Fiet (2002) shows that participants maximized the return from information search and reduced the search costs by using the most promising information channels. Thus, systematic search is a more formal and structured way of information search to recognize opportunities.
4.3.3. Promotion Focus and Entrepreneurial Information Search Behavior

Idson et al. (2000; 2004) argue that people feel more positive (“feeling right”) and motivated if they pursue a goal that fits their regulatory state. Specifically, promotion-focused individuals are more inclined to seek information about the absence or presence of positive outcomes that address promotion concerns (Aaker & Lee, 2001; Lee & Aaker, 2004 in Wang & Lee, 2006).

We argue that entrepreneurs with a high promotion focus have a weaker preference to search passively because of the regulatory misfit. Under passive search, the entrepreneur stays alert for new information signals while not intentionally attempting to recognize opportunities (DeTienne & Chandler, 2004). The risk of missing “hits” is present for a passively searching entrepreneur. There is empirical evidence of such a risk. For example, Patel and Fiet (2009) demonstrated that individuals using alertness as a form of passive search founded fewer firms than those conducting systematic search. Consequently, entrepreneurs with high promotion focus risk missing promising entrepreneurial opportunities. However, this condition is not in line with their desired goals and aspirations. Entrepreneurs with a high promotion focus strive for gains and intend to avoid errors of omission (Brockner et al., 2004; McMullen & Shepherd, 2004; Piperopoulos & Dimov, 2015). Entrepreneurs with high promotion focus prefer intentional search so they do not miss relevant information for opportunity recognition. Such an intentional information search matches their regulatory fit. Thus, we hypothesize the following:

H1a: Entrepreneurs’ levels of promotion focus will negatively influence their preference for passive search.

Second, proactive search for opportunities increases the likelihood of recognizing an entrepreneurial opportunity (Baron, 2004; Tang, 2009). The initiative to search proactively for information comes from the entrepreneur himself. There is no need for a specific problem to initiate the search (Chandler, DeTienne, & Lyon, 2003). The potential reward of identifying opportunities (i.e., attaining “hits”) through proactive search involves higher costs (Fiet, 2007) and potentially higher degrees of uncertainty and risk. Promotion-focused people are often risk-seekers (Gino & Margolis, 2011) as they have an inclination to say “yes” (i.e., a risky bias) while deciding whether an opportunity exists or not (Crowe & Higgins, 1997). These arguments make it likely that proactive search behavior is preferred by entrepreneurs with a high promotion...
focus. Proactive information search is characterized by a wide search scope that can lead to a higher diversity of information found (cf. Chandler et al., 2003; Dahlqvist, Chandler, & Davidsson, 2004). Moreover, promotion-focused entrepreneurs tend to apply a wide search scope (Baron, 2004), as they are eager to search for opportunities in foreign knowledge domains (cf. Pham & Chang, 2010). Hence, we hypothesize:

\[ H1b: \text{Entrepreneurs’ levels of promotion focus will positively influence their preference for proactive search.} \]

Third, there are two lines of argument regarding whether entrepreneurs with a high promotion focus prefer to search systematically. First, promotion-focused entrepreneurs are more likely to pursue information signals regarding opportunities, seeing their potential (McMullen & Shepherd, 2004; Piperopoulos & Dimov, 2015). Such entrepreneurs tend to value information related to the recognition of opportunities, as they represent “gains” (Brockner et al., 2004). Thus, they aim to find pieces of information with as much value as possible for opportunity recognition. Fiet et al. (2005) demonstrated that the likelihood of recognizing opportunities is high when searching systematically, making systematic search highly effective. Because entrepreneurs with high promotion focus try to strive for gains and “hits” (Brockner et al., 2004; Fiet et al., 2013), they tend to search systematically to achieve these goals.

Second, despite the efficiency of systematic search, there might be detrimental effects from the perspective of an entrepreneur with a high promotion focus. Systematic search constrains the entrepreneur’s search to specific information channels (Patel & Fiet, 2011). This makes it likely that searching entrepreneurs will miss valuable pieces of information for opportunity recognition that lie outside their search scope or consideration set (cf. Cliff et al., 2006). Such “errors of omission” thwart the goals of entrepreneurs with a high promotion focus (Brockner et al., 2004).

However, the entrepreneur himself can decide to what extent he restricts his search scope. Moreover, the primary objective of an individual with a high promotion focus is to identify opportunities and attain “hits” (Brockner et al., 2004). Hence, we argue that the gains related to systematic search outweigh the concomitant risk of “errors of omission”. Consequently, we posit that entrepreneurs with a high promotion focus prefer to search systematically compared to entrepreneurs with a low promotion focus.
**H1c: Entrepreneurs’ levels of promotion focus will positively influence their preference for systematic search.**

### 4.3.4. Prevention Focus and Entrepreneurial Information Search Behavior

Prevention-focused people are inclined to notice information about the avoidance of negative outcomes and losses (Lockwood, Jordan, & Kunda, 2002). This corresponds to the results of Sassenberg et al. (2015), who showed that individuals with high prevention focus are more attentive to negative than positive wording. In general, prevention focus is less prevalent regarding the search and identification of opportunities compared to promotion focus (Brockner et al., 2004). Based on these arguments, we assume that entrepreneurs with high prevention focus search differently compared to those with low prevention focus.

First, we propose that prevention focus is positively related to passive search for two main reasons. Passive information search (as a type of informal search) can be seen as cost effective, as no additional resources or larger investments are required beyond the entrepreneur’s daily activities (cf. Weber & Mahringer, 2008). Searching passively can be described as a routine or the maintenance of a state of entrepreneurial alertness that comes with other entrepreneurial tasks not necessarily for the purpose of information search for opportunity recognition (cf. Huber, 1991). Consequently, passive search is not perceived to involve high risks, as the entrepreneur is following his daily routine. Prevention-focused entrepreneurs are risk averse (Higgins, 2002) and feel more positive about executing tasks that fit their regulatory state (Idson et al., 2000), such as passive search.

On the other hand, one could argue that entrepreneurs with a high prevention focus might not search for information at all (McMullen & Shepherd 2004, Piperopoulos & Dimov, 2015). However, although it implies risk aversion, prevention focus does not discourage individuals from engaging in achieving minimal goals (cf. Idson et al., 2000). Such minimal goals can consist of activities to search for solutions to problems, as “non-search” could potentially correspond to making a mistake (Kammerlander et al., 2015). In certain situations, it might be reasonable for entrepreneurs to recognize opportunities for long-term firm survival. This would require entrepreneurs to conduct some form of opportunity recognition to not risk a loss and make a mistake. Such a “minimal” required information search can be conducted by searching passively.
These circumstances should make it more likely for people with high prevention focus to search passively. This leads to the following hypothesis:

H2a: Entrepreneurs’ levels of prevention focus will positively influence their preference for passive search.

Second, proactive search is associated with undeterminable outcomes and strong risk and uncertainty (Dahlqvist et al., 2004). There is no certainty of recognizing entrepreneurial opportunities by proactive search despite the costs of the search. Proactive search and entrepreneurial activity are closely related to beating the competition, shaping the environment and trying to innovate (Wang, 2008). Such goals can only be achieved by individuals with strong tolerance for risk. However, prevention-focused entrepreneurs are risk averse and attempt to avoid uncertainty (Zhou & Pham, 2004). They disapprove of the high diversity and ambiguity of information (cf. Zhu & Meyers-Levy, 2007) acquired through proactive search, as it thwarts their regulatory goals.

Moreover, proactive search increases the likelihood of “false alarms” (Baron, 2004). As a consequence of the broad search scope, proactively searching entrepreneurs acquire various information about potential opportunities (cf. Ucbasaran et al., 2003). However, not all information necessarily leads to the recognition of relevant and feasible opportunities. As a result, entrepreneurs with a high prevention focus avoid searching proactively, as it entails not only high search costs but also high risks of making wrong decisions and facing “false alarms”.

H2b: Entrepreneurs’ levels of prevention focus will negatively influence their preference for proactive search.

Third, there are two conflicting theoretical arguments regarding prevention focus and systematic search. On the one hand, systematic search is characterized by lower search costs and more-effective opportunity recognition (Fiet & Patel, 2008). It could be argued that entrepreneurs with high prevention focus prefer to constrain their search to known knowledge domains, as this helps them avoid mistakes (cf. Pham & Chang, 2010). These arguments speak in favor of a positive relation between the adoption of a prevention focus and systematic search.

On the other hand, it is even more likely that entrepreneurs will entirely avoid searching systematically, because the use of consideration sets reduces but does not
eliminate the risk of “false alarms”. Not all opportunities recognized will turn out to be feasible. Moreover, the correct selection of appropriate information channels during systematic search involves significant risks as well (Fiet et al., 2005). Although such information channels are selected based on the entrepreneurs’ prior knowledge (Fiet, Norton, & Clouse, 2007), there is no certainty that they are useful in future opportunity recognition processes. Entrepreneurs with a high prevention focus disapprove of situations of uncertainty and potential failure that prevail within the context of systematic search, as they create negative emotions (Idson et al., 2000). Thus, it is more likely that they will decide against searching systematically because of a misfit of their regulatory state. This leads us to the following hypothesis:

**H2c**: Entrepreneurs’ levels of prevention focus will negatively influence their preference for systematic search.

### 4.3.5. Environmental Dynamism and Information Search Behavior

Environmental dynamism is an important contextual factor in entrepreneurship research (Covin & Slevin, 1991). It is characterized by unpredictable, disruptive and rapid changes in consumer preferences and producers’ offerings (Eisenhardt & Martin, 2000; Miller, 1988; Wijbenga & van Witteloostuijn, 2007). Environmental dynamism is a key driver of venture creation and significantly pertains to entrepreneurs (cf. Baron & Tang, 2011). Changes in the environment, such as altered laws, customer needs, technological progress or other exogenous shocks, are the source of new entrepreneurial opportunities (Shane, 2003; Webb, Ireland, Hitt, Kistruck, & Tihanyi, 2011). In other words, environmental change creates opportunities (George et al., 2016).

Such changes in the environment influence the information search processes of entrepreneurs. Because information is limited, increasing environmental change goes along with greater uncertainty and greater information-processing requirements (Duncan, 1972; Tushman, 1979). Perceived uncertainty by entrepreneurs, which is inherent in dynamic markets, triggers information search behavior (McGee & Sawyerr, 2003; Sine & David, 2003). Consequently, opportunity recognition requires interpreting such environmental changes with regard to competition, timing or customer needs (Cooper, 1981; Puhakka, 2007). In other words, entrepreneurs facing environmental dynamism do not accept the change but try to take advantage of it by
searching for promising opportunities (cf. Peterson, 1985). Thus, information search is necessary to make sense of environmental changes and to act upon them for long-term survival (Bulow, Geanakoplos, Klemperer, & Bulow, 1985; McGee & Sawyerr, 2003). We propose that environmental dynamism is associated with entrepreneurs’ search for information.

When entrepreneurs are in the **passive search** mode, they are “receptive, though not engaged in a formal, systematic search process” (Ardichvili et al., 2003: 115). With regard to passive search, entrepreneurs are increasingly receptive or sensitive to environmental change while operating at a consciously heightened state (DeTienne & Chandler, 2004). Passively searching entrepreneurs are especially cognizant of their extant environment and are able to “connect the dots” and perceive important changes before others (cf. Baron, 2006; Kirzner, 1997; Weinzimmer et al., 2015). Gaglio and Katz (2001) even argue that unexpected changes in the environment can foster the recognition of innovative opportunities by alert entrepreneurs. The concept of alert entrepreneurs scanning the environment is closely related to that of passive information search (Baron, 2006). Thus, we propose the following:

*H3a: There is a positive relationship between environmental dynamism and the preference for passive entrepreneurial information search behavior.*

Entrepreneurs **search proactively** for opportunities based on the future and not on what has happened (Hills, 1995). They proactively anticipate and react to environmental change. Highly dynamic contexts create ambiguous industry structures with blurred boundaries (Eisenhardt & Martin, 2000). On the one hand, such contexts entail a variety of entrepreneurial opportunities (Shane, 2003; Webb et al., 2011). On the other hand, such change creates environmentally generated pressures that demand entrepreneurial activity. These environmentally generated pressures lead to proactive entrepreneurial action (cf. Baron & Tang, 2011), as entrepreneurs are forced to create new knowledge (Eisenhardt & Martin, 2000). Environmental change and the associated uncertainty involve proactive search for opportunities (Puhakka, 2007). Hence, we propose the following:

*H3b: There is a positive relationship between environmental dynamism and the preference for proactive entrepreneurial information search behavior.*
When facing rapid environmental change, effective decision makers maintain sophisticated information search behavior (Puhakka, 2007). Systematic search could be labeled “sophisticated”, as it is based on prior knowledge and the choice of unique information channels (Fiet et al., 2005; 1996). Patel and Fiet (2009) argue that systematic search indirectly reduces the negative impact of environmental uncertainty. Moreover, entrepreneurs might be tempted to search systematically to minimize the risk of investing in, for example, wrong technological trajectories or remaining with an obsolete technology in the future (e.g., Christensen & Bower, 1996; König, Kammerlander, & Enders, 2013). This implies that entrepreneurs tend to search systematically in highly dynamic environments to reduce corresponding uncertainty and risk.

