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A framework for the opportunity recognition process in UK entrepreneurial universities

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ABSTRACT

This study aims to develop an empirical framework for the opportunity recognition process in UK entrepreneurial universities. Initially, a conceptual framework was developed resulting from reviewing the literature relating to the factors that determine the opportunity recognition process as well as the factors that differentiate entrepreneurial universities. The framework was also affected by the principles of Resource-Based Theory (RBT), which underpins the present study. A multiple case study approach was adopted to validate the above-mentioned framework. Data was collected by using three main methods: website content, documented secondary data, and twenty-five semi-structured in-depth interviews with enterprise/entrepreneurship centres directors and academic deans (each lasted between 41 and 109 min). Two techniques were used to analyse the data: Template Analysis (TA) and Framework Analysis. The findings show that in addition to the identification of the factors that determine the opportunity recognition process, it is vital to consider the context when recognizing entrepreneurial opportunities, and it is important to find an optimal mixture of resources/capabilities to guarantee effectiveness in the process of entrepreneurial opportunity recognition.

1. Introduction

UK universities face the challenge of operating in a complex and ever-changing environment, leading to growing uncertainty and the prospect of troubled times ahead (Jones and Patton, 2020; Jones et al., 2021). They therefore need to behave entrepreneurially and signal such behaviour to their stakeholders and the surrounding community (Audretsch and Belitski, 2021). The complexity is increased by there being no agreement on an overarching definition of entrepreneurship. It may therefore be argued that 'entrepreneurial endeavours' are not an absolute but a continuum of behaviours that range from Kirznerian market adjustment to Schumpeterian waves of creative destruction.

Previously, entrepreneurship in the university context focused more on commercialising innovations, establishing incubations, and entering into joint ventures with business companies (Etzkowitz, 2004). At present, the focus has extended to cover the encouragement and enablement of staff, students, and alumni to be more entrepreneurial (Guerrero, Urbano, & Gajón). Additionally, senior staff are expected to behave entrepreneurially when formulating and implementing strategies (Novela et al., 2021).

Despite the wide range of research presented in the entrepreneurship literature on opportunity recognition and the entrepreneurial

university, some gaps still need to be addressed. The most significant of these is that too few studies highlight how entrepreneurial opportunities can be recognized in the context of entrepreneurial universities; the existing studies do not explain this process well. Further gaps need to be considered in relation to individual phenomena. The literature on opportunity recognition, for instance, shows that a considerable number of factors determine the opportunity recognition process. This has made it challenging to develop a model that covers a reasonable number of these factors. Also, the large number of factors present may be one of the main reasons for inconsistent and rival views on the opportunity recognition phenomenon. This gap may serve as a catalyst to devise a different way of developing models to address issues in the opportunity recognition process, and then to find a connection between factors that appear to be unrelated. This may be done by underpinning research with a flexible theory that can provide such a connection.

At the same time, the entrepreneurial university literature lacks an explicit framework to address the criteria used to determine whether a university is entrepreneurial. Yet the National Centre for Entrepreneurship in Education (NCEE) and the University Industry Innovation Network (UIIN) both consider these criteria, for which each of them has developed its own framework. These two frameworks have not been extensively tested through academic research; rather they have been

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used in practice to judge whether universities are entrepreneurial. Using these frameworks in academic research can therefore add to the extant body of knowledge.

To contribute bridge all the above-mentioned gaps, the present research adopts the Resource-Based Theory (RBT) to investigate entrepreneurial opportunity recognition in five UK entrepreneurial universities.

The major significance of the present research is therefore that it develops a more rigorous framework for the criteria that can be used to determine whether a university is entrepreneurial. It also adds greater clarity to the six most discussed factors determining the opportunity recognition process in the entrepreneurship literature. In addition, it extends RBT to consider the link between the opportunity recognition process and the entrepreneurial university context. It then develops an empirical model that can be used by universities that believe in entrepreneurialism, with a view to recognizing entrepreneurial opportunities.

This study has also important practical significance as it provides a clearer picture for senior staff at the UK entrepreneurial universities regarding using their capabilities and resources available in their universities to recognize entrepreneurial opportunities. It also helps these staff maintain their entrepreneurial status by considering the outcome of the present research regarding the criteria used to judge whether universities are entrepreneurial. Furthermore, it helps the senior staff of non-entrepreneurial universities to understand what is required to move towards the entrepreneurial university model. Additionally, it can help the NCEE update the criteria they use to choose the winner of the Times Higher Education (THE) entrepreneurial university of the Year Award.

Thus, this paper seeks to develop a framework for the opportunity recognition process in UK entrepreneurial universities. To achieve this aim, the present paper answers the following research question: *How can entrepreneurial opportunities be recognized in UK entrepreneurial universities?* Four sub-questions are designed out of this question: (a) What are the factors that determine the opportunity recognition process? (b) What are the contextual factors associated with entrepreneurial universities? (c) How do these contextual factors impact the factors that determine the opportunity recognition process? (d) What are the most important resources/capabilities required for the opportunity recognition process?

To pave the way to answer these questions, firstly the literature is reviewed, and a conceptual framework is developed. Then, the methodological considerations are clarified. Thereafter, the findings are presented and discussed. Afterwards, an empirical model is established. Finally, conclusions are drawn.

2. Literature review

2.1. Entrepreneurial opportunity recognition

There is a lack of agreement on what constitutes the concept of entrepreneurial opportunity recognition (Filser et al., 2020; Glavas et al., 2017; Siegel and Renko, 2012). Hills and Singh (2004, p. 20) define opportunity recognition as “perceiving a possibility for new profit potential through the founding and forming of a new venture, or the significant improvement of an existing venture”. This definition indicates that opportunity recognition is not only required for creating new ventures; it can also be required after a venture is established, or during the life cycle of the firm. This definition also pays a great deal of attention to seeking lucrative opportunities. This is supported by the views of Barringer and Ireland (2016, p. 78), who define opportunity recognition as “the process of perceiving the possibility of a profitable new business or a new product or services”.

Baron (2006, p. 107) views opportunity recognition as “the cognitive process (or processes) through which individuals conclude that they have identified an opportunity”. In light of this definition, it can be claimed that a large part of opportunity recognition indicates the situation of identifying. This definition also elucidates that opportunity

recognition focuses on using mental capabilities to create a prospect, which helps individuals to be sure that an opportunity is worth exploiting. In addition, this definition confirms that opportunity recognition is a process. Accordingly, it can be claimed that a group of steps is required for recognizing an entrepreneurial opportunity. This is in line with Foss and Foss, (2008), who argue that opportunity recognition is a process, which consists of a group of overlapping phases that require significant endeavour, knowledge, and investment.

Kuckertz et al., 92 show that opportunity recognition “is characterized by being alert to potential business opportunities, actively searching for and gathering information about them, communicating them, addressing customer needs and evaluating the viability of such potential entrepreneurial activities”. This definition provides a focus that is more on the factors that facilitate the process of opportunity recognition. Thus, this definition supports the idea of the importance of investigating the factors that determine the opportunity recognition process, to better understand the concept of opportunity recognition.

After reviewing the related literature and evaluating the available definitions of entrepreneurial opportunity recognition, the author believes that the most suitable definition for entrepreneurial opportunity recognition is that it is a process of perceiving lucrative and achievable opportunities by which a business concept can be established.

Recognizing entrepreneurial opportunities by only some people (not everyone) has gained great attention by the entrepreneurship scholars (Bhagavatula et al., 2010; Faroque et al., 2020; Foss and Klein, 2020; Lim and Xavier, 2015). Such an ability can be impacted by several factors, which have been examined by several researchers (see Appendix 1). However, they followed a ‘partial analysis approach’ when conducting their studies. This resulted in investigating the impact of a small number of these factors (or only one of them sometimes) on the opportunity recognition process (García-Cabrera and García-Soto, 2009; Park, 2005). Following the above-mentioned approach could be due to having many factors that determine the opportunity recognition process, both controlled and uncontrolled factors (Hills et al., 2004), or individual and environmental factors (Wang et al., 2013). Grégoire et al. (2010) believe that two questions need to be considered when identifying opportunity recognition factors. The first one is: what are the key factors that facilitate the opportunity recognition process? The second question is: why such factors provide this facilitation?

Appendix 1 shows that great attention has been paid to six factors that determine the opportunity recognition process. First, prior knowledge is a central cognitive resource in opportunity recognition (Rauch et al., 2018). It refers to the individuals’ whole knowledge at a certain time (Arentz et al., 2013). Such knowledge considers two domains: special interest knowledge and industry knowledge (Hills et al., 1999). The latter includes three aspects: knowledge about markets, knowing the methods of serving these markets, and knowledge about customer issues (Shane, 2000). Prior knowledge helps organizations to be more innovative (Darroch, 2005; Du Plessis, 2007; McAdam, 2000). From the RBT perspective, the above knowledge is viewed as two domains as well: general human capital and specific human capital. The latter involves specific industry ‘know-how’, management ‘know-how’, business ownership experience, and knowing how to gain financial resources (Westhead et al., 2011).

Second, networking (both internal and external) helps individuals to be intermingled with the surrounding environment (García-Cabrera and García-Soto, 2009). Third, entrepreneurial alertness which is resulted from “alert scanning and search, alert connection and association and judgement and evaluation” (Tang et al., 2012, p. 79). Fourth, external environment changes lead to emerging new opportunities (Buenstorf, 2007; Shepherd and DeTienne, 2005). Responding to these changes needs being quick (Zaheer and Zaheer, 1997), proactive (Navarro and Gallardo, 2003) and ready to take risks (Neill et al., 2017). Fifth, systematic search for opportunities. This notion, however, is challenged by the serendipitous discovery approach (Ardichvili and Cardozo, 2000; Ardichvili et al., 2003). Sixth, creativity which requires teamwork

(Folkestad and Gonzalez, 2010; Robinson, 2011), positive effects (Baron, 2008), producing valuable and novel ideas (Barringer and Ireland, 2016; Heinonen et al., 2011; Koch et al., 2018), considering people's needs (Barringer and Ireland, 2016), and recruiting creative individuals (Shane and Nicolaou, 2015).

