Extending understanding of Middle Eastern littering behaviour beyond the individual: A formative research study

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Submitted in fulfilment of the requirements for the degree of

Doctor of philosophy

January 2017

Abstract

The unprecedented scale and cumulative impact of individual behaviour on the natural environment threatens the balance of the world's ecosystem (Milfont & Schultz, 2015; Veiga et al., 2016; Weaver, 2015). Over many centuries human practices have contributed to environmental degradation (Davis, 2011) potentially limiting future growth and wellbeing. While environmental issues and concerns have been understood since the 1970s, the destruction and overuse of environmental resources continues (Mehmetoglu, 2010). One common human behaviour that significantly contributes is littering (Chitotombe, 2014), which can be intentional or accidental, individual or a more complex multi-faceted social problem.

Social marketing seeks to motivate people to change their behaviour at the downstream level and/or it seeks to alter the systems and environment surrounding an individual to effect behavioural change for the good of society (Polonsky, Francis, & Renzaho, 2015). Social marketers seek to encourage the target audience to trial a social behaviour and then sustain or maintain that behaviour (Cavill & Bauman, 2004; Evans, Blitstein, Hersey, Renaud, & Yaroch, 2008; Parkinson, Russell-Bennett, & Previte, 2012; Walls, Peeters, Loff, & Crammond, 2009). Initiatives which occur at the downstream level attempt to encourage people to pledge or alter individual actions which they otherwise would not normally do (Polonsky et al., 2015) with a health emphasis observed in social marketing practice and scholarship (Peattie & Peattie, 2011). This downstream emphasis is dominant in social marketing (Truong, 2014). Subsequently, the purpose of this thesis was:

To examine the broader system surrounding individuals to extend understanding of littering behaviour beyond individual behaviour in addition to gaining insights into individual behaviour.

To begin, the first research question asked; RQ*1: What are the key characteristics of effective littering interventions designed to reduce littering behaviour?* Study 1, a systematic literature review, was conducted to address this question, sourcing 672 publications from which 17 studies were examined in detail. The results have provided a contemporary overview of the recent interventions used by researchers to effectively change littering behaviour. However, an absence of social marketing studies in the context

of littering was evident in the current review. This is surprising given Takahashi's (2009) call for social marketing use to combat environmental issues. However, a wide array of behavioural change approaches was observed in the reviewed studies providing guidance for future interventions. The quality of the studies was also examined. The quality assessment found a lack of consistent and validated measures across studies reported in this review.

To commence a broader formative investigation in the context of this research, the next research question asked; *RQ2: What individual and environmental factors are known to influence littering behaviour?* Study 2 addressed this question using a structured observation method, littering behaviour was observed across three different parks in Saudi Arabia. A total of 362 individuals and the surrounding park environments were observed over 12 days. Approximately half of all disposals were improper with litter left on the ground. The findings revealed environmental factors had a significant impact on individual littering behaviour. Littering rates were higher when the amount of litter already on the ground was higher, environments were less beautiful and the distance to rubbish bins was further. A further social factor impacting littering was group size where littering rates were higher in smaller groups. Finally, only one individual characteristic was significantly related to littering. Younger people were more likely to litter than older people.

The final research question (RQ3) asked *what are the factors influencing littering behaviour (motivation, opportunity, ability and behaviour) within the target population?* Study 3 addressed this question through a qualitative study involving semi-structured interviews with 25 Saudi citizens. Qualitative thematic analysis was undertaken using The Motivation, Opportunity, Ability, Behaviour (MOAB) framework (Parkinson, Schuster, & Russell-Bennett, 2016), which considers both individual level and environmental level factors including structural, supply and socio-cultural factors. Findings revealed there is interplay between motivations, opportunity and ability and each was an important factor for littering behaviours.

In combination, these studies demonstrate that a broader formative research study focussed on understanding both the individual and the social and built environment surrounding the individual can produce deeper insights to guide intervention design. Taken together findings suggest that environmental changes including addition of new bins in the parks are likely to be more effective than downstream focussed interventions

on their own– a proposition that can be empirically tested utilising an experimental design in future research.