**H3c:** There is a positive relationship between environmental dynamism and the preference for systematic entrepreneurial information search behavior.

**Figure 5.** Integrative Model

### 4.4. Method

#### 4.4.1. Sample and Data Collection

The theoretical model was tested with an e-mail survey that was undertaken in 2015 and conducted with owner-managers from medical technology companies. We carried out interviews with owner-managers from medical technology companies who confirmed that they themselves are mainly responsible for opportunity search in their
respective companies. Thereby, we followed a key information approach (cf. Kumar et al., 1993) by questioning the owner-managers about their information search behavior for opportunity recognition. The survey was focused on small and medium-sized firms (SMEs) with less than 250 employees from Germany, Austria and Switzerland. We obtained the e-mail addresses of 17,044 companies operating in the medical technology industry from the ORBIS database. Our analyses were restricted to questionnaires that received answers for all required items (cf. Sieger & Monsen, 2015). The final quantitative sample consisted of 128 owner-managers who provided usable answers. The response rate is comparable to other studies conducting e-mail surveys in an entrepreneurial context (cf. Dehlen et al., 2014). The Harman’s one factor test confirmed that our data was not suffering from common method bias issues (Schriesheim, 1979). Moreover, we found no indication of non-response bias as we compared the responses of late and early respondents (cf. Dehlen et al., 2014).

<table>
<thead>
<tr>
<th>Sample Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of survey participants (^1)</td>
</tr>
<tr>
<td>CEO age (years)</td>
</tr>
<tr>
<td>CEO gender</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Firm size</td>
</tr>
<tr>
<td>0-9 employees</td>
</tr>
<tr>
<td>10-49 employees</td>
</tr>
<tr>
<td>50-249 employees</td>
</tr>
<tr>
<td>Mean of employees</td>
</tr>
<tr>
<td>Firm age (years)</td>
</tr>
</tbody>
</table>

\(^1\) All participants are owner-managers from medical technology companies.

4.4.2. Dependent Variables

The dependent variables in the names of passive (alpha = .62), proactive (alpha = .72) and systematic search (alpha = .75) were measured with an 11-item scale (see appendix). To answer the questionnaire, the respondents were asked to think about their last recognized opportunity. The participants could provide their answers on a
Likert-type scale ranging from 1 (“does not apply at all”) to 5 (“fully applies”). The obtained Cronbach's alpha of .62 for passive search seems low. However, for exploratory studies, alpha values greater than .60 are seen as sufficient by various scholars (Hair, Anderson, Tatham, & Black, 1998; Robinson, Shaver, & Wrightsman, 1991). We also ran additional robustness checks. We conducted calculations with (a) all five items, (b) only four items and (c) only three items of the passive search scale (cf. Kammerlander et al., 2015). We correlated the passive search measure (a) and its altered versions (b, c) with three different constructs (proactive search, systematic search, environmental dynamism). As a result, we found that the effects remained stable regarding their direction, significance and magnitude. This provides further evidence that the passive search measure exhibits adequate reliability.

Table 9. Robustness Test for Passive Search Scale

<table>
<thead>
<tr>
<th></th>
<th>Proactive search</th>
<th>Systematic search</th>
<th>Environmental dynamism</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Passive search (5 items)</td>
<td>.202 (.022)</td>
<td>.283 (.001)</td>
<td>.249 (.005)</td>
</tr>
<tr>
<td>(b) Passive search (4 items)</td>
<td>.227 (.010)</td>
<td>.243 (.006)</td>
<td>.225 (.011)</td>
</tr>
<tr>
<td>(c) Passive search (3 items)</td>
<td>.240 (.006)</td>
<td>.236 (.007)</td>
<td>.285 (.001)</td>
</tr>
</tbody>
</table>

Note. Pearson correlations are reported (p-values are shown in parentheses).

4.4.3. Independent Variables

Both promotion (alpha = .75) and prevention focus (alpha = .75) were measured with the regulatory focus questionnaire (RFQ) (Higgins et al., 2001) (see appendix). The RFQ has been used in an entrepreneurial context before (Bryant, 2009; Kammerlander et al., 2015). Although different instruments exist to measure individuals’ chronic regulatory focus, the RFQ is considered the most adequate and frequently used (Haws et al., 2010; Kammerlander et al., 2015). An exploratory factor analysis revealed that one item of the promotion focus scale loaded on a non-intended factor and was hence removed from the analysis.

Environmental dynamism (alpha = .72) was measured with a 5-item scale used by Jansen et al. (2006) (see appendix). It captures how individuals perceive the rate of change in their environment (cf. Jansen et al., 2006). We conducted a translation-back-
translation (e.g., Dickson, Weaver, & Hoy, 2006) to convert the initial questionnaires from English to German and to ensure accuracy and understandability (Kammerlander et al., 2015).

4.4.4. Control Variables
We controlled for several variables that previous studies associated with entrepreneurial information search behavior (e.g., Tang et al., 2012). *Firm size* is a commonly used control variable within the context of information search behavior (e.g., Tang et al., 2012). Firm size defines the firm’s resource bases (Stam & Elfring, 2008). Various researchers have noted that resource constraints affect entrepreneurial information search behavior (Matthews & Scott, 1995; Mohan-Neill, 1995; Shrader, Mulford, & Blackburn, 1989). Moreover, firm size potentially affects opportunity recognition (Gielnik, Zacher, & Frese, 2012). Hence, we controlled for firm size. Past findings suggest that gender impacts opportunity recognition processes (Ozgen & Sanderson, 2006). We controlled for *CEO gender* (coded 1 = female, 2 = male). It can be assumed that older CEOs prefer to exploit existing opportunities, neglecting the search for new ones (Kammerlander et al., 2015). Furthermore, older CEOs might search differently due to their substantial prior knowledge (cf. Fiet et al., 2013). We measured *CEO age* by requesting the CEO’s year of birth.

4.5. Results
4.5.1. Descriptive Data
The descriptive statistics for all variables used are included in Table 10. The two regulatory foci are only slightly correlated, which is in accordance with past research (cf. Higgins et al., 2001; Kammerlander et al., 2015). The different types of information search behavior correlate strongly and significantly with each other in some parts. This can be expected, as the types of information search are not mutually exclusive but complementary (Tang & Khan, 2007; van Gelderen, 2013).
### Table 10. Means, Standard Deviations, Pearson Correlations

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Passive search</td>
<td>2.14</td>
<td>.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Proactive search</td>
<td>3.37</td>
<td>1.03</td>
<td>.202</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Systematic search</td>
<td>2.19</td>
<td>1.12</td>
<td>.283</td>
<td>.395</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Promotion focus</td>
<td>4.15</td>
<td>.51</td>
<td>.129</td>
<td>.214</td>
<td>.076</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Prevention focus</td>
<td>2.93</td>
<td>.77</td>
<td>-.246</td>
<td>-.039</td>
<td>-.141</td>
<td>-.062</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Environmental dynamism</td>
<td>4.37</td>
<td>1.23</td>
<td>.249</td>
<td>.421</td>
<td>.246</td>
<td>.148</td>
<td>-.158</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 CEO age</td>
<td>55.94</td>
<td>9.91</td>
<td>.054</td>
<td>.147</td>
<td>.145</td>
<td>.130</td>
<td>.135</td>
<td>.076</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 CEO gender</td>
<td>1.88</td>
<td>3.20</td>
<td>-.210</td>
<td>.023</td>
<td>.236</td>
<td>-.172</td>
<td>.119</td>
<td>.089</td>
<td>.188</td>
<td></td>
</tr>
<tr>
<td>9 Firm size (employees)</td>
<td>19.92</td>
<td>33.19</td>
<td>.003</td>
<td>-.002</td>
<td>-.100</td>
<td>.134</td>
<td>-.103</td>
<td>.134</td>
<td>.065</td>
<td>-.019</td>
</tr>
</tbody>
</table>

N = 128; * p < .05; ** p < .01; *** p < .001
4.5.2. Regression Models

We employed ordinary least squares (OLS) regression models to test our hypotheses. We calculated the regression analysis with unstandardized regression coefficients. In a first step, we conducted different regression diagnostics to confirm that our data met key assumptions of OLS (cf. Hair, Black, Babin, & Anderson, 2010; Kammerlander et al., 2015). Our data did not suffer from multicollinearity, as all variance inflation factors (VIFs) were below 1.2 and, hence, were below the threshold of 10 (Hair et al., 2010). The Durbin-Watson test showed results close to 2, indicating that autocorrelation is not an issue (cf. Tabachnick & Fidell, 2007).

4.5.3. Regression Results

Models 2, 4 and 6 include the independent variables, namely, promotion focus, prevention focus and environmental dynamism, respectively. In models 1, 3 and 5, only the control variables are included. Models 2, 4 and 6 are all significant, with an $R^2$ of substantial magnitude. The values of the adjusted $R^2$ indicate a superior model fit compared to models 1, 3 and 5.

Table 11. Regression Models of Information Search Behaviors

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1-2: Passive search</th>
<th>Model 3-4: Proactive search</th>
<th>Model 5-6: Systematic search</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO age</td>
<td>.009</td>
<td>.009</td>
<td>.010</td>
</tr>
<tr>
<td>CEO gender</td>
<td>-.590*</td>
<td>.153</td>
<td>.819*</td>
</tr>
<tr>
<td>Firm size</td>
<td>.000</td>
<td>-.001</td>
<td>-.003</td>
</tr>
<tr>
<td>Promotion focus</td>
<td></td>
<td>.368*</td>
<td>.155</td>
</tr>
<tr>
<td>Prevention focus</td>
<td>-.148</td>
<td>-.15</td>
<td>-.332*</td>
</tr>
<tr>
<td>Environmental dynamism</td>
<td>.125*</td>
<td>.300***</td>
<td>.172†</td>
</tr>
<tr>
<td>$F$</td>
<td>1.988</td>
<td>.465</td>
<td>2.522†</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.057</td>
<td>.014</td>
<td>.071</td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>.028</td>
<td>-.016</td>
<td>.043</td>
</tr>
</tbody>
</table>

$N = 128$; † p < .10; * p < .05; ** p < .01; *** p < .001
Overall, we found support for our hypotheses. In support of H1b, we obtained significant evidence that the entrepreneur’s level of promotion focus has a positive and significant ($\beta = .37$, $p < .05$) effect on proactive search. In the cases of passive and systematic search, the effects are positive though not significant. Therefore, we found no support for hypotheses H1a or H1c. Moreover, we provide evidence that the entrepreneur’s levels of prevention focus are negatively and significantly ($\beta = -.33$, $p < .05$) related to systematic search, which is consistent with H2c. The effect direction concerning passive and proactive search is negative but not significant, so hypotheses H2a and H2b were not supported.

Environmental dynamism is significantly and positively related to passive search ($\beta = .13$, $p < .05$) and proactive search ($\beta = .30$, $p < .001$). A positive and marginally significant effect can be determined regarding systematic search ($\beta = .17$, $p < .10$). These results support hypotheses H3a, H3b and H3c. We conducted additional robustness tests, such as bootstrapping (cf. Bacharach et al., 2005), to scrutinize our findings and account for our limited sample size.