There are some interactions between the above-mentioned factors: external environment changes and entrepreneurial alertness, prior knowledge, creativity, and networking (Barringer and Ireland, 2016); prior knowledge and networking (Hisrich et al., 2013); creativity and networking (Ardichvili et al., 2003); networking and systematic search (Ozgen and Baron, 2007); entrepreneurial alertness and networking (Adomako et al., 2018; Ardichvili et al., 2003; Khare and Joshi, 2018; Zaheer and Zaheer, 1997); systematic search and external environment changes (Brouthers et al., 2015); entrepreneurial alertness and prior knowledge (Ardichvili and Cardozo, 2000; Hulbert et al., 2015); prior knowledge and creativity (Shepherd and DeTienne, 2005); and creativity entrepreneurial and alertness (Obschonka et al., 2017).

2.2. Entrepreneurial university

The entrepreneurial university phenomenon has been defined in various ways (Guerrero and Urbano, 2012; Kirby et al., 2011; Meyers and Pruthi, 2011). This results in having no consensus on a single definition for this phenomenon (Jaminki, 2017; Kirby et al., 2011; Klofsten et al., 2019; Sánchez-Barrioluengo, Uyarra, & Kitagawa, 2019; Bezanilla et al., 2020). In this connection, Jones & Patton (2020) argue that entrepreneurial university is a vague notion. Clark, (1998) sees an entrepreneurial university as an institution that seeks innovative business, a fundamental transformation in organizational character, promising future and being a 'stand-up' university. Whereas, Zhou and Peng (2008) believe that it is the university that impacts the process of industry and economic regional development through employing high-tech entrepreneurship, which is based on entrepreneurship capacity, impactful research, and technology transfer.

Etzkowitz (2013) defines an entrepreneurial university as a phenomenon that emphasizes expanding the role of the universities from a conservator to an originator of knowledge. On the other hand, Sam and van der Sijde (2014) describe an entrepreneurial university as an institution that plays a significant role in developing society as well as the innovation (eco) system. By the same token, de Araujo Ruiz et al., (2020) define an entrepreneurial university as an institution that is integrated into an innovative and entrepreneurial ecosystem and has the capability to innovate, change and recognize and create opportunities.

Analysing the available definitions helped the author to develop a definition for entrepreneurial universities that they are the universities that search for new sources of funding and pay great attention to innovation when carrying out their activities in order to have a positive impact on the economy and surrounding society.

There are five views on entrepreneurial university criteria, four of them have not been considered by the conceptual framework of the present study because they have not provided a comprehensive picture of the criteria that should be considered when deciding whether a university is entrepreneurial. This study adopts the NCEE framework for deciding whether a university is entrepreneurial for three reasons. Firstly, it is based on academic work (the work of (Gibb, 2012)). Secondly, it is used to choose the winners of the THE Entrepreneurial University of the Year Award. Thirdly, it is the most comprehensive framework regarding the criteria used to decide whether a university is entrepreneurial. The NCEE framework includes several criteria distributed over four main groups: (1) vision and strategy (entrepreneurship, enterprise, and innovation occupy an important part of the institutional strategy); (2) culture and mindset (a supportive environment for entrepreneurial behaviours and mind-sets is provided for both students and staff); (3) entrepreneurial impact (entrepreneurial universities seek for having a positive impact on the economy and the surrounding society); and (4) policy and practice: entrepreneurial universities influence

Table 1

The focus of several authors on the factors relating to the entrepreneurial university.

The focus	Author(s)
Considering entrepreneurialism into the strategy	Bezanilla et al. (2020) and Gibb (2012)
Considering entrepreneurial teaching	Heinonen & Hytti (2010) and Sancho et al. (2021)
Establishing an atmosphere for supporting entrepreneurial activity	Kalar & Antoncic (2015)
Conducting impactful research	Clauss et al. (2018) and Romero et al. (2021)
Having strong joint work with industry	Czarnitzki et al. (2015)
Contributing to the development of the surrounding society	Charles (2003), Guerrero et al. (2015), Leih & Teece (2016), Romero et al. (2021), Zhou & Peng (2008), and Sánchez-Barrioluengo & Benneworth(2019)
Impacting on the economy positively	Urbano & Guerrero (2013), Pinheiro & Stensaker (2014) Sam & van der Sijde (2014), Guerrero et al. (2015); Zhou & Peng (2008), Gibb (2009), Nelles & Vorley (2010), Etzkowitz (2013), Etzkowitz, 2017, and O'Reilly et al. (2019)
Having entrepreneurial staff	Gibb & Hannon (2006), Guerrero & Urbano (2012), and Williams & Kluev (2014).

Source: Author.

policy at all levels and they demonstrate good practices and effectiveness (NCEE, 2018). In this connection, different authors provide various views relating to the criteria of the entrepreneurial university. Table 1 summarizes a few examples relating to these views.

2.3. Opportunity recognition and entrepreneurial university

Reviewing the literature shows that there have not been sufficient studies that consider the opportunity recognition process in the context of entrepreneurial universities. Furthermore, the existing studies do not provide sufficient detail about those resources required for the above-mentioned recognition, as well as the factors that determine the process. amongst the studies that realize the importance of opportunity recognition for the universities who behave entrepreneurially is conducted by López (2013) who developed a model for encouraging and facilitating the development of commercialization at universities, and thus helps in shifting to the entrepreneurial university model. This model shows that opportunities sources in universities are the faculty and students, individuals with patent grants and industry partners. In addition, this model highlights that the first step to developing commercialization at universities, and of course for being an entrepreneurial university, is opportunity recognition and discovery. Developing this model shows that commercial resources are required for identifying and exploiting entrepreneurial opportunities by entrepreneurial universities. This model also indicates that providing the most recent technologies may assist in recognizing opportunities, as these applications might create new businesses

Another argument that highlights the importance of opportunity recognition in entrepreneurial universities is presented by de Araujo Ruiz, et al. (2020) who argue that recognizing opportunities is one of the main characteristics of entrepreneurial universities. Likewise, Sam and van der Sijde (2014), argue that entrepreneurial universities are vigorously recognizing and exploiting opportunities in order to develop themselves (in terms of education and research) and their environment (third mission: transmission of knowledge), and they are further able to organise the reciprocal dependency and to maximise the impact of the university's third mission. One way for universities to achieve the above-mentioned impact is to enhance research ambidexterity. This has been connected to the entrepreneurial university context by Chang et al. (2016), who consider the individual antecedent for developing

ambidexterity as opportunity recognition. They find that there is a positive and significant correlation between opportunity recognition and individual research ambidexterity. Accordingly, universities' members can facilitate research ambidexterity through developing their opportunity recognition capabilities. Doing so alongside organizational and institutional support (e.g. the provision of better resources) can play a considerable role in becoming entrepreneurial universities.

In terms of the factors that determine opportunity recognition in universities, Franzoni (2007) argues that competencies and information existing in teaching and research activities are considered sources of outstanding opportunity recognition. This argument shows the importance of knowledge in recognizing opportunities within different contexts. In this respect, Vohora et al. (2004) find that although universities and academics possess considerable technological experience, there has not been adequate knowledge about how the market can be served, and there are no realistic expectations about the earnings that can be obtained from their discovered technology. The above argument shows that universities need to possess the two domains of knowledge, that is, special interest knowledge and industry knowledge, in order to be effective in recognizing opportunities.

3. Theoretical underpinning: resource-based theory

RBT looks to a firm as comprising of a historically specified heterogeneous assortment of resources/assets attached to the management of that firm (Vohora et al., 2004). Helfat and Peteraf (2003) contend that both theoretical and empirical studies of RBT consider both organizational resources and capabilities. Ray et al. (2004) argue that the terms 'capabilities' and 'resources' are used interchangeably. Over different periods in the organization's life cycle, these resources and capabilities may be subject to evolution and change in a way that benefits the organization (Helfat and Peteraf, 2003).

Concerning the benefits provided by the resources and capabilities to the organizations/firms, Barney (1991) argues that not all of a firm's resources can contribute to sustained competitive advantage. At most, resources that can make such a contribution must have four characteristics or requirements: valuable, rare, imperfectly imitable, and sustainability. However, Barney in his work with Clark in (2007) considers sustainability as a complementary requirement to 'imperfectly imitable' and they believe that organizing the resources can be the fourth requirement for realizing sustained competitive advantage. Newbert (2007) argues that although there is an indispensable need for firms to own valuable, rare, inimitable, non-substitutable resources and capabilities, this is not enough, because firms need to be able to improve these resources in a way by which their full potential can be recognized; thus achieving competitive advantage. In this context, it can be argued that the nature and quality of the possessed or acquirable resources/-capabilities have a considerable role in achieving long-term success (Dollinger, 2003).

In terms of the types of the above-mentioned resources, Barney (1991) divided firms' resources into three groups: human, physical and organizational capital resources. However, as work on RBT has progressed, new groups have emerged. For example, Mills et al. (2003) categorize organizational resources into six groups: tangible resources, knowledge resources, skills and experience, cultural resources, and values, networks resources and resources with potential dynamic capability. By reviewing the work of Newbert (2007), who systematically assesses RBT grounded empirical articles, a large number of new groups of resources/capabilities can be found, for example entrepreneurial resources, managerial resources, the economics of scale, reputation, racial diversity, top management team, technological resources, innovate capabilities, IT, information acquisition. Recently, Kellermanns et al. (2016) provide a comprehensive picture of resources/-capabilities addressed in RBT. They identify a considerable number of resources/capabilities, which are classified into five groups: Human capital, organizational capital, financial capital, physical capital and

relationship capital.

The above classifications show that the resources/capabilities that can be possessed or acquired by firms are numerous. The present study takes into consideration those resources that are required to deal with factors that determine the entrepreneurial opportunity recognition process.

4. The conceptual framework

The conceptual framework is a combination of the six factors (and sub-factors) that determine the opportunity recognition process¹ and the factors (and sub-factors) associated with entrepreneurial universities.² This framework is also impacted by the RBT principle as is shown in Fig. 1.