II Acknowledgments

I could not have accomplished this without the help and support of many people. It is difficult to put my appreciation into words, but here is an attempt. First, I owe a lot to both of my supervisors, Professor **Sharyn Rundle-Thiele** and Dr **Joy Parkinson**. Sharyn Rundle-Thiele, over the past years, I have started to believe that you have several holograms of yourself walking around. At least, that seems the only possible scientific explanation for your being available for anyone who needs anything, at any time. Knowing that you could always be counted on gave me a lot of mental peace. I had many emotional difficulties and you were one of the few people who made me smile and think positively. It was a real privilege and an honour for me to share your exceptional knowledge but also your extraordinary human qualities. Joy, thanks for giving me the opportunity to experience and learn to appreciate the academic life. I have been fortunate to have the two of you as wonderful supervisors, role models and mentors. You have routinely gone beyond your duties to fire-fight my worries, concerns, and anxieties, and have worked to instil great confidence in both me and my work.

A major thank you is due to my family and friends. I realise how fortunate I am to have grown up in such an extraordinarily caring and happy environment. I thank my parents for your enthusiasm about my PhD work. You always showed me how proud you are and did for me what you do best: encouraging and praying. I am truly grateful to my parents for their immeasurable love and care. They have always encouraged me to explore my potential and pursue my dreams. They helped me to reach this stage in my life.

To my husband **Moath**, and my children **Lara**, **Ahamd** and **Najed**, I thank you for your endless faith, patience, tolerance and unwavering support during this journey. You have kept me grounded and helped me to achieve my best. I am grateful to Moath for his continued support and encouragement, I could not have imagined a better companion to share these PhD years with. I could count on you for everything, even to discuss my work. Not many doctoral students can say that about their partner. You always have faith in me, especially when I do not: you started using "Doctor Yara" as the greeting for my office phone number in your mobile phone four years ago.

Additionally, my thanks to the ministry of education in Saudi Arabia for sponsoring me during my study, and for the support given to me by Saudi Arabian Embassy and cultural mission in Canberra. Completing this work would have been all the more difficult were it not for the support and friendship provided by **Dr Raad**, **Dr Aishath** and members of the **Social Marketing @ Griffith** Centre and the Department of Marketing. In particular, I would like to thank Dr Raad. You taught me invaluable lessons on how to do research. Your insightful ideas put me on track towards completing this PhD. I have never seen the combination of such genius and such a pleasant personality in one individual. It is a pleasure to have you on my PhD journey and I thank you for helping me keep things in perspective.

III Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature:

Date: 8 January 2017

IV PhD Specific Publications

Journal Papers currently in revise and resubmit stage

Al Mosa, Y. A., Parkinson, J. E. & Rundle-Thiele, S. R. (second review, review received 15.12.2016). Littering reduction: A systematic review of research 1995-2015. *Social Marketing Quarterly*.

Al Mosa, Y. A., Parkinson, J. E. & Rundle-Thiele, S. R. (second review, review received 4.11.2016). A socio-ecological examination of observing littering behaviour. *Journal of Nonprofit & Public Sector Marketing*.

Conference Papers

Al Mosa, Y., Rundle-Thiele, S.R., Parkinson, J., Williams, J. and Weir, L. (2014) OPAL – An empirical examination of market orientation, International Social Marketing Conference 2014, Victoria, Australia.

Al Mosa, Y. A., Rundle-Thiele, S. R. & Parkinson, J. E. (2014) Applying social marketing to change littering behaviour in the Middle East: The Riyadh experience. Paper presented at the Australian and New Zealand Marketing Academy Conference (ANZMAC) 29-30 December 2014, Brisbane, Australia.

Al Mosa, Y. A., Parkinson, J. E. & Rundle-Thiele, S. R. (2017) A systems approach to change littering behaviour in Saudi Arabia. World Social Marketing Conference 16-17 May 2017, Washington DC, USA.

Prizes, Grants and Awards

7/2014 Higher Degree by Research (HDR) Presentation Seminar, Pre-confirmation category Griffith University Best Presenter $300AUD

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VIII List of Abbreviations

AASM Australian Social Marketing Association

iSMA International Social Marketing Association

US United States

IX Acknowledgment of Papers included in this Thesis

ALL PAPERS INCLUDED ARE CO-AUTHORED

Section 9.1 of the Griffith University Code for the Responsible Conduct of Research ("Criteria for Authorship"), in accordance with Section 5 of the Australian Code for the Responsible Conduct of Research, states:

To be named as an author, a researcher must have made a substantial scholarly contribution to the creative or scholarly work that constitutes the research output, and be able to take public responsibility for at least that part of the work they contributed. Attribution of authorship depends to some extent on the discipline and publisher policies, but in all cases, authorship must be based on substantial contributions in a combination of one or more of:

- conception and design of the research project
- analysis and interpretation of research data
- drafting or making significant parts of the creative or scholarly work or critically revising it so as to contribute significantly to the final output.