4.5.4. Post Hoc Test

To scrutinize the significant effects found regarding H1b and H2c, we examined “different combinations of promotion and prevention focus” within the context of proactive and systematic search (Kammerlander et al., 2015: 597; Lanaj et al., 2012). A similar analysis has been performed by Kammerlander et al. (2015). We formed four differing clusters by using a median split approach (cf. Krueger, 1993). The clusters were denominated according to the four personalities offered by Markovits (2012): “achiever” (high promotion focus and low prevention focus), “rationalist” (high promotion focus and high prevention focus), “indifferent” (low promotion focus and low prevention focus), and “conservative” (low promotion focus and high prevention focus). Afterwards, we estimated the mean values of proactive and systematic search for each cluster and used contrast analysis to test for significant differences (cf. Kammerlander et al., 2015).
Table 12. Contrast Tests: Proactive Search

<table>
<thead>
<tr>
<th>Group (mean value)</th>
<th>Contrast value</th>
<th>SD</th>
<th>T</th>
<th>Significance (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achiever (3.59) - Rationalist (3.50)</td>
<td>.095</td>
<td>.25</td>
<td>.381</td>
<td>.704</td>
</tr>
<tr>
<td>Achiever (3.59) - Indifferent (3.26)</td>
<td>.335</td>
<td>.26</td>
<td>1.285</td>
<td>.201</td>
</tr>
<tr>
<td>Achiever (3.59) - Conservative (3.07)</td>
<td>.521</td>
<td>.24</td>
<td>2.153</td>
<td>.033</td>
</tr>
<tr>
<td>Rationalist (3.50) - Indifferent (3.26)</td>
<td>.24</td>
<td>.27</td>
<td>.887</td>
<td>.377</td>
</tr>
<tr>
<td>Rationalist (3.50) - Conservative (3.07)</td>
<td>.427</td>
<td>.25</td>
<td>1.686</td>
<td>.094</td>
</tr>
<tr>
<td>Indifferent (3.26) - Conservative (3.07)</td>
<td>.186</td>
<td>.27</td>
<td>.701</td>
<td>.484</td>
</tr>
</tbody>
</table>

In terms of proactive search, the results indicate that promotion focus dominates prevention focus, as the preference for proactive search is the highest in the case of “achievers” (mean = 3.59) and the lowest regarding “conservatives” (mean = 3.07). Significant differences were found between “achievers” and “conservatives” (p = .033). The results support hypothesis H1b.

The preference for systematic search is the lowest for “conservatives” (mean = 1.97) and “rationalists” (mean = 2.10). It is considerably higher for “achievers” (mean = 2.35) and “indifferents” (mean = 2.35). The contrast analysis did not reveal any significant differences among the groups. Nonetheless, the results conform to hypothesis H2c.

Table 13. Contrast Tests: Systematic Search

<table>
<thead>
<tr>
<th>Group (mean value)</th>
<th>Contrast value</th>
<th>SD</th>
<th>T</th>
<th>Significance (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achiever (2.35) - Rationalist (2.10)</td>
<td>.255</td>
<td>.27</td>
<td>.935</td>
<td>.352</td>
</tr>
<tr>
<td>Achiever (2.35) - Indifferent (2.35)</td>
<td>.005</td>
<td>.29</td>
<td>.018</td>
<td>.986</td>
</tr>
<tr>
<td>Achiever (2.35) - Conservative (1.97)</td>
<td>.381</td>
<td>.27</td>
<td>1.434</td>
<td>.154</td>
</tr>
<tr>
<td>Rationalist (2.10) - Indifferent (2.35)</td>
<td>-.249</td>
<td>.30</td>
<td>-.839</td>
<td>.403</td>
</tr>
<tr>
<td>Rationalist (2.10) - Conservative (1.97)</td>
<td>.126</td>
<td>.28</td>
<td>.454</td>
<td>.650</td>
</tr>
<tr>
<td>Indifferent (2.35) - Conservative (1.97)</td>
<td>.376</td>
<td>.29</td>
<td>1.289</td>
<td>.200</td>
</tr>
</tbody>
</table>
4.6. Conclusion and Discussion

We found evidence that promotion focus positively impacts the preference for proactive search, which adds to previous research findings (e.g., Hmieleski & Baron, 2008; Tumasjan & Braun, 2012). This seems very plausible, as an individual with high promotion focus strives for advancement and growth, and proactive search enables
him to actively search for new promising opportunities (i.e., attaining “hits”). No significant effects were found for passive and systematic search within the context of promotion focus. A possible explanation for the non-significant effect for systematic search is that promotion-focused entrepreneurs are torn, as the idea of systematic search promises outcomes that are in accordance with their regulatory goals and outcomes that thwart such goals.

In terms of their direction, all effects regarding prevention focus are negative, though only significant in the case of systematic search. The results thereby provide some preliminary evidence that prevention-focused entrepreneurs are less likely to conduct any type of information search for opportunities. This evidence is consistent with previous research (cf. Baron, 2002; Tumasjan & Braun, 2012; Wu et al., 2008). A negative relation between prevention focus and passive search seems plausible, as passive search also goes along with risk and uncertainty due to its unspecific nature (Fiet et al., 2005). Furthermore, existing research has found that prevention-focused entrepreneurs generally engage less in exploration activities, as they tend to neglect opportunity-related information signals (Kammerlander et al., 2015; Trevelyan, 2008; McMullen & Shepherd, 2004). This is because “information seeking can increase uncertainty by increasing the number of alternatives” (Brashers, Neidig, Haas, Dobbs, Cardillo, & Russell, 2000: 63). In other words, entrepreneurs with high prevention focus choose inaction over action, as action implies uncertainty and the undesired possibility of “false alarms” and mistakes (McMullen & Shepherd, 2004). In such circumstances, the entrepreneur tries to attain a “correct rejection”, meaning that no opportunity exists, and he rightly does not identify one (Baron, 2002). However, if the circumstances strongly decrease the net benefit of a “correct rejection”, entrepreneurs with high prevention focus could choose to act, as the perceived costs of inaction are too high (McMullen & Shepherd, 2004). This could be the case if firm survival is at stake. Therefore, it is still possible for entrepreneurs with high prevention focus to search for opportunities. However, our findings provide some evidence that this is less likely compared to individuals with high a promotion focus.

Based on the work of Markovits (2012), we conducted a post hoc test to examine varied combinations of promotion and prevention focus (cf. Kammerlander et al., 2015). The results of the post hoc test are in line with the results of the regression analysis. We find that “achievers” search significantly more proactively than
“conservatives”. The downward-sloping curve shown in figure 6a illustrates the positive effects of a high promotion focus and suggests negative effects of a high prevention focus on proactive information search. Figure 6b demonstrates the negative influence of a high prevention focus on searching systematically. The mean values for systematic search are higher for rationalists than for conservatives, which provides some evidence that a high promotion focus has a positive effect on the preference for systematic search.

All three search behaviors are significantly and positively related to environmental dynamism. The preference for passive search is significantly and positively influenced by environmental dynamism. Hence, it can be assumed that environmental dynamism increases the entrepreneur’s level of alertness to opportunities. Environmental dynamism is positively associated with the preference for proactive search. Fast-changing environments may create an urge in the entrepreneur, or even an obligation, to proactively search for information. By searching systematically, the entrepreneur can acquire information to reduce perceived risk and uncertainty. Overall, environmental dynamism seems to be the presumed breeding ground for opportunities, which then triggers opportunity search activities among entrepreneurs.

Our research shows that entrepreneurial information search behavior is significantly influenced by cognitive and contextual factors. Specifically, we show that entrepreneurs’ regulatory focus and environmental dynamism play a vital role in the constitution of entrepreneurial information search behavior. We contribute primarily to two streams of literature.

First, we contribute to the opportunity recognition literature and advance our understanding of entrepreneurial behavior. We demonstrate that entrepreneurial behavior can be explained by key antecedents of entrepreneurial information search behavior. Thereby, our findings complement recent extant research (cf. Weinzimmer et al., 2015) by empirically examining important antecedents and differentiating among distinct types of information search behavior. We specifically follow calls for research investigating the influence of antecedents (such as self-regulation strategies or environmental dynamism) on opportunity recognition processes (cf. Brockner et al., 2004; Tang, 2009).

Second, we advance the regulatory focus theory literature. Previous research has explained the general effects of regulatory focus on opportunity recognition (Tumasjan
We add value to the study by Tumasjan and Braun (2012) and regulatory focus theory (Lanaj et al., 2012) in general by providing a more differentiated perspective on how regulatory focus relates to entrepreneurial behavior and the opportunity recognition process. Our results are consistent with the “notion that individuals’ cognitive framing strategies influence entrepreneurial behavior” (Tumasjan & Braun, 2012: 633).

4.7. Limitations and Suggestions for Further Research

Our research is not without limitations. The literature offers a plethora of instruments measuring regulatory focus (Haws, Dholakia, & Bearden, 2010; Summerville & Roese, 2008). We relied on the measure by Higgins et al. (2001), and we cannot be certain that different measures would show equivalent results. However, the RFQ is seen to map “well on to key concepts within regulatory focus theory” (Haws et al., 2010: 25). Also, our measures primarily rely on subjective assessments and self-reported data, which calls for studies conducting experiments, including objective assessments. The chronic regulatory focus is assumed to be dependent on the individual’s cultural background (Fiske & Taylor, 2013; Kurman & Hui, 2011). We cannot assume that our findings are generalizable to regions with different cultural backgrounds or low-technology industries. Moreover, because we assessed the search behavior of owner-managers, our findings cannot be applied to a typical startup context. Furthermore, our quantitative cross-sectional study yields interesting insights into why entrepreneurs search for information on opportunities the ways they do. It is suggested that examining cognitive processes (especially regulatory focus theory) helps answer important “why” questions in the entrepreneurship context (Baron, 2004). However, our cross-sectional study design has weaknesses in explaining causal relationships, meaning that “why” questions cannot be answered to the extent that longitudinal process data can. Nevertheless, past research findings support our approach and legitimate our assumption that differences in regulatory foci impact entrepreneurial information search behavior and not vice versa (cf. Tumasjan & Braun, 2012). We would commend future longitudinal studies or experimental analyses that further validate our findings.
Avenues for further research are manifold. We recommend studying the antecedents, processes, outcomes and contexts with respect to entrepreneurial information search.

First, there are further antecedents that are likely to impact entrepreneurial information search behavior. For example, prior experience influences opportunity recognition in general (Shane, 2000) and shapes how entrepreneurs search systematically (Fiet, 2002) or proactively (cf. Frese & Gielnik, 2014) in particular. Especially experienced entrepreneurs, such as serial or portfolio entrepreneurs, can search information differently compared to novice entrepreneurs because of their prior experience. Such changes in search behavior have already been demonstrated in other domains. Peterson and Merino (2003), for example, found for consumer research that search behavior and search frequency change over time. We recommend studying how experience influences information search by comparing the search behavior of serial, portfolio and novice entrepreneurs, continuing the research of Fiet (2007).

Second, the process of information search needs further analysis. Entrepreneurs often learn in the pursuit of opportunity development processes (Corbett, 2005). For example, the initial opportunity signal, such as a potential customer need, might be recognized by an alert and passively searching entrepreneur. However, to find a solution to this market need, the entrepreneur might prefer to search proactively. Thus, we recommend analyzing this process more fundamentally with respect to how information search changes during the process of opportunity recognition and further development. Because the boundaries between recognition, evaluation and exploitation are sometimes intertwined (Mahnke, Venzin, & Zahra, 2007), such differences can even be studied in recognition and exploitation processes. A longitudinal study might be a particularly fruitful avenue to research such aspects.

Third, how entrepreneurs search for information can impact entrepreneurial outcomes, such as the number of recognized opportunities and the performance or newness of recognized opportunities. For example, systematic search is superior with respect to the number of firm foundations (Patel & Fiet, 2009), the number of discovered opportunities and the wealth-creating potential of opportunities (Fiet, 2007). Furthermore, the ways entrepreneurs search for information can foster radical innovation (Troilo, De Luca, & Atuahene-Gima, 2014). It can also impact the type of recognized opportunities, such as products, services or even new business models.
Hence, we invite academics to further examine how information search behaviors impact entrepreneurial outcomes.

Fourth, we suggest studying more contextual factors, such as competitive intensity or national culture, and their influence on information search. Contextualization is important for entrepreneurship research (Zahra, Wright, & Abdelgawad, 2014). Environmental conditions affect entrepreneurship in general (Kiss & Barr, 2015; Zahra et al., 2014) and how entrepreneurs recognize opportunities (Dutta & Crossan, 2005). Competitive intensity can influence the urge of entrepreneurs to search for new opportunities (e.g., Kammerlander et al., 2015). Additionally, national culture can affect how entrepreneurship is fostered in a particular country as well as the perceived desirability of being an entrepreneur and recognizing opportunities (e.g., Mueller & Thomas, 2001). We recommend more thoroughly examining the impact of national culture on how entrepreneurs search for information with respect to opportunity recognition.