For RBT, the idea of finding an optimal mixture of resources/capabilities is the most obvious RBT principle considered in the conceptual framework (Vohora et al., 2004). These resources/capabilities are decided by considering both opportunity recognition determinants and contextual factors. The aforementioned mixture may vary when recognizing different opportunities types because some opportunities can be affected more by particular factors compared to the others. For example, some opportunities may depend more on creativity (Shane and Nicolaou, 2015), others may rely on networking (Franzoni, 2007) and so on. Therefore, there is no one scenario for the process of opportunity recognition (de Jong and Marsili, 2015; Glavas et al., 2017), but that does not mean that the main idea/principles are different. This is because, according to the conceptual framework of the present paper, the process for recognizing all types of opportunities is determined by several factors that are relevant for all contexts; however, it may also be impacted by contextual factors. In addition, the beliefs of opportunity recognizers may influence this process (Saravathy et al., 2010). Those beliefs, according to the present paper, are associated with the importance of resources/capabilities for facilitating the process of opportunity recognition.

5. Methodology

5.1. Research strategy

Following the qualitative approach, the present multiple case study was conducted. The decision to follow the case study strategy was made due to three reasons. Firstly, it is considered an appropriate approach to deal with 'why' and 'how' questions (Yin, 2014). Thus, it helps with answering the research question of the present study, which is related to 'how' questions. Secondly, this strategy provides detailed and in-depth descriptions of a social phenomenon (Yin, 2014). This can contribute significantly to making sense of the opportunity recognition concept in which rival and diverse views exist (Siegel and Renko, 2012) and also the entrepreneurial university phenomenon, which lacks a universal agreement by the entrepreneurship scholars (Jaminki, 2017; Kirby et al., 2011; Klofsten et al., 2019; Sánchez-Barrioluengo, et al., 2019). Thirdly, the case study strategy helps with combining data gathered from various sources (Eisenhardt, 1989). This contributed significantly to conducting the present study because the data was gathered from three sources of evidence (as will be discussed later).

5.2. Sample description

Qualitative researchers rely on purposeful sampling when collecting data. Such sampling allows researchers to depend on their own

¹ These factors have been identified by reviewing the literature (see Appendix 1).

² The factors identified by the NCEE (2018) framework were considered while deciding on the factors associated with entrepreneurial universities.

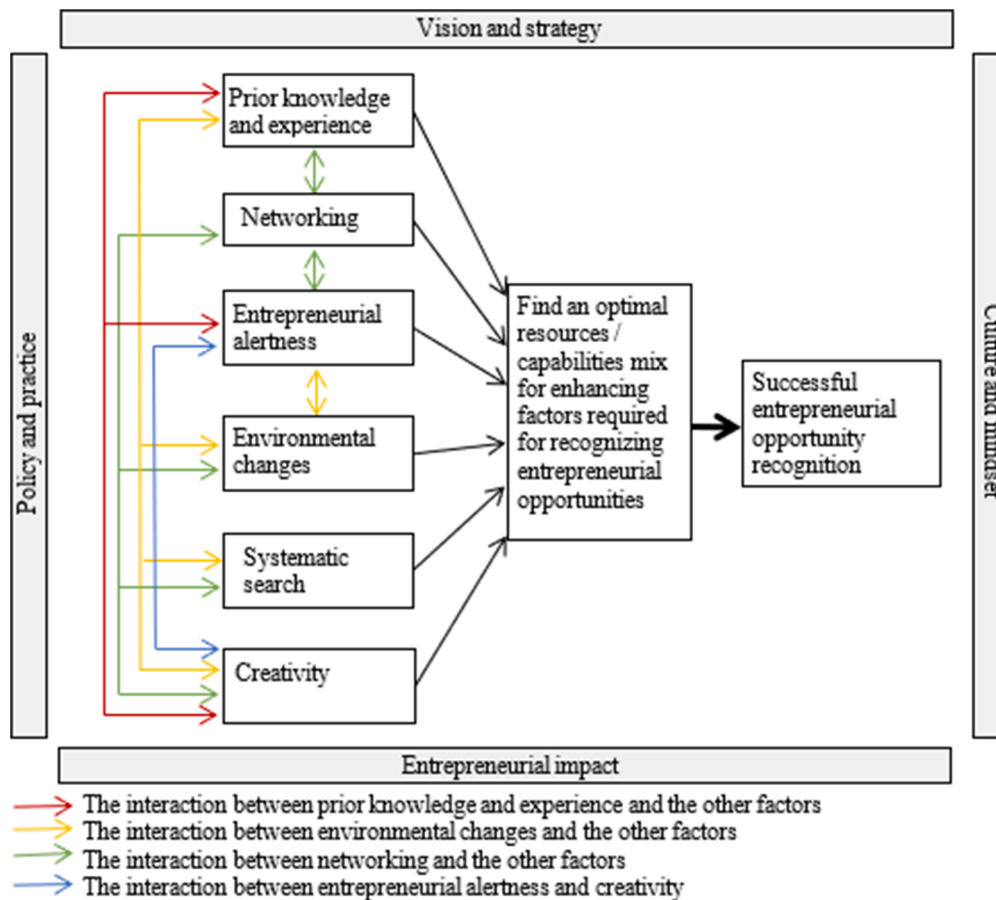


Fig. 1. The conceptual framework. Source: Author.

judgement when selecting the sample (Saunders, 2012). Two levels were considered when choosing the sample of the present research: institutional selection and individual selection. Regarding the institutional selection, the universities who won the THE Entrepreneurial University of the Year Award were considered the research population and the context of the present study. Thus, five of these universities were chosen to gain the data from. The main reasons for such a choice were; firstly, winning the aforementioned award can be seen as evidence that they are entrepreneurial universities; at least regarding one consistent and independent set of 'external criteria', which gain the legitimacy from the role played by NCEE in the process. Secondly, the possibility of gaining an appropriate number of participants from these five universities and thus obtaining data saturation from them.

For individuals' level, the deans and directors of enterprise/entrepreneurship centres were chosen to be part of this study. The main reasons behind such a choice were the accessibility to these individuals and also the interviewing questions of the present study are preferable to be answered by the senior staff because the most relevant entrepreneurial opportunities are expected to be recognized by them (Hisrich et al., 2013), as well as, they have the ability and influence to move their universities towards an entrepreneurial university model (Coyle et al., 2013).

Initially, two purposeful sampling strategies were followed to make the aforementioned selections: extreme case sampling and theory/concept sampling. To gain additional participants, the snowball sampling strategy was followed. The size of this purposeful sampling was established by following the data saturation criterion.

5.3. Data collection

Three methods were employed to collect the data of the present study because combining these methods increases flexibility and helps obtain a variety of data, which in turn helps gain a deeper and broader understanding regarding complex and ambiguous phenomena. This is because each source can contribute to an understanding of certain aspects of these phenomena. Thus, a combined approach can significantly contribute to moving forward towards obtaining a comprehensive picture of a particular phenomenon (Gilmore, 2010).

The first method was the semi-structured (Face-to-face or Skype) interviews with twenty-five deans and directors of enterprise/entrepreneurship centres. Totally, 1497 min of audio-recorded interviews were gained. These produced more than 146,000 words after cleansing the data. Tables 2.

The second method was documentary secondary data. The present study relied on 'electronic documents' issued by the five universities considered. A variety of the above-mentioned documents were considered with a focus on the strategic plan, annual review, corporate strategy, research strategy, case studies, strategy map, and financial statements. The third method was website content. All contents of the websites of the universities considered were examined to select those relating to the themes included in the present study. Not all web contents selected were considered because the second reading revealed the contents that are certainly relevant to the research question of the present study. Eventually, 277 pages were considered as another source of evidence. These pages cover several topics relating to the activities of the universities considered; such as the reasons for winning the entrepreneurial university of the year, strategic orientation, types of opportunities, collaborations/partnerships, entrepreneurial activity, the

Table 2
Details about the interviewees.

Interview number	Interviewee code	Interviewee specialization	Position	Interview type	Duration of the interview (in minutes)	
1	A1-DR	Public administration	Director	Skype	29	60
					31	
2	A2-DN	Materials engineering	Dean	Skype	55	
3	A3-DN	Higher education enterprise	Dean	Skype	82	
4	A4-DN	International business, finance and logistics	Dean	Skype	53	69
					16	
5	A5-DN	Health and social care	Dean	Skype	48	
6	A6-DR	Entrepreneurship	Director	Skype	67	
7	B1-DN	Dental public health	Dean	Face-to-face	53	
8	B2-DR	Entrepreneurial practice	Director	Skype	87	
9	B3-DN	Mechanistic biology	Dean	Skype	70	
10	B4-DR	Chemical engineering	Director	Skype	46	
11	C1-DR	Innovation	Director	Face-to-face	59	109
					50	
12	C2-DN	Construction engineering	Dean	Face-to-face	57	
13	C3-DN	Biochemistry	Dean	Face-to-face	66	
14	C4-DN	Public health	Dean	Face-to-face	61	
15	C5-DN	Applied psychology	Dean	Face-to-face	65	
16	C6-DN	Production economics	Dean	Face-to-face	45	
17	C7-DN	Psychology	Dean	Face-to-face	41	
18	C8-DN	Musicology	Dean	Face-to-face	67	
19	D1-DN	Analytical chemistry	Dean	Skype	55	
20	D2-DN	Labour law	Dean	Skype	42	
21	D3-DR	Entrepreneurship	Director	Skype	41	
22	E1-DN	Public law	Dean	Skype	58	
23	E2-DN	Journalism	Dean	Skype	44	
24	E3-DR	Higher education management	Director	Skype	28	53
					25	
25	E4-DN	Mental health sciences	Dean	Skype	56	

Note: 1. Interviews 1, 4, 11, and 24 were undertaken in two parts on two different dates. This is because, at the first time, there was not enough time to cover all the interview questions.

2. DN refers to deans and DR refers to directors.

Source: Author.

Table 3
Number of pages selected from the websites of the universities under study.

	Number of web pages selected	
	First selection	Final selection
University A	99	33
University B	120	94
University C	59	30
University D	108	53
University E	67	67
Total	453	277

Source: Author.

university research, networking activities, innovation and entrepreneurship-related centres, and student and staff support.