Section 9.3 of the Griffith University Code ("Responsibilities of Researchers"), in accordance with Section 5 of the Australian Code, states:

Researchers are expected to:

- offer authorship to all people, including research trainees, who meet the criteria for authorship listed above, but only those people.
- accept or decline offers of authorship promptly in writing.
- include in the list of authors only those who have accepted authorship
- appoint one author to be the executive author to record authorship and manage correspondence about the work with the publisher and other interested parties.

- acknowledge all those who have contributed to the research, facilities or materials but who do not qualify as authors, such as research assistants, technical staff, and advisors on cultural or community knowledge. Obtain written consent to name individuals.

Included in this thesis are papers in Chapters 4, 5, and 6 which are co-authored with other researchers. My contribution to each co-authored paper is outlined at the front of the relevant chapter. The bibliographic details (if published or accepted for publication)/status (if prepared or submitted for publication) for these papers including all authors, are:

Chapter 4: Revised and resubmitted 26.12.2016

Chapter 5: Revised and resubmitted 1.12.2016

Appropriate acknowledgements of those who contributed to the research but did not qualify as authors are included in each paper.

(Signed)

18.01.2017

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08.01.2017

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8.01.2017

Supervisor: Dr Joy Parkinson

Chapter 1: Introduction

A social marketing approach has been found to be effective in helping individuals reach the desired behaviour change for different initiatives (French & Russell-Bennett, 2015; Tapp & Rundle-Thiele, 2016). Social marketing is "a sub-discipline of marketing which seeks to address social issues using commercial marketing principles" (Parkinson, Gallegos & Russell-Bennett, 2016, p. 111). Apart from using social marketing to promote an idea, it seeks to identify the target individual and their behavioural patterns (Kennedy, 2010). Social marketing campaigns focus on influencing behaviour and aims to benefit individuals, families, communities or society as a whole rather than the organisation that produces the campaigns (Andreasen, 1994; Kennedy, 2010; Prestin & Pearce, 2010). The literature indicates that social marketing is a useful tool for influencing behaviour, and hence offers sustainable choices among those whose behaviour needs to be changed (Stephen & James, 2014).

Four main behavioural domains to which social marketing interventions are applied include health improvement, safety/injury prevention, community involvement and environmental protection (Lee & Kotler, 2011; Peattie & Peattie, 2011). While protection of the physical environment plays an important role in our wellbeing, quality of life, health and health-related issues have tended to dominate social marketing practice and scholarship (Peattie & Peattie, 2011). Social marketing has been identified as a useful yet underused approach in environmental issues, and one which is still developing (Peattie & Peattie, 2011; Takahashi, 2009). Hence, there is a lack of published social marketing interventions that aim to reduce littering behaviour (Roper & Parker, 2008). Calls to extend the field by examining the multiple influences on behaviours and implementing new methods of investigation are evident (Carins, Rundle-Thiele & Fidock, 2016; French & Lefebvre, 2012; Gordon, Spotswood & Tapp, 2013; Truong, 2014). Accordingly, this research seeks to explore individual and environmental factors that influence littering behaviour. This formative study will help researchers to understand the target audience and create insights that will inform the design, development and implementation of future social marketing

interventions.

This chapter gives an outline of the thesis, and includes a background to the research in section 1.1; a description of the research context in section 1.2; a statement of the aims and the research questions in section 1.3; a summary of the research design in section 1.4; a brief overview of the planned contributions to the field of social marketing in section 1.5; and a diagram presenting the structure of the seven-chapter thesis in section 1.6.

1.1.   Background

The cumulative impact of individual behaviour on the natural environment threatens the balance of the world's ecosystem; hence, the importance of preserving the Earth cannot be overemphasised (Berger & Hevenstone, 2016; Milfont & Schultz, 2015). The increasing number of environmental issues and the growing environmental concerns of the general public since the 1970s as the destruction and overuse of environmental resources continue pose a serious danger to the planet (Mehmetoglu, 2010; Milfont & Schultz, 2015; Veiga et al., 2016; Weaver, 2015). The limits of the Earth's ability to regenerate are relatively unidentified, and it is possible that it will be overwhelmed (Lehman & Geller, 2005). One of the most common human behaviours that significantly contributes to environmental degradation is littering (Chitotombe, 2014).