4.8. Implications for Practice

Compared to previous research, we provide more-precise practical implications, as we specifically assess distinct types of search behavior instead of opportunity recognition in a general sense (cf. Tumasjan & Braun, 2012). This leads to a more practical applicability of such research findings. Entrepreneurs are provided with specific information to scrutinize and optimize their individual search for opportunities, which is a manageable and learnable process (Fiet et al., 2005; Fiet, 2002). Entrepreneurship courses could utilize this insight by teaching entrepreneurs how to use different information searches and when they are most fruitful. It could be possible for entrepreneurs to recognize their regulatory focus inclination and develop a better understanding of how it impacts their information search preference (cf. Hu, Gu, Wu, & Lado, 2017). Thereby, the entrepreneur will be able to increase his opportunity search efficiency. More specifically, firms could intentionally hire promotion-focused CEOs if they are eager to recognize new opportunities. This would increase the likelihood of the CEO proactively searching for information.

Our research could be especially beneficial for entrepreneurs with a high prevention focus who are potentially less likely to identify promising opportunities by being
deterred by the risks associated with systematized information search. Entrepreneurship training could teach promotion focus-enhancing techniques (Bryant, 2007), especially when facing high levels of environmental dynamism. Although our research is focused on entrepreneurs’ chronic regulatory focus, it should be noted that entrepreneurs can deliberately try to apply a situational promotion focus regardless of their chronic focus (Friedman & Förster, 2001). Such a temporary promotion focus can be induced, for instance, by thoughts about goals, hopes and aspirations (McMullen & Shepherd, 2004). Specifically, the regulatory focus can be actively strengthened and elicited by different techniques (cf. Brockner & Higgins, 2001; Forgas, Baumeister, & Tice, 2009; Nambisan & Baron, 2013). Such techniques (cf. Stadler, Oettinger, & Gollwitzer, 2010) include “mental contrasting”, which necessitates that entrepreneurs reflect upon their goals, wishes and possible obstacles, similar to priming procedures (Paies & Hamstra, 2010). Another technique is “implementation intentions”, which requires entrepreneurs to think about their goal implementation process. As such, our findings offer a valuable building block for future studies investigating the antecedents of entrepreneurial information search behavior.
### 4.9. Appendix

**Table 14. Entrepreneurial Information Search Behavior Scale**

<table>
<thead>
<tr>
<th>Entrepreneurial Information Search Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Passive Search (alpha = .62)</strong></td>
</tr>
<tr>
<td>1. I studied general topic-related information (such as trade fairs or specialized literature) while not intentionally searching for a business idea.</td>
</tr>
<tr>
<td>2. While I wasn't intentionally searching for a business idea, I identified a business idea in conversations with people known and/or unknown to me.</td>
</tr>
<tr>
<td>3. I can’t tell exactly how I identified the business idea; rather, I spontaneously came up with the idea.</td>
</tr>
<tr>
<td>4. Employees unrequestedly approached me with new information, which then led to a business idea.</td>
</tr>
<tr>
<td>5. Suppliers unrequestedly approached me with new information, which then led to a business idea.</td>
</tr>
</tbody>
</table>

| **Proactive Search (alpha = .72)**          |
| 1. I intentionally searched for customer needs for which I have developed a solution subsequently. |
| 2. I intentionally took time to search for a business idea. |
| 3. I intentionally questioned existing solutions (own and/or competitors’ solutions) in order to identify a business idea. |
| 4. The intention of the search was to leverage my company’s strengths to develop a business idea. |

| **Systematic Search (alpha = .75)**         |
| 1. I intentionally restricted my search for a business idea to particular information channels (e.g. internet, journals, personal network). |
| 2. I intentionally restricted my search for a business idea to particular information channels that relate to my specific knowledge. |

The items are scored on a five-point Likert scale (1 = “does not apply at all” to 5 = “fully applies”).
Table 15. Regulatory Focus Questionnaire

**Regulatory Focus**

Promotion Focus (alpha = .75)

1. Compared to most people, are you typically able to get what you want out of life? †
2. How often have you accomplished things that got you “psyched” to work even harder?
3. Do you often do well at different things that you try?
4. When it comes to achieving things that are important to me, I find that I perform as well as I ideally would like to do.
5. I feel like I have made progress toward being successful in my life.
6. I have found hobbies or activities in my life that capture my interest or motivate me to put effort into them.

Prevention Focus (alpha = .75)

1. Growing up, would you ever “cross the line” by doing things that your parents would not tolerate?*
2. Did you get on your parents’ nerves when you were growing up?*
3. How often did you obey rules and regulations that were established by your parents?
4. Growing up, did you ever act in ways that your parents thought were objectionable?*
5. Not being careful enough has gotten me into troubles at times.*

The scale originates from Higgins et al. (2001) and has been used for example by Kammerlander et al. (2015). The items are scored on a five-point Likert scale (1 = “never or seldom” to 5 = “very often”).

* = reverse coded
† = excluded due to unintended cross loading

Table 16. Environmental Dynamism Scale

**Environmental Dynamism (alpha = .72)**

1. Environmental changes in our local market are intense.
2. Our clients regularly ask for new products and services.
3. In our local market, changes are taking place continuously.
4. In a year, everything has changed in our market.
5. In our market, the volumes of products and services to be delivered change fast and often.

The scale was originally developed by Dill (1958) and Volberda and Van Bruggen (1997). Amongst others, it has been applied by Jansen et al. (2006). Responses were rated on a 7-point Likert scale (1 = “strongly disagree” to 7 = “strongly agree”).
5. The Impact of Entrepreneurial Information Search Behavior on the Innovativeness of Recognized Opportunities

5.1. Abstract

The recognition of innovative opportunities is an important concept, as it determines firm performance and entrepreneurial success. Entrepreneurial information search behavior is assumed to be a decisive factor in the innovation process. Research differentiates three main search behaviors relevant for opportunity recognition: passive search, proactive search and systematic search. One key unresolved question that touches the core of entrepreneurship research is why some entrepreneurs identify highly innovative opportunities while others do not. To address this research gap, my study investigates the role of entrepreneurial information search behavior in the recognition of innovative opportunities. The findings provide evidence that passive information search is a precursor for identifying highly innovative opportunities. No significant effects could be found for proactive and systematic search behavior. A post hoc test further revealed that environmental dynamism moderates the relationship between proactive search and the perceived innovativeness of the opportunities identified.

5.2. Introduction

As companies are increasingly facing competitive environments, generating innovative ideas has become a critical factor in maintaining a competitive advantage (Barney, 1991; Grégoire & Shepherd, 2012; van den Ende, Frederiksen, & Prencipe, 2015). Past research has shown that innovativeness can both positively and negatively influence startup survival and firm performance (Hyytinen et al., 2015; Rosenbusch et al., 2011), which further highlights its relevance for entrepreneurship research.

Despite extensive existing research emphasizing the interest in explaining firm’s innovative performance heterogeneity, to date, there is little or even contradictory evidence about key processes influencing the innovativeness of recognized opportunities (e.g., Dahlqvist & Wiklund, 2011; D'Souza & Schenkel, 2011; Holmén, Magnusson, & McKelvey, 2007; Koellinger, 2008; Samuelsson & Davidsson, 2009). Most research has mainly focused on general factors impacting opportunity
recognition, such as entrepreneurial characteristics (Samuelsson & Davidsson, 2009; Shane, 2012), access to information (Hsieh & Kelley, 2016; Patel & Fiet, 2009) and human capital (Shepherd & DeTienne, 2005). The question of what kinds of processes bring about variance in the opportunity identified is still unresolved (cf. D’Souza & Schenkel, 2011). In this regard, information search behavior has drawn scholar’s attention, as it is hypothesized that entrepreneurial information search plays a key role in the innovation process (cf. Cassiman & Veugelers, 2006; Drucker, 1998; Hsieh & Kelley, 2016).

Innovations are closely related to the assimilation and combination of new knowledge (Kaivo-oja, 2012; Laursen, 2012). Furthermore, evolutionary theory claims that the number of selectable alternatives is positively related to the innovativeness of outcomes, known as the “selection effect of variation” (Katila & Ahuja, 2002; Nelson & Winter, 1982). The more alternatives the entrepreneur is provided with to approach a given technological objective, the higher the likelihood of innovative outcomes (cf. Laursen, 2012). Information search behavior enlarges the entrepreneur’s knowledge pool and increases the number of alternatives to select from related to problem solving activities (Katila & Ahuja, 2002; March, 1991). Hence, information search creates choice alternatives and enables the entrepreneur to discover foreign knowledge domains (cf. Park, 2015). Among other reasons, information search behavior is therefore expected to explain quality dimensions of the identified opportunity such as its perceived innovativeness (DeTienne & Chandler, 2004; Hsieh & Kelley, 2016).

Despite the importance of information search behavior in determining the nature of identified opportunities (e.g., D’Souza & Schenkel, 2011), existing empirical findings assessing concepts of search behavior show results with unclear managerial implications. For example, Laursen and Salter (2006) found a positive relationship between search scope and firms’ innovativeness. In contrast, Terjesen and Patel (2014) found a negative relationship between search scope and process innovation. Furthermore, some existing studies use patent data as a proxy for search behavior (e.g., Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001) rather than measuring the search behavior itself. Patent data are known to have severe limitations as proxies for search (Laursen & Salter, 2006; Chesbough, 2003).

As a result, scholars and practitioners alike lack knowledge regarding the inherent benefits of different information search behaviors and the concomitant question of
why entrepreneurs identify opportunities of deviating quality. Entrepreneurs invest
significant resources in their search for innovative opportunities (Laursen & Salter,
2006). Consequently, a more advanced understanding of how entrepreneurs most
efficiently search for information to recognize innovative opportunities is essential for
practice.

In an effort to close this research gap and extend prior empirical findings, I
investigate the relationship between distinct types of entrepreneurial information
search behavior and the perceived innovativeness of recognized opportunities. The
proposed hypotheses are tested using survey responses from 128 owner-managers
from medical technology companies.

I contribute to the opportunity recognition and innovation literature by providing
evidence about key antecedents of innovative opportunities (cf. D’Souza & Schenkel,
2011; Samuelsson & Davidsson, 2009; Smith et al., 2009). Furthermore, I add value to
existing research (e.g., Baron & Tang, 2011), offering important insights into how the
environmental context influences the identification of innovative opportunities.
Moreover, practitioners are provided with information about how their choice of
information search behavior influences search outcomes.

5.3. Theoretical Foundations

5.3.1. Innovativeness of Opportunities

Entrepreneurial opportunities can be classified according to quality dimensions such as
their innovativeness (Hsieh & Kelley, 2016). Products and services with a high degree
of innovativeness provide a competitive advantage positively impacting firm success
(Porter, 1980). Furthermore, the degree of innovativeness of opportunities drives
economic growth (Mueller, 2007). Past research has found that innovativeness
enhances firms' absorptive capacity (Zahra & George, 2002), sales (Kelly &
Nakosteen, 2015) and speed to market (Fang, 2008). The question of why some
individuals are more likely to identify innovative opportunities than others is therefore
important.

“Innovativeness is most frequently used as a measure of the degree of newness of
an innovation” (Garcia & Calantone, 2002: 112). A central characteristic of
opportunities is therefore newness (Baron, 2004), although the degree of newness can
vary substantially (Alvarez & Barney, 2007; Sarasvathy, 2001). Taxonomies of
newness span from incremental to revolutionary or radical (Dahlqvist & Wiklund, 2011; Laursen & Salter, 2006). Incremental or imitative opportunities are more common and modify, improve or adjust existing practices (Amason et al., 2006). Highly innovative or radical opportunities have the power to disrupt whole industries and change the status quo (Amason et al., 2006; Dewar & Dutton, 1986). It is likely that the concepts of imitative and innovative opportunities exist as extremes on a continuum (Samuelsson & Davidsson, 2009).