The above-mentioned contents helped with gaining sufficient information that was used in conjunction with the documentary secondary data to support/triangulate the views of the interviewees. Although most of the documentary secondary data was gained from the websites of the universities considered, few of the documents were sent by the interviewees via email. Thus, website content was considered a separate method from documentary secondary data in this study.

5.4. Data analysis

Two techniques (by employing NVivo software) were used to analyse the present study data: Template Analysis (TA) to analyse the interviews (the primary data) and Framework Analysis to deal with the documentary secondary data and website content (the secondary data). With respect to TA, the author transcribed all the interviews 'word by word' and went through the transcripts several times to be familiar with them and thus code them. Then the codes produced were clustered into meaningful groups in a way that helped in developing an initial coding template for each case. These templates were modified to provide final

version templates (King and Brooks, 2016; King et al., 2018). Finally, through cross-case analysis the ultimate version template was developed that represents the five cases together (See Appendix 2). In other words, the results gained from the case-by-case analysis were compared in order to provide deeper interpretations than those that have been obtained from each case. Then, the main aim of this step is to present in-depth findings of integration across the five entrepreneurial universities under study. This final step is a product of the overall commonalities between the final version templates of each case, where there is consensus between at least two of them. As such, the main findings of the present research will be presented by relying on this ultimate version template.

TA technique was used because it helped with tackling the research question of this study in the most effective way. This is because the present study aims to provide in-depth details about how entrepreneurial opportunities in entrepreneurial universities. Enough detail about this process is not found in the literature. TA can contribute to providing this in-depth detail because it allows using a priori themes and also it is very possible to produce new themes when employing this technique (King et al., 2018). In addition, TA is viewed as a flexible approach, which promotes a less specific procedure (King et al., 2018; Saunders et al., 2019). This helped with making the template fits with the present study requirements (King, 2012). It also helped with analysing the data in a more structured manner (Brooks et al., 2015). However, the author was cautious enough to not 'fall into a trap' of being too focused on applying the template to the data obtained rather than using this data to develop the template (Saunders et al., 2019).

As for Framework Analysis, the main reason for using this technique is that the main purpose of employing documentary secondary data and website content is to support/triangulate the views gained from the interviews presented in the final version templates. Then, these were used as a guide to deal with the secondary data. This is, in fact, very applicable with Framework Analysis because this approach promotes

Table 4
Entrepreneurial opportunity recognition determinants at the universities under study (cross-case analysis).

		University					
		A	B	C	D	E	
Networking	Internal networking	*	*	*	*	*	
	External networking	Networking with the government	*		*	*	
		Networking with industry	*	*	*	*	*
		Networking with other universities	*	*	*	*	
		Networking with alumni			*		*
Prior knowledge and experience	Experience	*	*	*	*	*	
	Prior knowledge	Business knowledge	*		*		*
		Knowledge about enterprising and entrepreneurship	*				
		Knowledge about industry	*	*	*		*
		Knowledge about students	*	*			*
		General knowledge		*			
		Knowledge about staff			*		
		Knowledge about competitors					*
		Knowing how to obtain money					*
		Creativity	Being different	*		*	*
Teamwork	*		*	*	*	*	
Feelings and emotions	*			*	*	*	
Continuous support for creativity			*		*		
Non-linear thinking			*				
Continuous thinking of new ideas			*	*	*		
External environment changes	Being fast	*	*	*	*	*	
	Proactiveness	*	*	*			
	Risk taking	*	*	*	*		
	Meeting stakeholders' needs	*	*	*	*	*	
	Creating needs for people		*	*	*	*	
	Responding to external environment factors	Competition	*	*	*		*
		Political factors	*	*	*	*	*
		Technological advances	*	*	*	*	*
	Societal factors		*			*	
	Economic factors		*	*	*		
Entrepreneurial alertness	Being aware of opportunities overlooked by others	*	*	*			
	Distinguishing between value creation opportunities and non-value creation opportunities	*		*			
	Distinguishing between profitable opportunities and non-profitable opportunities		*		*		
	Finding connections between unrelated information/areas		*	*		*	
	Horizon scanning	*	*	*			
	Open-mindedness				*	*	
	Systematic search vs serendipitous discovery	Systematic search	The continuous search for opportunities	*	*	*	*
Market research			*	*	*	*	
Enthusiasm				*			*
Serendipitous discovery		*	*	*	*	*	
Both systematic search and serendipitous discovery			*	*			

Source: Author.

the idea of producing a list of the main themes before applying the codes to the data (Pope et al., 2000; Skinner et al., 2014). Hence, this technique provides sharply defined procedures that allow for the reworking and revising of ideas precisely.

5.5. The quality of research design

The author sought to meet the widely accepted criteria used to conduct social science research: confirmability, credibility, transferability, dependability (Lincoln and Guba, 1985). The author followed several tactics suggested by (Yin, 2014) to meet the above-mentioned criteria. Confirmability was boosted by following two tactics; firstly, employing various sources of evidence by using three methods (semi-structured interviews, documentary secondary data, and website content) to collect the data. Secondly, a chain of evidence was established by providing enough detail about this evidence and presenting that in a coherent way.

Concerning credibility, it was enhanced by two tactics: firstly, a pattern matching logic was used, which calls for finding a similarity between the empirical findings and the predicted ones. The second tactic was the explanation building which was used by providing a detailed analysis of the present study data, which created a universal explanation of the results from the cases considered. For transferability, it was established by underpinning this case study by a theory as well as by using replication logic for a multiple case study. As for dependability, it was gained through creating a case study database and preparing the case study protocol.

6. Findings and discussion

6.1. Entrepreneurial opportunity recognition determinants

There are six factors that determine the opportunity recognition process in the five universities under study. These factors are tied together with an overlap between some of them. First, internal networking and external networking (especially with industry, government, other universities, and alumni) are one of the most important, if not the most important, factors that contribute highly to recognizing entrepreneurial opportunities in entrepreneurial universities. The literature provides great support for the above view by showing that networking plays a considerable role in recognizing entrepreneurial opportunities (e.g. Ardichvili and Cardozo, 2000; Ardichvili et al., 2003; Baron, 2006; Barringer and Ireland, 2016; George et al., 2016; Lim and Xavier, 2015; Nicolaou et al., 2009; Ramos-Rodríguez et al., 2010; Veilleux et al., 2018; Wang et al., 2013; Webb et al., 2011). The results of this study go beyond what the literature focused on by stressing the importance of both keeping and strengthening the existing networks and building new ones. The results also show that networking in UK universities can be enhanced by various capabilities/resources such as communication, relationships, collaborations, partnerships, innovation/entrepreneurship centres, reputation, conferences and industrial networking events, social media, location, and recruiting individuals with potential links.

But also, having a strong network is really, really important if you are willing to be entrepreneurial because a lot of good ideas will only work if you can pull a bunch of people with different skill sets together. Networking is hugely important in this. D3(DN)

Second, the experience and prior knowledge (especially about industry and students, and also about how to run businesses) of senior staff play a remarkable role in facilitating the opportunity recognition process. There is considerable evidence that support above view (e.g. Ardichvili and Cardozo, 2000; Ardichvili et al., 2003; Arentz et al., 2013; Baron, 2006; Barringer and Ireland, 2016; Bloodgood et al., 2015; George et al., 2016; Hulbert et al., 2015; Kohlbacher et al., 2015; Kuckertz et al., 2017; Lim and Xavier, 2015; McMullen and Shepherd, 2006; Mueller and Shepherd, 2012; Park, 2005; Patzelt and Shepherd, 2011; Tang, 2010). Although all these studies support the importance of prior knowledge and experience to recognize opportunities, the literature does provide some views that are inconsistent with this view. For

Table 5

The relationship between entrepreneurial opportunity recognition determinants in the universities under study.

	Prior knowledge and experience	Networking	Entrepreneurial alertness	Environmental changes	Systematic search	Serendipitous discovery	Creativity
Prior knowledge and experience							
Networking	A, B, C, D, E						
Entrepreneurial alertness	C, E	A, C					
Environmental changes	A, C	A, B, D	C				
Systematic search		C		C			
Serendipitous discovery		A, D, E					
Creativity	B, D	B, D	A, C	B, C			

Source: Author.

Table 6

Entrepreneurial university factors at the universities under study (cross-case analysis).

		University				
		A	B	C	D	E
Creating a supportive environment for entrepreneurship	Support of entrepreneurship from the Vice-Chancellor office	*	*	*	*	*
	Establishing an entrepreneurial culture	*	*	*	*	*
	Encouraging and supporting students to be entrepreneurial	*	*	*	*	*
	Innovation centres	*	*	*	*	*
	Entrepreneurship centres	*	*	*	*	*
	Enterprise centres	*				*
	Structures for promoting entrepreneurship	*	*	*	*	*
	All faculties should have some entrepreneurial element	*				*
	Using entrepreneurialism language within the University			*		
	Inspiring talks and workshops about entrepreneurship					*
Placing enterprise, entrepreneurship and innovation in the university strategy	Placing enterprise in the university strategy	*	*	*	*	*
	Placing innovation in the university strategy	*	*		*	*
	Placing entrepreneurship in the university strategy		*			*
The three missions of universities	Teaching (first mission) and entrepreneurship	*	*	*	*	*
	Teaching with an entrepreneurship flavour			*		*
	Teaching with an innovative flavour	*		*		*
	Impactful research (second mission) and entrepreneurship	*	*	*	*	*
	The third mission	*	*	*	*	*
Entrepreneurial staff	Current entrepreneurial staff	*	*	*	*	*
	The need for more entrepreneurial staff	*				*
						*

Source: Author.

instance, the opponents to this view believe that individuals from outside the industry may look at things with a different lens, in a way that helps them to become more innovative than individuals with prior industry experience (Barringer and Ireland, 2016). Such an opposition view does not negate the importance of prior knowledge and experience to recognize opportunities, because, as previously mentioned, there many studies that support such importance, which is much more than that which negates this importance. Moreover, there is literature that shows that prior knowledge and experience can play a considerable role in being innovative (e.g. Darroch, 2005; Du Plessis, 2007; McAdam, 2000).

The findings also show that senior staff in the universities considered developing their learning capabilities and using their critical reflection capabilities when recognizing entrepreneurial opportunities. They also use several resources to enhance their knowledge, such as universities' expertise and knowledge.