Furthermore, littering is currently viewed as a multifaceted problem, that not only reduces the aesthetic appeal of public places including streets, parks and waterways, but can also degrade water quality, endanger and kill wildlife, and contribute to flooding by blocking drainage systems (Abu-Hilal & Al-Najjar, 2004; Al-Khatib, Arafat, Daoud & Shwahneh, 2009; Chitotombe, 2014; Hartley, Thompson & Pahl, 2015). Therefore, littering can be considered a social behaviour in a situation where maintaining a high standard of cleanliness in public areas is important for protecting the environment and public health as well as providing a livable environment for citizens (Ong & Sovacool, 2012; Spacek, 2004; Stephen & James, 2014). As pointed out by Ma and Hipel (2016), it is important for researchers to understand, design, and evaluate litter management from a social perspective. To achieve behaviour change in

the public, complex social issues such as littering require a multi-faceted approach from a variety of disciplines. However, each discipline has evolved with its unique theories, tools, and techniques. A lack of connectedness between behaviour change fields has been noted, and the sector is criticised for operating in isolation (Tapp & Rundle-Thiele, 2016).

Social marketing campaigns focus on influencing behaviour, and they are intended to benefit individuals, families, communities or society as a whole rather than the organisation that produces the campaigns (Andreasen, 1994; Kennedy, 2010; Prestin & Pearce, 2010). Social marketing 'seeks to develop and integrate marketing concepts with other approaches to influence behaviours that benefit individuals and communities for the greater social good' (AASM, ISMA, & ESMA, 2013). Social marketing strategies are well documented; yet the use of social marketing programs to support the environment has not been as widely explored (Takahashi, 2009). Social marketing, which involves the application of marketing thinking, tools and techniques to achieve social change (Donovan & Henley, 2010), may provide an important and valued contribution to the reduction of littering, thereby enhancing the environment and public health domains. Where there is a gap between individual behaviour and societal interests, social marketing is centrally placed to offer a wide variety of possible solutions (Tapp & Rundle-Thiele, 2016). Environmental behaviour studies that examine multi-level influences on behaviour are relatively scarce (Schultz, Bator, Large, Bruni, & Tabanico, 2013). Consequently, this research seeks to expand an understanding of the issue from a social marketing viewpoint and explore both individual factors and surrounding environmental (social and built) influences on littering behaviour. The present study therefore aim to examine the environmental and individual factors influencing littering behaviour in a Middle Eastern context.

1.2. Research context

Human behaviour significantly contributes to many social problems, and littering is one of these behaviours (Chitotombe, 2014). Given the social, aesthetic and environmental problems that result from litter, numerous interventions have been developed, implemented, and evaluated (Brown, Ham, & Hughes, 2010; Hoppe,

Bressers, de Bruijn & Franco-Garcia, 2013; Lindemann-Matthies, Bönigk & Benkowitz, 2012; Linh, 2014; Muñoz-Cadena, Lina-Manjarrez, Estrada-Izquierdo & Ramón-Gallegos, 2012; O'Connell, 2011; Ong & Sovacool, 2012; Roper & Parker, 2013). Despite these efforts, littering continues to be a problem (Lindemann-Matthies et al., 2012; Schultz et al., 2013). The past forty years have seen an increased awareness of littering and its negative impacts, particularly in developed countries (Ong & Sovacool, 2012; Veiga et al., 2016). However, Middle Eastern countries lack scholarly understanding of littering, even though littering continues to be an environmental and social issue in this context (Al-Khatib, Kontogianni, Abu Nabaa, Alshami & Al-Sari, 2015).

Most littering and environmental protection studies have been undertaken in Western contexts, such as the USA and Australia (Schultz et al., 2013; Sibley & Liu, 2003). At present, the Middle East is facing a significant problem with littering and its impact (Al-Khatib et al., 2009). This demonstrates the need for developing comprehensive interventions that aim to enhance environmental conservation among Middle Eastern countries (Al-Khatib et al., 2009; Campbell, de Heer & Kinslow, 2014). Consequently, research in non-Western cultural contexts is warranted. There is a growing need to investigate approaches to change littering behaviour within the Middle East as a means of protecting the wellbeing of individuals and the environment, and this will provide an ideal context for the application of the principles and methods of social marketing. Justification for selection of Middle East is shown in section 2.4.4.