I define an innovative opportunity as “the possibility for potential economic value inherent in a new combination of resources and market needs, emerging from changes in the scientific or technological knowledge base, customer preferences, or the interrelationships between economic actors” (Holmén, Magnusson, & McKelvey, 2007: 37). A key characteristic of innovative opportunities is that they break with existing conventions and broadly accepted knowledge (Amason et al., 2006; D’Souza & Schenkel, 2011). They are defined by limited information about relevant market players such as customers or competitors (cf. Koellinger, 2008). The opportunities are perceived to be innovative by the relevant entrepreneur (cf. Dewar & Dutton, 1986; Zaltman, Duncan, & Holbek, 1973). This means that innovativeness is a subjective assessment dependent on the individual’s perspective (Koellinger, 2008). “Entrepreneurs differ in the degree and type of novelty that they introduce to the economy” (Koellinger, 2008: 21). Such differences in the quality of the opportunity (cf. Shane, 2012) make it interesting to investigate how entrepreneurs discover such innovative opportunities.

5.3.2. Information Search and the Innovativeness of Opportunities

Despite its importance, surprisingly little research goes beyond investigating common antecedents such as R&D expenditure influencing the discovery of innovative opportunities (D'Souza & Schenkel, 2011; Samuelsson & Davidsson, 2009). In this regard, scholars increasingly focus their attention on information search behavior and its role in explaining the innovativeness of opportunities identified. Entrepreneurial information search is a key step of the innovation process (e.g., Laursen & Salter, 2006; McGee et al., 2009). Scholars hypothesize that innovation and information search are inextricably linked concepts (Dyer et al., 2008; Fleming, 2001, Katila & Ahuja, 2002; Terjesen & Patel, 2014). “A key logic in the innovation literature is that
the pace of new product introductions is a function of the search and identification of new knowledge and information” (Katila & Ahuja, 2002; Li et al., 2013: 893). The reasons for this logic are manifold.

First, a key characteristic of innovation is the limited available information (Koellinger, 2008). Search enables the entrepreneur to identify new knowledge and information that can be combined in novel ways (Laursen, 2012). By searching, the entrepreneur can transfer knowledge from a foreign arena to another (Hills & Lumpkin, 1997). The choice of search behavior determines the variety of knowledge inputs the entrepreneur is provided with (Laursen, 2012). The type of information search behavior explains, for instance, the choice of information channels or how distant or broad the search is. This, in return, influences whether the acquired information and knowledge are familiar or new to the searcher. The type of information search behavior is thus likely to differently impact the search outcome (cf. van Gelderen, 2013). Past research suggests, for instance, that information search focused on distant or unfamiliar knowledge domains leads to more innovative opportunities, as the entrepreneur has a strong exposure to information that is new to him (cf. Koellinger, 2008; Park, 2015).

A second explanation is provided by selective attention theory (cf. Li et al., 2013). The theory explains that individuals are exposed to competing sources of stimuli, meaning that they have to focus their information processing on one specific stimulus at a time (Ocasio, 2011). The human brain is only capable of processing a limited amount of stimuli, so some stimuli are screened out (Lavie, 1995; Ocasio, 2011). Novel information stands out compared to stimuli that the searcher is used to or expecting, meaning that the searcher’s attention is especially directed to such novel information (Li et al., 2013). Further evidence is provided by previous research that found, for instance, that different types of information search behavior relate to the number (Fiet & Patel, 2008), tacitness (Smith et al., 2009) or perceived viability (Heinonen, Hytti, & Stenholm, 2011) of the opportunities identified. Hence, I hypothesize that differences in entrepreneurial information search behavior are associated with the innovativeness of opportunities, making it a key construct explaining why entrepreneurs discover opportunities of deviating innovativeness.
5.3.3. Types of Entrepreneurial Information Search Behavior

Entrepreneurship literature differentiates three main types of information search behavior (e.g., Murphy, 2011; Tang et al., 2012). First, passive search assumes that opportunities cannot be clearly defined until they are recognized (DeTienne & Chandler, 2004). Along with anecdotal evidence, there is empirical evidence that a substantial number of opportunities are identified in the course of fortuitous discoveries; this is closely related to the concept of passive search (Chandler et al., 2003; Meyer & Skak, 2002). Passive search means searching for information without clear goals and without the intention of recognizing an opportunity (Ardichvili et al., 2003; DeTienne & Chandler, 2004; Kirzner, 1979). It usually does not follow systematic behavior (Foo et al., 2015; Kirzner, 1973). Passive search processes are perceived as continuous in the sense that they are not restricted to specific times or geographical boundaries (Kaish & Gilad, 1991). The entrepreneur is alert to his environment in order to be “in the right place at the right time” (Chandler et al., 2003: 400). Entrepreneurial alertness is a specific mental framework supporting the entrepreneur in identifying promising opportunities (Baron, 2004).

Second, proactive search refers to an intentional and deliberate search that is unfocused in scope and not constrained (Chandler et al., 2003; Dahlqvist, Chandler, & Davidsson, 2004). It is self-starting, and the entrepreneur focuses his resources on collecting new information for opportunity identification (Frese, 2009). Proactive search necessitates that the entrepreneur is sensitive to his environment and the associated changes (Foo et al., 2015). A starting point can be specific needs or restrictions (van Gelderen, 2010). Proactive search builds on the ontological perspective that highly diverse entrepreneurial opportunities “exist out there” and need to be discovered by the entrepreneur (Chandler et al., 2003). In the case of firm performance that falls below expectations (or when this scenario is anticipated), individuals are likely to carry out proactive information search as a response (Cooper et al., 1995; Levinthal & March, 1981). Hence, the existence of “organizational slack” often induces proactive information search (Levinthal & March, 1981).

Third, systematic search refers to a constrained search intended to discover entrepreneurial opportunities (Fiet, 2002). Compared to proactive search, systematic search is more focused, as entrepreneurs narrow their search to the most fruitful
information channels, which are referred to as consideration sets (Fiet, 2007). The search is based on technologies that correspond to the entrepreneur’s prior knowledge (Fiet et al., 2004). The entrepreneur focuses on processes where he possesses well-developed cognitive frameworks (Baron, 2006; Nicholas et al., 2013). He combines knowledge gained from past experience with recent information (Patel & Fiet, 2011). Entrepreneurs conducting systematic search “rely on an epistemic structure consisting of specific information” (Fiet et al., 2005: 490). Fiet et al. (2005) argue that access to specific information offers the opportunity to gain a competitive advantage against competing market agents, as it is not as widely available as general information.

5.4. Hypotheses

5.4.1. Passive Search and the Innovativeness of Opportunities

First, passive search is unintended, can take place during unconventional times and by its nature often leads to surprising or unexpected opportunities (Ardichvili et al., 2003; DeTienne & Chandler, 2004; Kaish & Gilad, 1991; Kirzner, 1997). Cliff et al. (2006: 655) describe “[...] innovative entrepreneurship as an often unintentional, almost random process [...]”, which indicates that passive search and innovation could be positively related. Entrepreneurs conducting passive search are able to “think outside the box” (Baron & Ward, 2004) and “conquer unknown territory” (cf. Koellinger, 2008). Entrepreneurs engaging in passive search behavior are used to increase the search scope, as they are able to make associations between disparate realms (cf. Foo, et al, 2013). High scope search is associated with positive effects on opportunity variation and innovation (Katila & Ahuja, 2002; Nelson & Winter, 1982). The main differences between an innovator and a “reproducer” are the circumstances they operate in. A “reproducer” can rely on past experience and has an understanding of the potential risks involved (Dahlqvist et al., 2004). The opposite applies for innovators, where the outcome is uncertain, as the innovator has limited information about the unknown territory he is searching (cf. Koellinger, 2008; Samuelsson, 2004). The concept of passive search is closely related to the theoretical construct of the innovator. The entrepreneur often passively searches unfamiliar knowledge areas where he cannot rely on prior knowledge. This kind of search involves high uncertainty and risk. Gruber et al. (2013) found that relying on more-diverse external
knowledge sources leads to more-varied market opportunities. Facing diverse information that is unrelated to the knowledge base of the individual is related to identifying opportunities with a high degree of novelty (Mumford, Baughman, Supinski, & Mahler, 1996).

Passively searching entrepreneurs are able to respond to and connect information that is limited or new and does not match their existing mental model (cf. Baron, 2004; Busenitz & Barney, 1997; Nicholas et al., 2013). Busenitz and Arthurs (2007) see the use of heuristics as a key driver of innovative ideas. Passively searching enables entrepreneurs to be “in the space where emergence of something new is likely to happen” (Bessant & Tidd, 2007: 238). During passive search, the entrepreneur is “receptive, though not engaged in a formal, systematic search process” (Ardichvili et al. 2003: 115). This idea of passive search and being alert to changes in the environment bears a remote resemblance to a phenomenon known from neuroscience called “transcendental consciousness”, which is “characterized by a state of restful alertness” (Deans, 2015: 2). The state of the individual could be described as “passively receptive”, as the mind is alert but the body is resting (cf. Deans, 2015). Ray Dalio is the founder of one of the world’s largest hedge funds and frequently puts himself in a state of transcendental consciousness. In a recent interview, he claimed: “I find that creative ideas don’t come from working hard at them in one’s conscious state. Instead, they come when I am very relaxed. They pass through my brain and I grab them” (Rosenthal, 2014; Deans, 2015). Hence, neuroscience provides further evidence that “subconscious” (cf. D'Souza & Schenkel, 2011) passive information search positively influences the innovativeness of opportunities recognized. Therefore, I hypothesize:

**H1**: Passive search is positively associated with the perceived innovativeness of the opportunities discovered.

### 5.4.2. Proactive Search and the Innovativeness of Opportunities

Second, individuals who engage in **proactive search** aim to change the status quo, and their likelihood of identifying innovative opportunities is enhanced (cf. Dyer et al., 2008; Tang et al., 2012; Zahra, 1993). Proactive information search was found to positively impact innovation performance on an individual and firm level (Kitchell, 1998; Wang & Ellinger, 2009). Innovative entrepreneurs proactively explore the
world, and they experiment by “trying new things” (Dyer et al., 2008; Sarasvathy, 2001). Proactive search can be described as explorative with the deliberate intent to explore information or knowledge domains distant from the preexisting ones (cf. Katila & Ahuja, 2002). Nicholas, Ledwith, & Bessant (2013) found that radical innovations are more likely to result from exploratory search behavior, which is characterized by a wide search scope, similar to that of proactive search. Due to the wide search scope, the outcomes show a higher variance, which increases uncertainty (Nelson & Winter, 1982). Proactive search can include the search space outside the entrepreneur’s specific knowledge base. The likelihood of discovering radical and innovative opportunities is enhanced. This claim is supported by prior studies showing that successful innovation searches occur far from known knowledge domains (Park, 2015). Distant knowledge domains tend to yield information that is new to the searcher, allowing him to increase his knowledge base (Li et al., 2013). Proactive search is forward oriented and “tries to create a vision of the future and establishes a business before others see the trend” (Puhakka, 2007: 25). Entrepreneurs conducting proactive search are anticipating the future and are less likely to engage in counterfactual thinking (i.e., thinking “what might have been”) (cf. Baron, 2004). This future-oriented forward-looking behavior has a positive impact on the newness value of ventures (cf. Puhakka, 2007). Hence, I hypothesize the following:

H2: Proactive search is positively associated with the perceived innovativeness of the opportunities discovered.

5.4.3. Systematic Search and the Innovativeness of Opportunities

Third, systematic search has been associated with incremental innovations rather than disruptive venture ideas (Weber & Jung, 2015). The potential for identifying opportunities with strong perceived innovativeness seems limited, as systematic information search is constrained by the entrepreneurs’ idiosyncratic knowledge (cf. Carson, 1972). Cooper et al. (1995) found that experience has a negative effect on the level of information search activity. Similarly, Cliff et al. (2006) found that experience in the core of an organization field makes it more likely for entrepreneurs to act as “imitative entrepreneurs”. Systematic search is based on the theoretical concept of reductionism lowering the sensitivity of the entrepreneur to changes in his
environment (Blade, 1963; DeTienne & Chandler, 2004). The consideration sets searched impede the assessment of completely new information and could lead to a fixedness in thinking (cf. Gielnik et al., 2014).