Experience helps you close down and not waste time on things that look like they might not be worth pursuing. A3(DN)

The greater knowledge you obtain, the more you are potentially able to recognize opportunities. They wouldn't be able to do this if they had limited knowledge. A5(DN)

Third, creativity is seen as an indispensable element in the opportunity recognition process. This is in line with the previous studies (Ardichvili et al., 2003; Barringer and Ireland, 2016; de Jong and Marsili, 2015; García-Cabrera and García-Soto, 2009; Hulbert et al., 2015;

Kuckertz et al., 2017; Lumpkin et al., 2004; Nicolaou et al., 2009; Webb et al., 2011). In fact, entrepreneurial opportunity recognition, or part thereof, is considered a creative process (Barringer and Ireland, 2016) or an innovative act (Lumpkin et al., 2004). Also, it is expected to be carried out more by creative individuals (Shane and Nicolaou, 2015). The main sources of creativity are being different, working as a team, having positive feelings and emotions, continuous support for creativity, and constantly thinking of new ideas. To enhance their creativity, senior staff seek to develop their imagination capabilities and innovate thinking constantly. What enhances such capabilities is being surrounded by creative individuals who provide creative solutions, produce innovative ideas (which, sometimes, can be practised), and challenge the internal process as a way of thinking.

Creativity is essential for any kind of opportunity recognition. B2(DR)

Fourth, external environment changes, which provides several opportunities, and also create threats. Overall these findings are in accordance with findings reported by (Coyle et al., 2013; Navarro and Gallardo, 2003). Then, universities need to respond to the changes in the external environment (especially, the competition, political factors, technological advances, and socio-economic factors) effectively and quickly, and sometimes proactively. They also need to take risks and consider the stakeholders' needs, and in some cases create needs for people. In fact, the findings of the present study go further than the literature by showing that these universities, sometimes, do not only need to deal with these changes in a way that helps them gain relevant

opportunities, but also to convert the threats that they face into opportunities. Then, senior staff need to develop their responsiveness and business development capabilities. In fact, several resources are available for the senior staff to persuade the afore-mentioned responsiveness, such as financial resources, time, cutting edge technology, innovation centres, reputation, partnerships, and research development managers.

The external environment impacts opportunity recognition, and since the rules are changing, we need to respond to them. B1(DN)

Fifth, entrepreneurial alertness contributes towards recognizing opportunities in a faster and easier way; therefore, it can be seen as an essential factor in the process of opportunity recognition. These findings are directly in line with some previous findings (e.g. Ardichvili and Cardozo, 2000; Ardichvili et al., 2003; Baron, 2006; Barringer and Ireland, 2016; de Jong and Marsili, 2015; Gaglio, 2004; Gaglio and Katz, 2001; García-Cabrera and García-Soto, 2009; George et al., 2016; Hulbert et al., 2015; Kohlbacher et al., 2015; Kuckertz et al., 2017; Lim and Xavier, 2015; Sambasivan et al., 2009; Veilleux et al., 2018; Webb et al., 2011). Entrepreneurial alertness is gained through several activities: being aware of opportunities overlooked by others, finding a connection between unrelated information/areas, horizon scanning, distinguishing between value creating opportunities and non-value creating opportunities, and being open-minded. Due to the importance of the entrepreneurial alertness, senior staff pay a great deal of attention to develop their awareness and special sensitivity capabilities. To do so, they seek to exploit the various and abundant information available.

Sixth, opportunities are recognized through systematic search activities. This view is strongly supported by some previous studies (e.g. Ardichvili et al., 2003; Baron, 2006; García-Cabrera and García-Soto, 2009; George et al., 2016; Hsieh et al., 2007; Hulbert et al., 2015; Pech and Cameron, 2006; Sambasivan et al., 2009; Sinclair and D'Souza, 2011; Veilleux et al., 2018). The above-mentioned activities require making such a search an ongoing process and market research. Universities considered providing several resources to facilitate the systematic search endeavours, such as cash, time, entrepreneurship and enterprise centres, and research development managers. However, there are few opportunities that are recognized serendipitously. This view is also supported by several studies (e.g. Ardichvili and Cardozo, 2000; Ardichvili et al., 2003; Hulbert et al., 2015; Veilleux et al., 2018). The findings from this study go beyond what the literature has demonstrated by suggesting a third tactic (recognizing entrepreneurial opportunities through both systematic search and luck). Such a tactic includes two approaches: deliberate-accidental approach and accidental-deliberate approach. This tactic found no support from other studies. This could be due to the fact this tactic represents the other two tactics. However, this study suggests that this third tactic is a mixture of the other two tactics. Such a mixture is different from considering each tactic separately.

We are on a constant look out for opportunities in different fields, basically. A6(DR)

...there is a combination of luck. You might be in the right place, right time, not even looking for opportunities, but you hear something, you see something, and the idea generates. C6(DN)

There is an interaction between the above opportunity recognition determinants. Firstly, networking interacts with the other determinants. This is in line with some other studies which show that there is an interaction between networking and creativity (Ardichvili et al., 2003), networking and dealing with external environment changes (Barringer and Ireland, 2016), networking and entrepreneurial alertness (Adomako et al., 2018; Khare and Joshi, 2018), networking and serendipitous discovery (Dew, 2009), networking and prior knowledge (Hisrich et al., 2013), and networking and systematic search (Ozgen and Baron, 2007).

Secondly, dealing with external environment changes interact with all the other determinants expect with serendipitous discovery. This is consistent with some previous studies which show that there is an interaction between dealing with external environment changes and entrepreneurial alertness, networking, prior knowledge, creativity (Barringer and Ireland, 2016) and systematic search for opportunities (Brouthers et al., 2015).

Thirdly, there is an interaction between prior knowledge and creativity and entrepreneurial alertness. This ties well with three studies that show that prior knowledge interacts with entrepreneurial alertness (Ardichvili and Cardozo, 2000; Hulbert et al., 2015) and creativity (Shepherd and DeTienne, 2005) when recognizing entrepreneurial opportunities.

6.2. Entrepreneurial university factors

In addition to the six determinants discussed earlier, the results show that the process of entrepreneurial opportunities recognition is also impacted indirectly by several factors (associated with the entrepreneurial university model) distributed over four groups. Firstly, creating a supportive environment for entrepreneurship is a crucial factor for being an entrepreneurial university. This view is supported by Kalar and Antoncic (2015) and Romero et al. (2021). Universities can use six activities/means as enablers for establishing such an environment: (1) supporting and practising entrepreneurship by the Chancellor and Vice-Chancellor; (2) establishing an entrepreneurial culture; (3) encouraging and supporting students to be entrepreneurial; (4) structures for promoting entrepreneurship; (5) entrepreneurship, enterprise and innovation centres; and (6) all faculties should have some kind of entrepreneurial element. In addition to these six activities/means, having inspiring talks and workshops about entrepreneurship in University E and using entrepreneurialism language within University C can enhance the supportive environment for entrepreneurship in these respective universities.

If you don't have an environment that supports it, it is not going to happen, because these things don't happen unless people believe you need it. They will listen to what you say, but they also watch what you do, and you have to be consistent. E1(DN)

Secondly, consider the aspects relating to entrepreneurialism (enterprising, entrepreneurship and innovation) within the university's strategy. This can have a great contribution to facilitating entrepreneurial activity in the universities. This in line with Bezanilla et al. (2020) and Gibb (2012), wherein strategy is one of the key areas of entrepreneurial potential in entrepreneurial universities. The findings show that placing enterprising in the university strategy was evident in all cases. On the other hand, incorporating entrepreneurship into this strategy was evident in only two cases. One possible reason for the latter is that, in some cases, the words enterprise and entrepreneurship are used interchangeably (Khare and Joshi, 2018). This applies to the context of universities. However, Gibb (2012) disagrees with the above view by defining these two phenomena separately and by showing that they are complementary to each other, but not synonyms. On the other hand, Gibb (2012) supports the idea of universities embracing enterprise and entrepreneurship. However, he calls for considering the challenges and issues that may emerge as a result of such incorporation. As for innovation, the findings show that it has gained considerable attention from the five universities under study; four of them placed innovation in their organizational strategy. This is logical due to the importance of innovation for universities in general and for entrepreneurial universities in particular (Clark, 1998; Kirby et al., 2011; Sam and van der Sijde, 2014).

Entrepreneurship is one of the strategic priorities of the university. So, being an entrepreneurial university is part of our university strategy; there are only seven pillars in this university strategy, and to be entrepreneurial is one of those. B2(DR)

Thirdly, consider entrepreneurialism in the three missions of universities. For the first mission, there is a need to be innovative and entrepreneurial in teaching. For being entrepreneurial in teaching, the literature (e.g. Gibb, 2012; Guerrero and Urbano, 2012; Heinonen & Hytti, 2010; Sancho et al., 2021) supports the following such an approach in entrepreneurial universities. As for the second mission, entrepreneurial universities need to conduct impactful research. This is in line with some previous studies (Clauss et al., 2018; Etkowitz, 2017; Romero et al., 2021). However, Czarnitzki et al. (2015) warn that adopting entrepreneurial university mode may have negative implications regarding the quantity and direction of the university research.

You can look at how much of their curriculum is entrepreneurial: what are they teaching? And are they teaching it entrepreneurially? E3(DR)

We have a whole range of what enables us to continue to be at the forefront of what we do. So, we're interested in how we can grow. we are interested in the value we create through our research. So, it is about evidence and impact. B4(DR)

For the third mission, entrepreneurial universities must have a positive impact on society and an enormous impact on the economy. Concerning the impact on society, the results are in accordance with the literature that shows that entrepreneurial universities contribute significantly to the development of societies (Charles, 2003; Etkowitz, 2013; Guerrero et al., 2015; Romero et al., 2021; Sánchez-Barrioluengo and Benneworth, 2019; Urbano and Guerrero, 2013; Zhou and Peng, 2008). As for the impact on the economy, the literature reveals that entrepreneurial universities should have a positive impact on the economy (Etkowitz, 2013; Gibb, 2009; Guerrero et al., 2015; Klofsten et al., 2019; Nelles and Vorley, 2010; Pinheiro and Stensaker, 2014; Sam and van der Sijde, 2014; Urbano and Guerrero, 2013; Zhou and Peng, 2008). The results from the present study fully support the literature, however (at the same time) these results provide a modified view. Such a view suggests that all universities (both entrepreneurial and non-entrepreneurial) in the UK are expected to impact the economy positively. Then, a positive impact on the economy cannot be counted as a criterion for deciding whether (or not) a university is entrepreneurial. Rather, entrepreneurial universities are those who can have a differential impact on the economy. The above results can be justified by considering other results from the current study, which reveal that it is easier for entrepreneurial universities (compared with other universities) to demonstrate their impact because of their various value-added and entrepreneurial activities. Thus, they can have a greater / more evident impact on the economy.