Past research has clearly demonstrated that educational and awareness programs can affect individual attitudes (Brown et al., 2010). However, research has also shown that while useful in changing attitudes, education alone has little impact unless the individual can see how the behaviour will personally benefit them (Kollmuss & Agyeman, 2002; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012; McKenzie-Mohr, 2000). Interestingly, although individuals report awareness of littering as a problem, individuals continue to litter (Linh, 2014). Furthermore, it is clear from the literature that programs to date are not necessarily built on an understanding of citizens' behaviour. There appears to be a disconnection between the

various disciplines that contribute to the overall body of knowledge on litter (Cialdini, 2003). This indicates that approaches other than education may be required to change littering behaviour. There is an opportunity to expand social marketing theory and practice by recognising and identifying individual and environmental factors that emphasise the role of motivation as an external factor with the potential to change littering behaviour.

In the domain of environmental issues, attitudes, behaviour, concern and knowledge are essential factors in environment action but they do not appear to be sufficient to foster anti-environmental behaviour and might not be the solution for environmental problems (Ballantyne, Fien & Packer, 2001; McKenzie-Mohr, 2000; McKenzie-Mohr, 2000; Osbaldiston & Sheldon, 2003; Pelletier, Tuson, Green Demers, Noels & Beaton, 1998; Seguin, Pelletier & Hunsley, 1999). This finding is consistent with Schultz et al.'s (2013) findings, which emphasise that improving individual interest in, and attitudes towards, littering do not necessarily prompt change in behaviours, although it is important. Understanding the role of the physical context in facilitating or discouraging littering behaviour is equally essential in influencing individual littering behaviour. Yet other environmental influences such as social networks, cultural context and infrastructure still need further investigation (Lefebvre, 2011; Parkinson, Schuster & Russell-Bennett, 2016; Schultz et al., 2013). While individuals might have awareness about not littering, external or contextual factors such as social norms, religion, and infrastructure may prevent them from following that initiative.

1.3.   Research purpose and research questions

Although protecting the physical environment plays an important role in our wellbeing, quality of life and health, health-related issues have tended to dominate social marketing scholarship and practice (Peattie & Peattie, 2011). Social marketing has been identified as a useful yet underused approach in environmental issues, and one which is still developing in that area (Peattie & Peattie, 2011; Takahashi, 2009). This thesis aims to extend social marketing research beyond the confines of public health to explore the social issue of littering in public areas. More specifically, the aim

is to address what Peattie and Peattie (2009) argue as a narrow emphasis for social marketing. They claim that most social marketing campaigns in the area of the environment tend to be around recycling, lawn water use and commuting to work. This thesis will focus on littering behaviour in Middle Eastern countries. This research is a starting point to redress the negative environmental behaviour that threatens the future of Middle Eastern countries, as well as to secure sustainable growth of its resources. Furthermore, if the results of this research are encouraging, the contributions of this study may expand to other practical programs in the future, and to different anti-environmental behaviour. Social marketing has proven that it is a powerful and suitable tool for fostering sustainable behaviour (Andriamalala et al., 2013). However, to date, very few researchers have applied the concept of social marketing to littering. Therefore, the purpose of this research is:

To examine the broader system surrounding individuals in order to extend understanding of littering behaviour beyond limited self-reporting methods.

To enhance the effectiveness of a social marketing intervention targeting littering behaviour, this research will start by conducting a systematic literature review using peer-reviewed studies comprising reputable, rigorous, and reliable resources for evaluating knowledge and developing scientific syntheses (Arnell, 2010; Ford, Berrang-Ford & Paterson, 2011). This step helps to pinpoint any important gaps in understanding the issue; to characterise and evaluate studies to illustrate how these studies differ with respect to theory and methods used; to assess the different approaches that have been used to change littering behaviour; and to review their effectiveness in achieving behaviour change, therefore updating the social marketing knowledge base in the littering area; guide future research so that the interests of littering researchers can be matched with the needs of practitioners; and provide insights for littering practitioners and researchers (Truong & Dang, 2017). This thesis also aims to assess the methodological quality of included studies. A systematic literature review addressed the need to examine the more recent littering intervention literature, and extract the key lessons to guide the development of an effective littering intervention for this project. The first stage also helps to understand the

different techniques and methods used for littering interventions as well as identifying gaps in the literature. This aim forms the first research question of this thesis:

RQ 1: What are the key characteristics of effective littering interventions designed to reduce littering behaviour?