Creativity literature suggests that a strong focus on one’s knowledge domain inhibits the ability to identify original and novel opportunities (Ward, 2004). The focus on the preexisting knowledge area constitutes a natural barrier to divergent thinking, which is positively associated with innovation (Gielnik, Frese, Graf, & Kampschulte, 2012). Just as the view of a horse is restricted by blinders, the entrepreneur searching his consideration sets only has a narrow view and perception of his environment. The entrepreneur is subject to “blinders of dominant logic” (Prahalad, 2004: 172). By “channeling” his information search, the entrepreneur may fall into “mental ruts” (Shepherd & DeTienne, 2005). This implies that the entrepreneur is less likely to “think outside the box” and identify innovative opportunities (Shepherd & DeTienne, 2005). The discovered opportunities are more proximate (cf. Dahlqvist, et al., 2004; Martini et al., 2015) and the search is more predictable (cf. Katila & Ahuja, 2002). This increases the likelihood of arbitrage or franchise opportunities (van Gelderen, 2013). The entrepreneur searches for a piece of missing information (Kirzner, 1997; Kontinen & Ojala, 2011) rather than something completely new. Moreover, studies have found that codified opportunities are more likely to be recognized by conducting a systematic search (Smith, Matthews, & Schenkel, 2009). A codified opportunity is focused on “imitated or moderate improvements of products, services, raw materials, or organizing methods” (Smith, Matthews, & Schenkel, 2009: 44). Thus, I hypothesize:

**H3:** Systematic search is negatively associated with the perceived innovativeness of the opportunities discovered.

![Information Search Behavior Diagram]

**Figure 7.** Hypothesized Relationships
5.5. Method

5.5.1. Sample and Data Collection

I used the survey software Qualtrics to collect my data in a two month time period during mid-2015. The survey was emailed to 17,044 owner-managers from medical technology companies located in Germany, Switzerland and Austria. The addresses for the e-mail dispatch were obtained from the database ORBIS. I selected only small and medium-sized firms (SMEs) with less than 250 employees from the database that were related to the medical technology industry. This specific industry is especially suitable for my research as it is characterized by short product life cycles and increasing competitive intensity (Hofrichter & Dümmler, 2014). Hence, companies operating in the medical technology industry are in need to continuously search for new opportunity ideas. Moreover, scholars note that high-technology industries are especially suitable to examine innovative outcomes (Li et al., 2013). Interviews with owner-managers from medical technology companies revealed that the owner-manager himself is the most important person in conducting the search for new opportunities. Therefore, I relied on a key information approach (Kumar et al., 1993) by targeting owner-managers only.

As my survey was only focused on fully answered questionnaires from owner-managers and SMEs with under 250 employees, my final sample contained 128 full responses from owner-managers.

### Table 17. Sample Statistics

<table>
<thead>
<tr>
<th>Sample Statistics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of survey participants(^1)</td>
<td>128</td>
</tr>
<tr>
<td>CEO age (years)</td>
<td>55.9</td>
</tr>
<tr>
<td>CEO gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>11.7%</td>
</tr>
<tr>
<td>Male</td>
<td>88.3%</td>
</tr>
<tr>
<td>Firm size</td>
<td></td>
</tr>
<tr>
<td>0-9 employees</td>
<td>55.7%</td>
</tr>
<tr>
<td>10-49 employees</td>
<td>34.9%</td>
</tr>
<tr>
<td>50-249 employees</td>
<td>9.4%</td>
</tr>
<tr>
<td>Mean of employees</td>
<td>19.9</td>
</tr>
<tr>
<td>Firm age (years)</td>
<td>25.1</td>
</tr>
</tbody>
</table>

\(^1\) All participants are owner-managers from medical technology companies.
I conducted the Harman’s one factor test which indicated that common method bias is unlikely to distort my data (Schriesheim, 1979). The fit of a three-factor (passive search, proactive search, systematic search) model ($\chi^2 = 49.955$, CFI = .964, IFI = .965, TLI = .951, RMSEA = .041; degrees of freedom = 41, p = .159) was superior to that of a one-factor model ($\chi^2 = 126.378$, CFI = .644, IFI = .679, TLI = .581, RMSEA = .121; degrees of freedom = 44, p = .000). I also mitigated the possibility of socially desirable answers by ensuring full confidentiality and anonymity within the context of the survey (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

5.5.2. Dependent Variable

The perceived innovativeness of the recognized opportunities was measured with a scale by Marvel and Lumpkin (2007) that has been used in an entrepreneurial context (e.g., Marvel, 2012). The scale was used to measure the perceived innovativeness of the last opportunity recognized by the survey participants. The scale consists of seven items, with four items reverse-coded to avoid patterned responses (cf. Marvel, 2012). The reverse-coded items were recoded prior to analysis to ensure that higher values constitute higher levels of perceived innovativeness. I performed an exploratory factor analysis to evaluate the latent structure of the measure. As a result, three items had to be excluded from further analysis due to unintended cross-loadings (see appendix). The Cronbach’s alpha for this measure is sufficient, at .78 (cf. Hair et al., 2010). I conducted a translation-back-translation (cf. Dickson, Weaver, & Hoy, 2006) to convert the original items from English to German to ensure comprehensibility and accuracy (Kammerlander et al., 2015). The answers were averaged in order to form a single measurement instrument.

5.5.3. Independent Variables

The independent variables consist of the three distinct information search behaviors (see appendix). The owner-managers from the medical technology companies were asked to think about their last identified opportunity while answering the questions. The questions were answered on a five-point Likert scale with responses ranging from 1 = "does not apply at all" to 5 = "fully applies".
**Passive search** was measured with a five-item scale and had a Cronbach's alpha of .62. According to Nunnally and Bernstein (1994), an alpha that exceeds .60 is sufficient for exploratory studies (cf. also Zellweger, Sieger, & Halter, 2010). **Proactive search** was measured with a four-item scale with an alpha of .72. **Systematic search** (alpha = .75) was measured with a two-item scale, in line with the rule of having at least two paths from or to any latent variable (Bollen & Davis, 2009; Sieger et al., 2016). All three scales were professionally translated and back-translated from German to English (cf. Dickson, Weaver, & Hoy, 2006). In each case, the items were averaged into one indicator.

### 5.5.4. Moderator Variable

**Environmental dynamism** was measured with a five-item scale based on the measure developed by Birkinshaw et al. (1998) and Jaworski and Kohli (1993) (see appendix). It captures how individuals perceive the rate of change in their environment (cf. Jansen et al., 2006). Respondents were asked to answer the questions on a seven-point Likert-scale, ranging from (1 = “strongly disagree”) to (7 = “strongly agree”). I averaged the five items to generate a single measure. The measure shows internal consistency, with a Cronbach's alpha of .72 (cf. Hair et al., 2010).

### 5.5.5. Control Variables

I controlled for **CEO share** (cf. Kammerlander et al., 2015), where “no CEO ownership” represents the baseline. Other cases were described using two dummy variables: “CEO minority share” (coded “1” if the CEO owned shares, but less than 50% of the company) and “CEO majority share” (coded “1” if the CEO owned > 50% of the shares). This control variable was included in the analysis, as CEO ownership is closely related to his/her goal setting process and motivation, which is associated with exploration activities (Gedajlovic et al., 2012; Kammerlander et al., 2015). I also controlled for common control variables, such as firm age and competitive intensity (cf. Radicic & Pugh, 2017). **Firm age** was included, as infant firms are expected to be more innovative (Parida, Westerberg, & Frishammar, 2012). Firm age was measured by subtracting the firm's founding year from the current year (e.g., Finkelstein & Hambrick, 1996). **Competitive intensity** (alpha = .83) was measured with a four-item scale that is based on a 7-point Likert scale, ranging from 1 = "strongly disagree" to 7.
= "strongly agree", developed and used by Jansen et al. (2006) (see appendix). The items were aggregated into a single measurement instrument. Competitive intensity is defined “as a situation where competition is fierce due to the number of competitors in the market and the lack of potential opportunities for further growth” (Auh & Menguc, 2005: 1654). Intense competition increases pressure on firms to innovate and tends to increase venturing activities (Zahra, 1993).

5.6. Results

5.6.1. Descriptive Data

The descriptive statistics for all variables used are included in table 18. The Pearson correlation coefficients are reported. All correlations are below the threshold of .60, which implies that my data are not subject to shared variance issues (cf. Zellweger et al., 2011). The different types of information search behavior correlate strongly and significantly with each other in some parts. This could be expected, as the distinct types of information search behavior are not mutually exclusive but complementary behaviors (Tang & Khan, 2007; van Gelderen, 2013). The mean values for both environmental dynamism and competitive intensity appear to be high compared to other studies (cf. Jansen et al., 2006). This is in accordance with the prediction that the medical technology industry is characterized by a fast-changing environment and strong competition.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Passive search</td>
<td>2.14</td>
<td>.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Proactive search</td>
<td>3.37</td>
<td>1.03</td>
<td>.202*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Systematic search</td>
<td>2.19</td>
<td>1.12</td>
<td>.283**</td>
<td>.395**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Competitive intensity</td>
<td>5.24</td>
<td>1.45</td>
<td>.142</td>
<td>.116</td>
<td>.163</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Environmental dynamism</td>
<td>4.37</td>
<td>1.23</td>
<td>.249**</td>
<td>.421**</td>
<td>.246**</td>
<td>.410**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 CEO minority share</td>
<td>.16</td>
<td>.37</td>
<td>-.076</td>
<td>-.070</td>
<td>.096</td>
<td>-.033</td>
<td>.033</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 CEO majority share</td>
<td>.63</td>
<td>.48</td>
<td>.102</td>
<td>.074</td>
<td>-.083</td>
<td>-.051</td>
<td>-.007</td>
<td>-.582**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Firm age</td>
<td>25.08</td>
<td>25.94</td>
<td>.165</td>
<td>.030</td>
<td>.010</td>
<td>.106</td>
<td>.136</td>
<td>-.078</td>
<td>.040</td>
<td></td>
</tr>
<tr>
<td>9 Innovativeness</td>
<td>2.97</td>
<td>.77</td>
<td>.235**</td>
<td>.193*</td>
<td>.223*</td>
<td>-.041</td>
<td>.122</td>
<td>.163</td>
<td>-.057</td>
<td>-.052</td>
</tr>
</tbody>
</table>

N = 128; * p < .05; ** p < .01; *** p < .001
5.6.2. Regression Models

I used SPSS 23 to analyze the data. I employed ordinary least squares (OLS) regression models to test the hypotheses (unstandardized regression coefficients). In a first step, I assessed my data for a variety of OLS-relevant assumptions (cf. Hair et al., 2010). To avoid multicollinearity, I mean-centered the interaction terms of the products (cf. Aiken & West, 1991). The variance inflation factors (VIFs) are at 1.59 or lower and are thus below the recommended threshold of 10 (cf. Neter, Wasserman, & Kutner, 1985). The Durbin-Watson test revealed that no regression model suffers from significant autocorrelation, as all results were close to 2 (cf. Tabachnick & Fidell, 2007). The Breusch-Pagan test showed no significant results, indicating that the assumption of homoscedasticity is not violated (cf. Breusch & Pagan, 1978). The data did not suffer from significant outliers, as the Cook's distance for all cases was well below 1.0 (highest value: .068) (Tabachnick & Fidell, 2007). The use of Cook's distance is suggested by Lorenz (1987) for outlier analyses. In regression model 1, I entered all control variables. In model 2, I included the independent variables, namely, passive search, proactive search and systematic search. In a third step, the interaction terms were added and evaluated to conduct the post hoc test (models 3-6) (cf. Cohen & Cohen, 1983).

5.6.3. Regression Results

Model 2 shows the results associated with the three hypotheses. Hypotheses 1 (H1) predicts that passive search is positively associated with the perceived innovativeness of the opportunities discovered. The R² of model 2 is of substantial magnitude (.134). In support of H1, I obtained significant evidence that passive search has a positive and significant (β = .22, p < .05) effect on perceived innovativeness of the opportunity identified. Hypothesis 2 (H2) predicts a positive relationship between proactive search and the perceived innovativeness of the opportunities discovered. In the cases of proactive search, the effects are positive, though not significant. Therefore, I found no support for hypothesis H2. Hypothesis 3 (H3) predicts that systematic search is negatively associated with the perceived innovativeness of the opportunities discovered. The results show no support for the prediction of hypothesis H3.
### Table 19. Regression Models 1-2: Innovativeness of the Opportunity

<table>
<thead>
<tr>
<th>Variables</th>
<th>Innovativeness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td>Firm age</td>
<td>-.001</td>
</tr>
<tr>
<td>CEO minority share</td>
<td>.395†</td>
</tr>
<tr>
<td>CEO majority share</td>
<td>.091</td>
</tr>
<tr>
<td>Competitive intensity</td>
<td>-.017</td>
</tr>
<tr>
<td>Passive search</td>
<td></td>
</tr>
<tr>
<td>Proactive search</td>
<td></td>
</tr>
<tr>
<td>Systematic search</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>.969</td>
</tr>
<tr>
<td>R²</td>
<td>.031</td>
</tr>
</tbody>
</table>

N = 128; † p < .10; * p < .05; ** p < .01; *** p < .001.