It's important to always look for opportunities and to translate that into meaningful outcomes for society. Ultimately, we are funded by society. B3 (DN)

... the natural extension of that is if you're an entrepreneurial university, that is making things happen, that becomes one of the places to go to, then that's going to have an even bigger effect on the economy. A4(DN)

Fourthly, having and recruiting entrepreneurial staff who are considered one of the significant factors for shifting towards entrepreneurial universities. The latter do not satisfy with the number of entrepreneurial staff they have. They seek for obtaining more of them. Generally, these findings are in line with some previous studies (Gibb and Hannon, 2006; Guerrero and Urbano, 2012; Meyers and Pruthi, 2011; Williams and Kluev, 2014).

Entrepreneurial people will be more attracted to an entrepreneurial organization. A1(DR)

Entrepreneurial university factors can highly contribute to the facilitation of activities relating to the six determinants of the opportunity recognition process considered by the present paper (as it is shown in Table 7). This makes sense since entrepreneurial universities can provide considerable and continuous support for entrepreneurial initiatives. Then, it is possible to argue that entrepreneurial universities are one of the best contexts for recognizing entrepreneurial opportunities.

7. Empirical model

The developed empirical model considers opportunity recognition as a process that includes six steps as follows:

1. Identify opportunity recognition determinants: Opportunity recognizers need to be aware of the main factors (as well as their aspects/sources) that have a significant impact on the opportunity recognition process. This can be considered an essential step that provides a strong base for the other five steps. According to the present paper, these factors are: a. Networking, both externally (with industry, the government, alumni, and other universities) and internally. b. External environment changes, which need to deal with both proactively and quickly through considering the most impactful external factors on the universities' main activities. Doing so could require risk-taking, meeting stakeholders' needs, and, in certain cases, creating needs for people. c. Experience and prior knowledge about how to run businesses (business knowledge) as well as about industry and students. d. Creativity can be fostered through interdisciplinary teamwork, positive feelings and emotions and thinking differently, along with continuously thinking of new ideas and constant support for creativity-related activities. e. Entrepreneurial alertness which can be resulted from horizon scanning, being aware of entrepreneurial opportunities overlooked by others, finding a connection between unrelated areas/information, being open-minded and distinguishing between value creation opportunities and non-value creation opportunities. f. Systematic search for entrepreneurial

Table 7

The relationship between entrepreneurial university factors and entrepreneurial opportunity recognition determinants in the universities under study.

	Prior knowledge and experience	Networking	Alertness	Systematic search	Creativity	Environmental changes
Placing enterprise, entrepreneurship and innovation at the university strategy	*	*	*	*	*	*
Supportive environment for entrepreneurship	*	*	*	*	*	*
The three missions of universities						
Teaching (first mission) and entrepreneurship	*	*	*	*	*	*
Impactful research (second mission) and entrepreneurship	*	*	*	*	*	*
Contribution to socio-economic development (Third mission)	*	*	*	*	*	*
Entrepreneurial staff	*	*	*	*	*	*

Source: Author.

opportunities with taking into consideration that some of these opportunities are recognized serendipitously. Thus, some other opportunities are recognized as a result of a mixture of random chance and intentional search for entrepreneurial opportunities. For systematic search, it needs to be an ongoing activity as well as (in some times) to conduct market research.

2. Spot the interaction between opportunity recognition determinants: There are interactions between some of the factors that determine the opportunity recognition process. Having a good comprehension of the aforementioned interactions can have a great impact on steps 4 and 5.

3. Identify the contextual factors: These factors represent the context in which opportunities are recognized. The context of the present research is the entrepreneurial universities, who use some means and strategies that can be, somewhat, from those used by other universities. This can produce factors that some factors that impact the various activities of the university. Then, it can be claimed that in addition to the factors that determine the opportunity recognition process, the contextual factors are vital when recognizing entrepreneurial opportunities. However, such factors affect the opportunity recognition process indirectly. These contextual factors, according to the empirical model of the present study, interact with each other and are distributed over four groups, as follows: a. Creating a supportive environment for entrepreneurship, which involves gaining support from Chancellor/Vice-Chancellor for entrepreneurship-related activities, establishing culture and structures that promote entrepreneurialism, enabling all faculties/schools to have some entrepreneurial element, encouraging and enabling students to be entrepreneurial, and establishing innovation and entrepreneurship-related centres. b. Placing entrepreneurialism and innovation in the corporate strategy of the university. c. The three missions of entrepreneurial universities, which call for being entrepreneurial and innovative in teaching and research and having a great impact on society and the economy. d. Entrepreneurial staff (both the current ones and those who will be employed in the future).

4. Deciding resources and capabilities that facilitate the opportunity

recognition process: Opportunity recognizers need to think of the resources and capabilities that help them in dealing with the opportunity recognition determinants in a way that helps with obtaining the most advantage from these determinants. Making such a decision is directly impacted by steps 1 and 2 and indirectly by step 3.

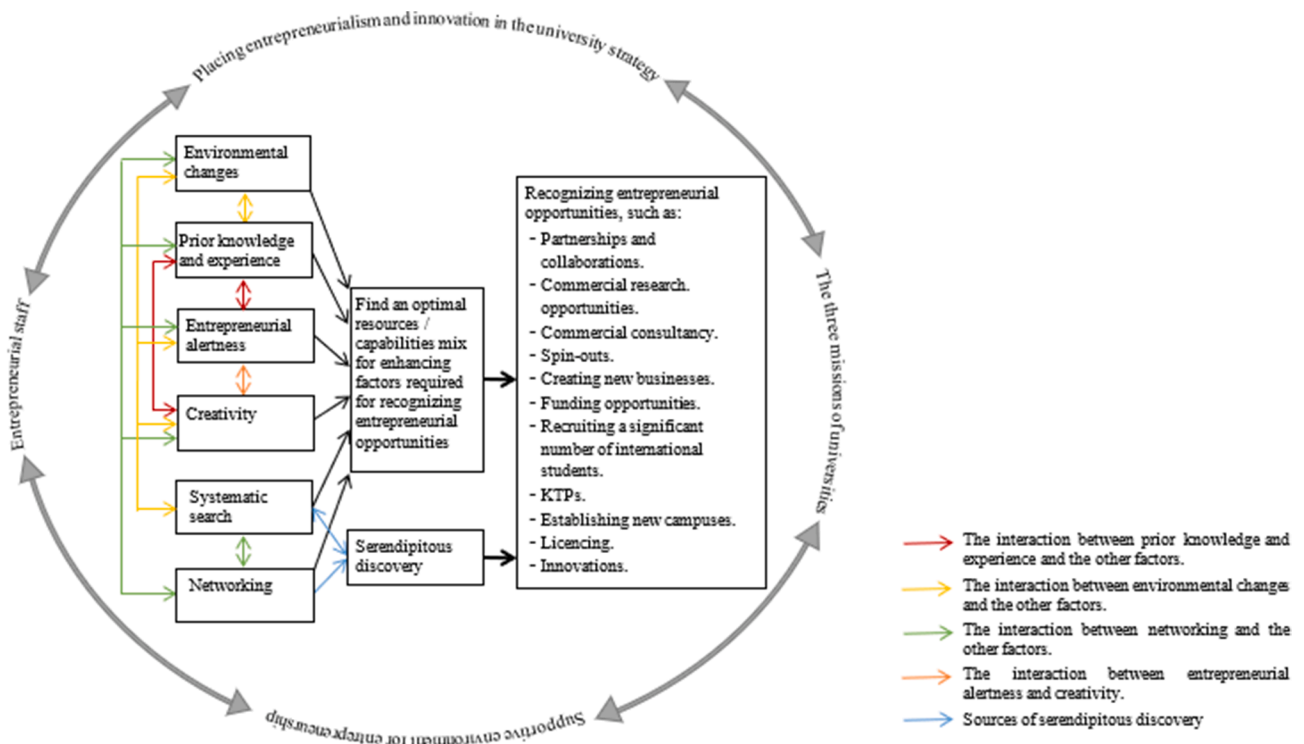
5. Finding an optimal resources/capabilities mixture: Once resources/capabilities are decided, there is a need to find an optimal mixture from these resources/capabilities in a way that helps with recognizing opportunities entrepreneurially and effectively. While this mixture is impacted by all the four previous steps, step 2 has a greater impact on determining the aforementioned mixture, which suggests that various scenarios can be considered while recognizing entrepreneurial opportunities.

6. Deciding the entrepreneurial opportunities that require evaluation: The outcomes of the previous five steps are recognizing several opportunities that need to be evaluated. The most important of these, for entrepreneurial universities, are partnerships/collaborations, spin-outs, creating new businesses, commercial research opportunities, Knowledge Transfer Partnerships (KTPs), commercial consultancy, establishing new campuses, funding opportunities, licensing, innovations, recruiting a big number of international students, and engineering opportunities. This step is considered the input/fundamental step of the entrepreneurial process. Thus, it is significant to be most effective when conducting the previous steps to ensure recognizing the most relevant entrepreneurial opportunities, which can be exploited to gain and sustain competitive advantage.

The above empirical model is different from the conceptual framework in five main points, as follows:

1. The empirical model provides more detail about the process of opportunity recognition compared to the conceptual framework.