### 5.6.4. Post Hoc Test: Interactive Effects of Search Behaviors and Environmental Dynamism

I conducted a post hoc test to investigate whether environmental dynamism moderates the relationship between search behavior and innovativeness of opportunities. High levels of environmental dynamism are likely to increase levels of activation among entrepreneurs (Baron & Tang, 2011). Hence, there is reason to believe that environmental dynamism serves as a moderator in the context of identifying innovative opportunities. In regression models 3, 4 and 5 (see table 20), I included environmental dynamism as the moderating variable and separately added the product terms for each search behavior to show that the main effects remain stable. In model 6 (R² = .183), all relevant product terms were included together. Model 6 shows a significant interaction effect for proactive search (β = .15, p < .05). Therefore, environmental dynamism positively moderates the relationship between proactive search and perceived innovativeness of the opportunity identified. Environmental dynamism does not act as a moderator in the case of passive search (β = .01, n.s.) and systematic search (β = -.08, n.s.). The interactive effects are also visualized in figure 8.
Table 20. Regression Models 3-6: Innovativeness of the Opportunity

<table>
<thead>
<tr>
<th>Variables</th>
<th>Innovativeness</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 3</td>
<td>Model 4</td>
<td>Model 5</td>
<td>Model 6</td>
</tr>
<tr>
<td>Firm age</td>
<td>-.002</td>
<td>-.002</td>
<td>-.002</td>
<td>-.001</td>
</tr>
<tr>
<td>CEO minority share</td>
<td>.380†</td>
<td>.306</td>
<td>.377†</td>
<td>.289</td>
</tr>
<tr>
<td>CEO majority share</td>
<td>.044</td>
<td>.011</td>
<td>.043</td>
<td>.001</td>
</tr>
<tr>
<td>Competitive intensity</td>
<td>-.055</td>
<td>-.050</td>
<td>-.056</td>
<td>-.050</td>
</tr>
<tr>
<td>Passive search</td>
<td>.025*</td>
<td>.204*</td>
<td>.216*</td>
<td>.217*</td>
</tr>
<tr>
<td>Proactive search</td>
<td>.088</td>
<td>.125</td>
<td>.083</td>
<td>.128</td>
</tr>
<tr>
<td>Systematic search</td>
<td>.073</td>
<td>.078</td>
<td>.077</td>
<td>.082</td>
</tr>
<tr>
<td>Environmental dynamism (E.D.)</td>
<td>.025</td>
<td>.023</td>
<td>.024</td>
<td>.016</td>
</tr>
<tr>
<td>Passive search x E.D.</td>
<td>.023</td>
<td>.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proactive search x E.D.</td>
<td>.105*</td>
<td></td>
<td>.147*</td>
<td></td>
</tr>
<tr>
<td>Systematic search x E.D.</td>
<td></td>
<td></td>
<td>-.015</td>
<td>-.080</td>
</tr>
<tr>
<td>F</td>
<td>2.037*</td>
<td>2.585*</td>
<td>2.036</td>
<td>2.343*</td>
</tr>
<tr>
<td>R²</td>
<td>.135</td>
<td>.166</td>
<td>.135</td>
<td>.183</td>
</tr>
</tbody>
</table>

N = 128; † p < .10; * p < .05; ** p < .01; *** p < .001.

Figure 8. Interaction Effects
5.7. Conclusion and Discussion

The findings demonstrate that entrepreneurial information search behavior is a key factor defining the innovativeness of opportunities. It is clear that information search is a more comprehensive construct than assumed by previous research. My research shows that passive search behavior significantly influences the perceived innovativeness of identified opportunities. This seems plausible, as passively
searching entrepreneurs are able to search beyond the boundaries of their local environment. Passive search is explorative and does not limit the entrepreneur to his or her individual knowledge base or other established trajectories (cf. Katila & Ahuja, 2002). Consequently, the likelihood of identifying innovative opportunities increases. In this regard, Li et al. (2013: 911) recommend that top managers conduct their “search in unfamiliar, distant, and diverse terrains and employ a persistent yet less effortful […] process” in order to increase firm innovativeness.

The non-significant effect regarding proactive search could be explained as a possible tendency of entrepreneurs to “over-search”. Over-searching has negative effects on innovation, as too many opportunities are identified, making it nearly impossible for the firm to manage and pay enough attention to all of them (Koput, 1997; Laursen & Salter, 2006). Therefore, over-searching limits innovativeness due to absorptive capacity and attention allocation problems (Koput, 1997; Laursen & Salter, 2006). Furthermore, under strong competitive pressure or in the case of firm performance falling below expectations, the entrepreneur might feel the need to proactively search intensively, which would negatively affect innovativeness (cf. Laursen, 2012). Thus, actionism, or activity for activity’s sake, could explain this non-significant effect. It is also possible that entrepreneurs can be overstimulated by information they acquired through intensive proactive searching, inhibiting their ability to selectively assess promising opportunities. In today’s world, we are flooded with information as a result of our constant access to digital technologies. This could intensify the problem of overstimulation even further. Another explanation for the non-significant effect could be that proactive search is often conducted in order to solve a specific problem rather than to find an innovative new opportunity (cf. Cyert & March, 1963).

Systematic search is said to be less costly and involves less risk. However, because risk and reward are inextricably intertwined (cf. Knight, 1921; Samuelsson, 2004), systematic search could also be less rewarding within the context of innovation. However, the findings show that a negative impact on the innovativeness of opportunities identified cannot be assumed. Hence, systematic search and innovativeness are not necessarily competing concepts. However, the constrained search domain seems to be a limiting factor regarding the likelihood to identify opportunities with a high degree of innovativeness.
Despite these findings, it can still be assumed that many innovative opportunities are recognized through deliberate and conscious information search behavior (cf. Drucker, 1998). However, the perceived degree of innovativeness of opportunities identified is potentially higher within the context of passive search.

The results of the *post hoc test* seem plausible, as especially innovative (i.e., Schumpeterian) opportunities emerge from changes in the environment (Hulbert, Gilmore, & Carson, 2013). Environmental dynamism is a breeding ground for discovering innovative opportunities (cf. Foo et al., 2015; Shane, 2003) while searching unconstrained and proactively. “Dynamism creates opportunities for a firm within its existing markets or in adjacent fields” (Zahra, 1993: 322). Opportunities in adjacent industries could especially be of high innovativeness, as entrepreneurs can combine unfamiliar combinations of information (cf. Nicholas et al., 2013; Park, 2015). The degree of environmental dynamism influences what kind of knowledge sources an individual uses (Laursen & Salter, 2006; Cohen & Levinthal, 1990). Furthermore, previous research has shown that exploratory innovation is enhanced in dynamic environments (Jansen et al., 2006). Information search and innovation are thus closely linked to environmental dynamism (Sidhu et al., 2007).

I contribute to the literature mainly in three ways. First, I contribute to the opportunity recognition literature, offering a new perspective on the role of information search behavior in the opportunity recognition process. I thereby answer a call by Dahlqvist and Wiklund (2011) investigating the role of information search behavior in opportunity variation. The findings contribute to an understanding of information search behavior and entrepreneurial behavior in general. My findings specifically deepen our understanding of the construct of passive search behavior and Kirzner’s (1979) alertness theory. Moreover, my research offers further insights into the ongoing controversial debate of what types of information search behavior are most beneficial (cf. Fiet & Patel, 2008). In contrast to most existing research, I assessed opportunities in terms of their perceived quality rather than quantity (cf. DeTienne & Chandler, 2004; Gruber, MacMillan, & Thompson, 2012). Furthermore, my research enhances scholars’ understanding of the individual-opportunity nexus (cf. Grégoire & Shepherd, 2012; Smith, Matthews, & Schenkel, 2009).

Second, my research adds to the innovation literature by providing evidence of information search behavior as a determinant of entrepreneurial innovativeness (Cliff...
et al., 2006; Koellinger, 2008). I further add value to existing studies investigating important antecedents of innovative opportunities (e.g., Samuelsson & Davidsson, 2009; Smith et al., 2009). My findings support the study of Koellinger (2008: 21), who found that “entrepreneurial innovativeness depends both on individual factors and on the environment”. Hence, my findings contribute to the important question of why some entrepreneurs recognize innovative opportunities while others do not (cf. Koellinger, 2008).

Third, I contribute to the literature by investigating a key moderator of opportunities (Short, Ketchen, Shook, Ireland, 2010), namely, environmental dynamism. The findings advance scholars’ previously limited knowledge about the role of the industry environment within the context of information search and identifying innovative opportunities (cf. Terjesen & Patel, 2014).

5.8. Limitations and Suggestions for Further Research

My research is subject to limitations. I asked respondents to evaluate the innovativeness of the opportunity identified. I cannot assume that such subjective perceptions precisely reflect objective evaluations of the opportunities (cf. Hsieh & Kelley, 2016; Renko et al., 2012). I only asked the owner-managers themselves to judge the degree of innovativeness. Customers, suppliers or competitors might have a different perception. However, the surveyed owner-managers reported, on average, a work experience of 24 years in the medical technology industry. This substantial amount of experience strengthens the validity of their evaluations. The findings are likely to be generalizable to high-technology industries, such as computer engineering, pharmaceutical or aerospace engineering, where the challenges/circumstances in searching for new innovations are similar (cf. Katila & Ahuja, 2002). However, I cannot assume that they are generalizable to non-high-tech industries or other countries than Switzerland, Germany and Austria.

Future research could investigate and compare further antecedents influencing the innovativeness of opportunities. It would also be interesting to assess the differences among novice and serial entrepreneurs in this context. Also, research could investigate whether the findings of this study hold stable in less-competitive industries or in developing countries. Moreover, it would be interesting to examine how types of
search behavior impact other outcomes, such as the number of identified opportunities or their perceived feasibility. Another fruitful avenue for future research would be to look at imitative opportunities. Such opportunities have the potential to be of great economic value as well (Koellinger, 2008). Future studies could investigate whether there is a significant relationship between information search behavior and the identification of imitative opportunities.

Moreover, longitudinal studies examining under what circumstances entrepreneurs adapt their search behavior would enhance scholars’ understanding of the underlying processes. It could also be interesting to assess whether the frequency of using a specific type of information search behavior influences the quality of the opportunities identified. Katila and Ahuja (2002) suggest that the reuse of existing knowledge is detrimental to successful information search. This could imply that the number of identified innovative opportunities is negatively related to the frequency of usage of systematic search, where the entrepreneur relies primarily on his specific preexisting knowledge (cf. Fiet, 2007).

Also, research could examine the “dark side” of entrepreneurial information search behavior. Such research could investigate under what circumstances entrepreneurs tend to under- or over-search, leading to detrimental outcomes (cf. Laursen, 2012; O'Reilly & Pondy, 1979). Such circumstances could be time pressure or resource constraints (Koput, 1997).

5.9. **Implications for Practice**

Entrepreneurs are provided with specific information to scrutinize and optimize their individual search for opportunities, which is a manageable and learnable process (Fiet et al., 2005; Fiet, 2002). This also applies to the concept of passive information search (cf. Baron, 2006; DeTienne & Chandler, 2004). Entrepreneurship courses could teach entrepreneurs about benefits of different information search behaviors. It is an important finding that passive search behavior leads to opportunities with the highest degree of perceived innovativeness. Passive search is characterized by open non-restricted search for information. The entrepreneur does not restrict the scope of search and does not exclude specific information channels. Entrepreneurship courses could
try to teach future entrepreneurs how to conduct information search without restricting its scope.

Nonetheless, it may well be argued that the benefits of passive search are increasingly undermined, which can be illustrated by the example of searching the internet. The internet has become a primary source for entrepreneurs' information search activities (Shoham, Baruchson-Arbib, & Gouri-Oren, 2006). Passive information search is often conducted online (De Bruijn & Spence, 2001; Nonnecke & Preece, 2000). Paradoxically, standard internet search engines could be conceived as an obstacle to unrestricted passive information search. The individual search window is severely limited by algorithms (cf. Moshe & Hel-Or, 2006). Without realizing it, algorithms create unwanted “consideration sets” similar to those found during systematic search behavior, possibly limiting the entrepreneur’s ability to identify disruptive or innovative opportunities. The likelihood of finding information that is completely new and unrelated to one’s previous search history becomes increasingly unlikely. Algorithms draw conclusions based on past search behavior and are thus “backward-looking”, limiting the entrepreneur in his ability to “think outside the box”. Therefore, the entrepreneur should be especially alert to external factors inattentionally constricting his scope of search. This makes it important for entrepreneurs not to restrict their search to specific search channels such as the internet.