2. New sub-themes are included in the empirical model. These are: a. networking with alumni is one of the sources for recognizing entrepreneurial opportunities. b. entrepreneurial opportunities can be recognized as a result of both a systematic search and a random chance mixture. c. Knowing how to run businesses (business knowledge) can



Note: The order of the examples of entrepreneurial opportunities included in this figure is based on their importance for the sample of the present research.

Fig. 2. The developed empirical model for entrepreneurial opportunity recognition in the UK entrepreneurial universities. Source: Author.

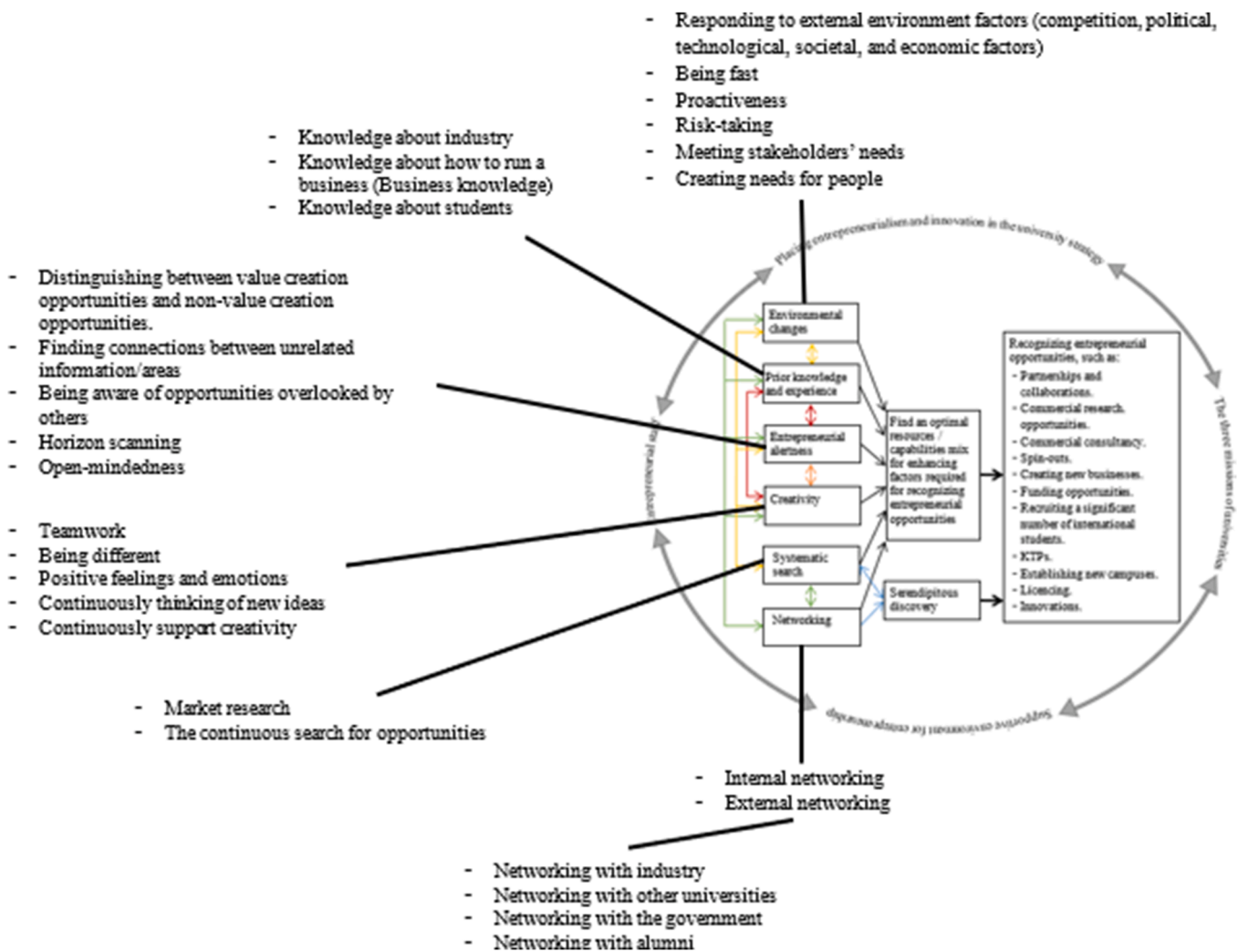


Fig. 3. A detailed explanation of the determinants of the opportunity recognition process included in the developed empirical model. Source: Author.

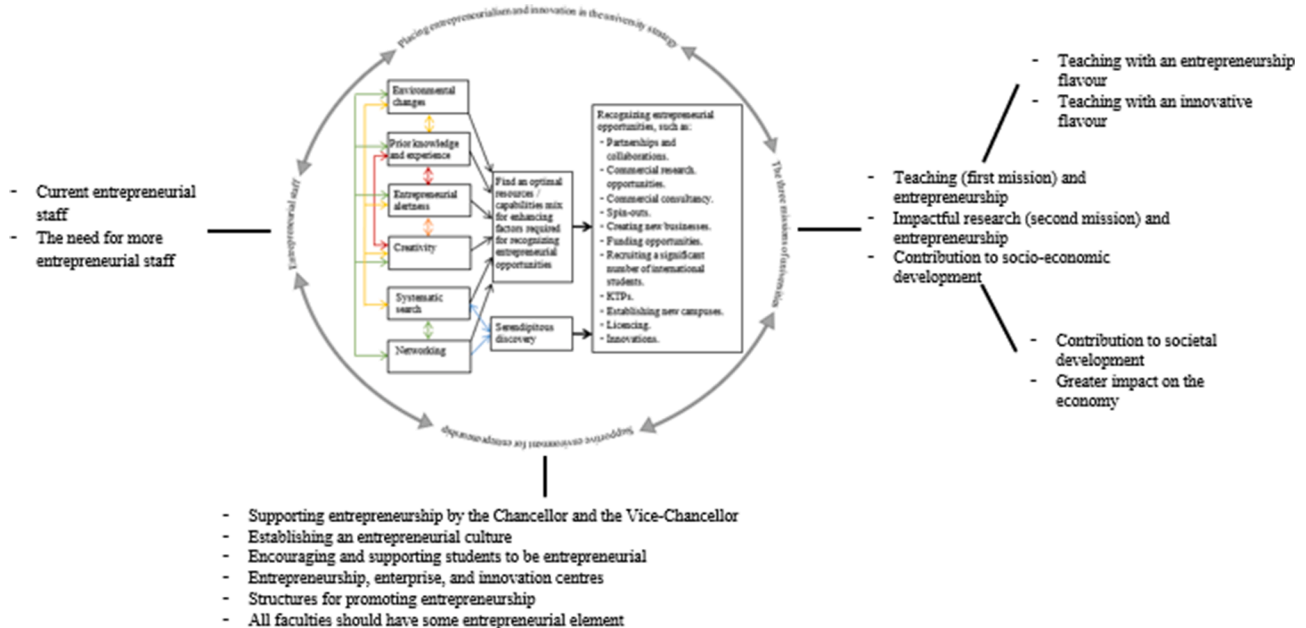


Fig. 4. A detailed explanation of the contextual factors included in the developed empirical model. Source: Author.

have a great role in recognizing entrepreneurial opportunities in the university context. d. Distinguishing value-creating opportunities from non-value creating opportunities helps more in recognizing entrepreneurial opportunities when compared to distinguishing profitable opportunities from non-profitable ones.

3. Serendipitous discovery is considered separately, in the empirical model, from a systematic search for opportunities.

4. There are interactions between factors relating to entrepreneurial universities (contextual factors) in the empirical model. Therefore, the part relating to these factors is presented differently from the one in the conceptual framework. In the empirical model, the aforementioned interactions are shown through a set of arrows; on the other hand, there is no indication for such interactions in the conceptual framework.

5. The empirical model provides three new views about the factors relating to entrepreneurial universities, as follows: a. Establishing innovation and entrepreneurship-related centres can highly contribute to creating a supportive environment for entrepreneurialism. b. Enabling all faculties/schools to have some entrepreneurial element can also contribute considerably to the creation of the above-mentioned environment. c. The impact of entrepreneurial universities on the economy is greater than the one of the non-entrepreneurial universities. [Figs. 2,3,4](#)

8. Conclusion

This study develops a framework for the opportunity recognition process in UK entrepreneurial universities. The framework shows that merely identifying the factors that determine the opportunity recognition process is not always sufficient to ensure effectiveness in this process, but that consideration must also be given to the context, and to finding an optimal mixture of the resources/capabilities required to recognize opportunities. This empirical model therefore considers three main components: the factors that determine the opportunity recognition process, the factors associated with entrepreneurial universities (contextual factors), and the resources/capabilities required for recognizing entrepreneurial opportunities. The study thus contributes to both theory and practice by developing a more comprehensive model of entrepreneurial opportunity recognition than that which has been produced by entrepreneurship scholars. It considers the context in which such opportunities are recognized. Such a model therefore contributes helps provide a broader understanding and clearer picture of opportunity recognition determinants in the entrepreneurial universities context by considering both direct and indirect factors that determine the opportunity recognition process.

The implication for theory can be made clearer by breaking it down into three theoretical contributions. Firstly, this study expands the opportunity recognition phenomenon to cover the universities context. This is significant due to the fact that few previous studies have examined the opportunity recognition process in this context. This research can therefore make the process of opportunity recognition clearer and understandable where it relates to universities. Secondly, this paper reveals the importance of resources and capabilities for recognizing entrepreneurial opportunities by promoting the idea of finding an optimal mix of resources/capabilities to ensure effectiveness in this process. No other models of opportunity recognition have considered such a mix. This contribution results from employing the RBT lens, which helps focus on the importance of identifying the resources/capabilities needed to enhance the factors which impact the opportunity recognition process. In addition, it helps emphasize the value of applying the principles of this theory to the empirical model developed by this study. Such application helps focus on finding an optimal resources/capabilities mix to enhance the factors required for recognizing entrepreneurial opportunities in this model. This will in fact help extend

the RBT into a theory that includes a new set of resources used by universities, with a view to gaining opportunities. Thirdly, this study helps provide a more rigorous framework for the criteria that can be used to judge whether a university is entrepreneurial. This is valuable because adequate clarification of these criteria has not been found in the literature. This study can thus help fill this gap and open the door for other researchers to investigate more extensively in this area.