This challenge can be further illustrated by the example of Polaroid. Polaroid was unable to make the shift to digital imaging, as their corporate executives exhibited cognitive inertia (Tripsas & Gavetti, 2000). The managers at the time discouraged search for alternatives that lay outside the existing knowledge base of Polaroid (Tripsas & Gavetti, 2000). Similar to the effects of algorithms, Polaroid was unable to reframe its perspective of the search space, and the company suffered from inattentional blindness (Nicholas et al., 2013).

It seems obvious that the search scope of any individual is naturally constrained by prior knowledge or time (cf. Fiet, 2007). However, my findings suggest that entrepreneurs should not unnecessarily and actively constrain their information search scope if they intend to identify highly innovative opportunities. This means that the decision of the entrepreneur of what type of search behavior he should perform is closely related to his or her goals. Passive search is not necessarily “the most
beneficial” search behavior. The search costs may be higher compared to systematic search, and the number of identified opportunities could be lower with respect to proactive search. It can be said, though, that passive search is most expedient for entrepreneurs intending to disrupt an entire industry or trying to identify especially innovative opportunities conferring competitive advantages.
5.10. Appendix

**Table 21. Entrepreneurial Information Search Behavior Scale**

<table>
<thead>
<tr>
<th>Entrepreneurial Information Search Behavior</th>
<th>Passive Search (alpha = .62)</th>
<th>Proactive Search (alpha = .72)</th>
<th>Systematic Search (alpha = .75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I studied general topic-related information (such as trade fairs or specialized literature) while not intentionally searching for a business idea.</td>
<td>1. I intentionally searched for customer needs for which I have developed a solution subsequently.</td>
<td>1. I intentionally restricted my search for a business idea to particular information channels (e.g. internet, journals, personal network).</td>
<td></td>
</tr>
<tr>
<td>2. While I wasn't intentionally searching for a business idea, I identified a business idea in conversations with people known and/or unknown to me.</td>
<td>2. I intentionally took time to search for a business idea.</td>
<td>2. I intentionally restricted my search for a business idea to particular information channels that relate to my specific knowledge.</td>
<td></td>
</tr>
<tr>
<td>3. I can’t tell exactly how I identified the business idea; rather, I spontaneously came up with the idea.</td>
<td>3. I intentionally questioned existing solutions (own and/or competitors’ solutions) in order to identify a business idea.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Employees unrequestedly approached me with new information, which then led to a business idea.</td>
<td>4. The intention of the search was to leverage my company’s strengths to develop a business idea.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Suppliers unrequestedly approached me with new information, which then led to a business idea.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Responses were rated on a five-point Likert scale (1 = “does not apply at all” to 5 = “fully applies”).

**Table 22. Competitive Intensity Scale**

<table>
<thead>
<tr>
<th>Competitive Intensity (alpha = .83)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Competition in our local market is intense.</td>
</tr>
<tr>
<td>2. Our organizational unit has relatively strong competitors.</td>
</tr>
<tr>
<td>3. Competition in our local market is extremely high.</td>
</tr>
<tr>
<td>4. Price competition is a hallmark of our local market.</td>
</tr>
</tbody>
</table>

The scale builds upon the measure developed by Birkinshaw et al. (1998) and Jaworski and Kohli (1993). Amongst others, it has been used by Jansen et al. (2006) and Kammerlander et al. (2015). Responses were rated on a 7-point Likert scale (1 = “strongly disagree” to 7 = “strongly agree”).
Table 23. Environmental Dynamism Scale

Environmental Dynamism (alpha = .72)

1. Environmental changes in our local market are intense.
2. Our clients regularly ask for new products and services.
3. In our local market, changes are taking place continuously.
4. In a year, everything has changed in our market.
5. In our market, the volumes of products and services to be delivered change fast and often.

The scale was originally developed by Dill (1958) and Volberda and Van Bruggen (1997). Amongst others, it has been used by Jansen et al. (2006). Responses were rated on a 7-point Likert scale (1 = “strongly disagree” to 7 = “strongly agree”).

Table 24. Innovativeness of Opportunities Scale

Innovativeness of Opportunities (alpha = .78)

1. There is a large group of customers that already uses a very similar product/service.*
2. Our product/service represents an entirely new type of product/service.
3. Our product/service may be described as a new technology.
4. Our product/service is a gradual progression upon the last generation.* †
5. Our product/service meets a want or need that has not been addressed by other products/services.
6. Our product/service could be described as a product line extension.* †
7. Our product/service is a new twist on an old theme.* †

The scale was developed by Marvel and Lumpkin (2007). Responses were rated on a five-point Likert scale (1 = “strongly disagree” to 5 = “strongly agree”).

* = reverse coded
† = excluded due to unintended cross loading
6. Concluding Chapter

6.1. Contributions

This chapter addresses and summarizes key contributions made by the cumulative dissertation from theoretical and practical perspectives. All contributions are discussed in detail in respective chapters of the papers.

*Paper one* makes two important theoretical contributions. First, the paper clearly differentiates between distinct types of information search by discussing differences and common features. The paper in turn offers conceptual clarity to the domain of entrepreneurial information search behaviors, allowing entrepreneurs to gain a common understanding of this important construct. Second, we provide academics with a rigorous measurement instrument that enables them to study antecedents and outcomes of information search behavior. As a result, scholars can begin to answer important questions of entrepreneurship research such as the following: Why do some entrepreneurs identify opportunities while others do not, and how do entrepreneurs search for information to identify opportunities? (cf. George et al., 2016).

Practitioners mainly benefit in two ways. First, entrepreneurship training involves the use of a new and valid instrument designed to educate (future) entrepreneurs on different types of information search behaviors and on their potentially beneficial or detrimental effects on opportunity recognition. This could help entrepreneurs become more efficient in recognizing promising opportunities. Second, the tool allows entrepreneurs to reflect on their individual information search behaviors. They can in turn become more aware of their own behaviors in the context of opportunity recognition, which assists them in their efforts to optimize and facilitate their searches for information.

*Paper two* of the dissertation mainly contributes to two distinct streams of literature. First, the paper offers insight into important “why” questions of the opportunity recognition and information search literature. The findings contribute to controversial debates around questions of why some entrepreneurs identify opportunities while others do not (George et al., 2016; Shane & Nicolaou, 2015; Vandor & Franke, 2016). Furthermore, in light of the paper’s title, the research conducted further scholarly understanding of why entrepreneurs search for information on opportunities in the ways they do. The paper thereby provides insight into key underlying processes of
opportunity recognition and information search behavior. Moreover, paper two clarifies effects of contextual factors in the context of opportunity identification. Second, the paper contributes to the cognition and more specifically to the regulatory focus theory literature by showing how entrepreneurs’ regulatory foci relate to their preferences for certain types of search behaviors.

From a practical perspective, paper two contributes to entrepreneurial knowledge of how entrepreneurs’ regulatory focus inclinations influence their search for information. Prevention-focused people especially benefit, as they can actively practice promotion focus-enhancing techniques (Bryant, 2007) to enhance their likelihood of identifying opportunities. Likewise, entrepreneurship courses can apply such techniques and can support entrepreneurs in their information search efforts. In addition, firms can be motivated to hire promotion-focused CEOs when they must identify more opportunities.

**Paper three** advances the opportunity recognition and innovation literature. The paper answers a call made by Dahlqvist and Wiklund (2011) to examine how information search relates to different characteristics of opportunities identified. The findings are of considerable importance to scholarly understanding and perceptions of the constructs of passive search and entrepreneurial alertness (Kirzner, 1979). Moreover, paper three offers explanations to the ongoing debate on the merits of different information search behaviors (cf. Fiet & Patel, 2008). The paper also extends academic knowledge of the individual-opportunity nexus (cf. Grégoire & Shepherd, 2012). The innovation literature is advanced by showing that information search behaviors constitute a central precursor of innovative opportunity identification (Samuelsson & Davidsson, 2009) and of entrepreneurial innovativeness in general (Cliff et al., 2006). Furthermore, the paper fills a key research gap (cf. Terjesen & Patel, 2014) by clarifying how environmental factors relate to the interplay of search behaviors and to the innovativeness of recognized opportunities.

Entrepreneurs themselves benefit as they are provided with specific information needed to optimize their individual search for opportunities. Entrepreneurs striving to identify highly innovative opportunities are more likely to achieve their goals by relying on the findings of paper three. Practitioners attempting to innovate can follow the recommendation to not restrict their search space unnecessarily. Likewise, the paper shows entrepreneurs that technologies which they use every day such as search
algorithms can limit their abilities to identify highly innovative opportunities by causing “inattentive blindness” (Nicholas et al., 2013: 28).

6.2. Limitations

The research presented in the three academic papers is subject to limitations. The main limitations of each paper are highlighted in this section.

The scale of paper one focuses on one specific industry, namely, the medical technology industry. Thus, it cannot be assumed that the measurement instrument proposed is applicable to less dynamic or competitive industries. Further testing is also required to assess whether the scale constitutes a valuable tool for measuring information search behaviors in a start-up context.

In paper two, regulatory focus is measured with the instrument provided by Higgins et al. (2001). However, the RFQ is one of many valid instruments that measure individual self-regulation (Haws et al., 2010). Hence, the results of the study may deviate when different measures are employed. Moreover, an individual’s regulatory focus is dependent on his or her cultural background, which limits the applicability of the findings to other contexts (Fiske & Taylor, 2013; Kurman & Hui, 2011).

In paper three, it is shown that survey participants made subjective assessments regarding the innovativeness of the identified opportunities. These evaluations are based on individual experiences and perceptions and are not necessarily objective. Nonetheless, the survey participants’ substantial average levels of industry experience (over 20 years) serve as an indication of the validity of their assessments. Furthermore, it cannot be assumed that the findings are generalizable to different cultures or industries.

6.3. Future Research

This chapter highlights research areas of great promise that academics could address in future studies.

The developed instrument in paper one invites researchers to conduct further validation studies and to test the scale for different industries and contexts. Scholars should be encouraged to use the new instrument to examine antecedents and outcomes of information search behaviors. Similarly, the search behaviors of different “types” of
entrepreneurs can be investigated (cf. Ucbasaran et al., 2001). Such studies could help advance our understanding of how search behaviors are related to contextual factors and to different individual traits or characteristics.

*Paper two* of the cumulative dissertation offers distinct recommendations for further research. Scholars could delve further into assessing other antecedents of entrepreneurial information search behaviors such as prior knowledge related to opportunity recognition (e.g., Shane, 2000). In this regard, the behaviors of serial and novice entrepreneurs could be compared. Moreover, studies investigating whether and how entrepreneurs combine search behaviors for opportunity recognition could provide academics with important insights into processes of information search. Additionally, studies of impacts of other contextual factors on information search (e.g., competition levels and national cultures) could constitute valuable next steps for future research efforts.

Promising avenues for further research can be derived from the findings of *paper three*. Studies could further explore antecedents of innovative opportunities and could determine to what extent such antecedents relate to the recognition of innovative opportunities. Interesting findings could result from future studies on how information search impacts other outcomes such as the number of identified opportunities or their perceived feasibility. As imitative opportunities involve lesser identification efforts than innovative opportunities, entrepreneurs are more likely to engage in searches to identify imitative opportunities (Bradley, McMullen, Artz, & Simiyu, 2012). In this regard, academic research could investigate which types of search behavior are influencing the recognition of imitative opportunities. Finally, future studies could examine the “dark side” of information search behaviors by exploring how different degrees of search intensity can have detrimental outcomes (cf. Laursen, 2012).

### 6.4. Conclusion

This cumulative dissertation shows that the construct of entrepreneurial information search behavior is much more comprehensive than suggested by previous research. The dissertation makes a significant contribution to academic understanding of entrepreneurial information search behaviors by developing and validating a measurement instrument and by investigating key antecedents and outcomes of information search. It is also of great practical importance to entrepreneurs themselves,
as information search constitutes a key determinant of entrepreneurial success and influences opportunity recognition processes. The findings of the three papers and the newly developed scale enable scholars to thoroughly study and analyze entrepreneurial information search behaviors. In this regard, scholars are encouraged to conduct research to further our understanding of this important concept.
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