This study has three implications for practice, two of which are offered for senior staff at UK universities. Firstly, it will give them greater understanding of the mechanism for recognizing entrepreneurial opportunities. This includes both the factors that need to be considered and the optimal resources and capabilities they need to assemble when seeking opportunities. Such understanding can help them be effective and efficient in recognizing entrepreneurial opportunities. Secondly, the study will help these senior staff acquire in-depth knowledge of what makes their universities more entrepreneurial, while staff in non-entrepreneurial universities can acquire useful guidance for shifting towards an entrepreneurial university model. In addition, those at entrepreneurial universities can find a way to maintain their entrepreneurial status and even become more entrepreneurial. The third implication is for NCEE, which sponsors the The Entrepreneurial University of the Year Award. This is given to universities who demonstrate entrepreneurialism in action. The judges employ a number of criteria to determine which university in the UK is the most entrepreneurial. These criteria are very similar to those found by this study; however, the latter provides more detail about each criterion, and includes some new themes. The NCEE might therefore consider updating the criteria it uses by referring to the criteria found by this study. These are validated by having been produced in consideration of the views from universities who have previously won the award.

This study has two limitations. Firstly, this study employed the RBT lens only; hence, the potential advantages offered by theory triangulation were not gained. Yet, RBT has provided a robust framework when was used to underpin other studies. The main reason for using a single lens in this study was that the prime focus was on resources/capabilities needed for enhancing the universities' ability to deal with various factors that determine the opportunity recognition process, thus gaining an ideal mix of these resources/capabilities that can help with recognizing entrepreneurial opportunities effectively.

The second limitation is related to generalization. Although the evidence from a multiple case study is often more convincing than those obtained from a single case study, only a limited generalization to a universal population can be provided by the findings from the present study. There are three main reasons for this. First, the research population of the present research includes only five universities. Second, there is no control group of universities, which could potentially be the universities that have not been awarded the status of an entrepreneurial university. The third reason is related to the context of research, which is entrepreneurial universities. This type of university varies from one country to another. For example, what is considered an entrepreneurial university in developing countries may not be considered the same in developed countries. Even in the context of developed countries, not all of them view entrepreneurial universities in the same way. Notwithstanding the above-mentioned limitation, the criteria used for selecting the cases as well as the techniques of data collection and analysis provided a detailed description of the phenomena considered, thus providing a strong foundation for disseminating the present study's findings. Therefore, the outcomes of this study can be very useful for those interested.

Conducting this study led the author to think of several future studies that can have a significant contribution to both the opportunity recognition and entrepreneurial university body of knowledge. First, it is recommended to conduct a study that explores (in greater detail) the

role played by networking in facilitating the opportunity recognition process in the entrepreneurial university context, and also investigates the role of this networking in moving towards an entrepreneurial university mode. Such a recommendation is inspired by one of the findings of this study which reveals the exceptional importance of networking for both the opportunity recognition process and the entrepreneurial university phenomenon. With respect to the significance of networking, it is also worth conducting a study that focuses on the role of networking with alumni for gaining more entrepreneurial opportunities. The validity of this recommendation comes from the findings from this study, which highlight the important role played by networking with alumni in recognizing entrepreneurial opportunities, yet the literature has not provided adequate detail about this role at present. Thus, understanding how networking with alumni facilitates the entrepreneurial opportunity recognition process can have significant implications for universities, especially those with an entrepreneurial orientation.

The third recommendation would be exploring the mechanism of (and also resources needed for) enabling all faculties/schools to have some entrepreneurial elements, and finding which of these faculties/schools can play a greater role in shifting towards being more entrepreneurial. This recommendation is inspired by the findings of the present study, which show that creating a supportive environment for entrepreneurship requires spreading entrepreneurialism in all faculties/schools of an entrepreneurial university, at least to enable them to have some entrepreneurial element. The fourth recommendation is to undertake a comparative study between entrepreneurial universities and

non-entrepreneurial universities regarding the role they play in regional economic development. This recommendation is based on one of the findings that casts a new light on the role played by universities in developing their economy, which is, according to this study, that UK entrepreneurial universities have a greater impact on the economy when compared to UK non-entrepreneurial universities.

One of the interesting findings from this study is related to the third approach for finding opportunities. This approach combines a systematic search for opportunities with serendipitous discovery. Understanding more about how this approach works could have some significant implications. Therefore, the third recommendation for future research is to consider this approach in the frameworks of future research relating to opportunity recognition, with a view to ensuring its effectiveness.

9. Author statement

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Appendices

See Appendix Table 1 and Appendix Table 2

Appendix Table 1

Factors that determine the opportunity recognition process Arenius and De Clercq (2005); Davidsson and Honig (2003); Dyer et al. (2008); Hulbert et al. (2013); Lumpkin and Lichtenstein (2005); Macpherson et al. (2004); Marvel and Droege (2010); Rae (2007); Shane and Venkataraman (2000); Smith-Nelson et al. (2011);

	Factors that determine the opportunity recognition process																																								
	Prior knowledge	Alertness	Networking	Cognitive properties	Technology orientation	Systematic search	Creativity	Optimism	Self-efficacy	Human capital	Environmental changes	Entrepreneur's perspective	Market analysis	Potential financial reward	Organizational learning	Entrepreneur's passion	Meeting intrinsic needs	Serendipity	Diversified competences	Openness to experience	Motivation	Perception of threats	Altruism toward others	Associational thinking	Problem construction ability ³	Learning ability	Organizational development	Failure	Intuition	The desire for autonomy	Entrepreneur's demographic	Locus of control	Personal turbulence	Possessing expert opportunity prototypes	Time	Risk-taking	Positive affect				
Ardichvili and Cardozo (2000)	✓	✓	✓																																						
Shane and Venkataraman (2000)	✓			✓																																					
Shane (2000)	✓				✓																																				
Gaglio and Katz (2001)		✓																																							
Ardichvili et al. (2003)	✓	✓	✓			✓	✓	✓	✓																																
Davidsson and Honig (2003)			✓								✓																														
Gaglio (2004)	✓	✓																																							
Macpherson, Jones, and Zhang (2004)	✓		✓	✓							✓	✓	✓																												
Lumpkin, Hills, and Shrader (2004)			✓				✓																																		
Arenius and De Clercq (2005)			✓								✓																														
Shepherd and DeTienne (2005)	✓												✓																												
Park (2005)	✓				✓							✓																													
Lumpkin and Lichtenstein (2005)														✓																											
Baron (2006)	✓	✓	✓		✓																																				
Pech and Cameron (2006)	✓				✓										✓	✓																									

³ The ability to re-frame and raise problems in new and uncommon ways.

(continued on next page)

Appendix Table

2: Main themes, sub-themes, and codes that emerged from the cross-case analysis.

a. Opportunity recognition determinants
a.1 Networking
a.1.1 Internal networking
a.1.2 External networking
a.1.2.1 Networking with the government
a.1.2.2 Networking with industry
a.1.2.2 Networking with other universities
a.1.2.2 Networking with alumni
a.2 Prior knowledge and experience
a.2.1 Experience
a.2.2 Prior knowledge
a.2.2.1 Knowledge about how to run a business (Business knowledge)
a.2.2.2 Knowledge about enterprising and entrepreneurship
a.2.2.3 Knowledge about industry
a.2.2.4 Knowledge about students
a.2.2.5 General knowledge
a.2.2.6 Knowledge about staff
a.2.2.7 Knowledge about competitors
a.2.2.8 Knowing how to obtain money
a.3 Creativity
a.3.1 Being different
a.3.2 Teamwork
a.3.3 Feelings and emotions
a.3.4 Continuous support for creativity
a.3.5 Non-linear thinking
a.3.6 Continuous thinking of new ideas
a.4 External environment changes
a.4.6 Being fast
a.4.2 Proactiveness
a.4.3 Risk-taking
a.4.4 Meeting stakeholders' needs
a.4.5 Creating needs for people
a.4.6 Responding to external environment factors
a.4.6.1 Competition
a.4.6.2 Political factors
a.4.6.3 Technological advances
a.4.6.4 Societal factors
a.4.6.4 Economic factors
a.5 Entrepreneurial alertness
a.5.1 Being aware of opportunities overlooked by others Horizon scanning
a.5.2 Distinguishing between value creation opportunities and non-value creation opportunities
a.5.3 Distinguishing between profitable opportunities and non-profitable creation opportunities
a.5.4 Finding connections between unrelated information/areas (dot connection)
a.5.5 Horizon scanning
a.5.6 Open-mindedness
a.6 Systematic search vs serendipitous discovery
a.6.1 Systematic search
a.6.1.1 The continuous search for opportunities
a.6.1.2 Market research
a.6.1.3 Enthusiasm
a.6.2 Serendipitous discovery
a.6.3 Both systematic search and serendipitous discovery
b. Entrepreneurial university factors (contextual factors)
b.1 Supportive environment for entrepreneurship
b.2.1 Supporting entrepreneurship by the Vice-Chancellor office
b.2.2 Establishing entrepreneurial culture
b.2.3 Encouraging and supporting students to be entrepreneurial
b.2.4 Innovation centres
b.2.5 Enterprise centres
b.2.6 Entrepreneurship centres
b.2.7 Structures for promoting creativity entrepreneurship
b.2.8 All faculties should have some entrepreneurial element
b.2.9 Using entrepreneurialism language within the University
b.2.10 Inspiring talks and workshops about entrepreneurship
b.2 Placing entrepreneurship, enterprise, and innovation in the university strategy
b.3 The three missions of universities
b.3.1 Teaching (first mission) and entrepreneurship
b.3.1.1 Teaching with an entrepreneurship flavour
b.3.1.2 Teaching with an innovative flavour
b.3.2 Impactful research (second mission) and entrepreneurship
b.3.3 Contribution to socio-economic development (Third mission)
b.3.3.1 Contribution to societal development
b.3.3.2 Greater impact on the economy

Appendix Table (continued)

b.3.3.2 Positive impact on the economy
b.4 Entrepreneurial staff
b.4.1 Current entrepreneurial staff
b.4.2 The need for more entrepreneurial staff

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