To enhance the validity of the research results for rich outcomes, combining the systematic literature reviews with other research methods is recommended (Truong & Dang, 2017). Therefore, customer orientation through observation, interviews, and/or focus groups is crucial (Creswell & Clark, 2007). It helps to become familiar with the target audience's perspective and to frame the social marketing intervention (Andreasen, 2002; Dietrich, Rundle-Thiele, Leo & Connor, 2015; French & Blair-Stevens, 2006; Hoepfl, 1997). A review of recent littering studies identified limited theory use (Brennan, Binney, Parker, Aleti, & Nguyen, 2014). The inherent complexity of changing littering behaviour indicates that theory application extending beyond the individual targeted for change is warranted (Liu & Sibley, 2004). Extending the study beyond the targeted individual and through use of a mixed methods approach will assist in closing the gap between individual and societal interests (Carins et al., 2016). Next, to test this proposition, and within the context of this research, the subsequent research questions are:

RQ2: What individual and environmental factors are known to influence littering behaviour?

RQ3: What are the factors influencing littering behaviour (motivation, opportunity, ability and behaviour) within the target population?

1.4. Research design

Three studies, using mixed methods research design, were applied to address the stated research questions, as outlined in Table 1.

Table 1: Research design, research questions and corresponding research studies

Study	Objectives	Research Question	Method
Systematic literature review	To update the litter reduction evidence base and to provide a contemporary understanding of the elements included in these programs to assist in the development of future behaviour change programs.	RQ1	Data collection: Systematic literature search Analysis: MMAT, Social Marketing Scorecard
Formative Study 1	To examine the environmental, social, and individual factors that influence littering behaviour, using Behavioural Ecological framework	RQ2	Data collection: Observational Structured observation (n=360) Analysis: Descriptive statistics and Generalized Linear Model
Formative Study 2	To explore individual perceptions of the littering issue and behaviour using the MOAB model.	RQ3	Data collection: Semi-structured depth interviews (n=25) Analysis: Thematic

Study 1 employed a systematic literature review process to update earlier systematic reviews on littering. A scorecard developed from social marketing components and theory was used to assess the identified programs aiming to reduce littering. Adopting key Centre for Reviews and Dissemination guidelines, the search included all peer-reviewed studies published between 1995 and 2015 that were published in the English language available through ten databases. A total of 1,220 articles were initially identified and resulted in a final set of 17 papers reporting 16 interventions that met the study criteria.

Study 2 was a quantitative structured observation designed to study the effect of individual- and environmental-level factors on individuals' littering behaviour in parks using the Behavioural Ecological framework (Brennan, Binney, Hall, & Hall,

2015). Littering behaviour was observed across three different parks in Saudi Arabia. A total of 362 individuals were observed over 12 days.

Study 3 was a qualitative semi-structured interview study designed to provide a consumer insight to assist the development of social marketing strategies that could be used to modify littering behaviour. This study aims to identify key factors responsible for influencing individual littering behaviour through the lens of the MOAB model (Parkinson et al., 2016). Semi-structured interviews were conducted between February 2014 and May 2015 with a sample of 25 Saudi Arabian adults aged 19–50 years. Qualitative thematic analysis was undertaken using Nvivo software.

1.5. Overview of contributions to theory and practice

The application of social marketing in littering is lacking, and calls have been made to extend social marketing beyond the confines of public health to explore social and environmental issues such as littering (Bator, Bryan & Schultz, 2011; Roper & Parker, 2008; Takahashi, 2009). This study makes four key contributions to the literature. First, this research included a contemporary review of litter reduction studies, updating earlier reviews in this domain (Dwyer, Leeming, Cobern, Porter & Jackson, 1993; Huffman, Grossnickle, Cope & Huffman, 1995) and revealed key insights into the use of seven social marketing components and methodological quality identifying areas for improvement in future studies. Second, this research has addressed the call to apply theory in social marketing studies (Luca & Suggs, 2013), taking a systems view that ensures understanding extends beyond the individual to the social and built environment influences surrounding the individual targeted for change. By taking a wider view the current study provides an understanding of the forces opposing the desired behaviour. This study empirically tested the MOAB framework (Parkinson et al., 2016) and the Behavioural Ecological framework (Brennan, Binney, Hall, & Hall, 2015). Third, this research addressed the call to extend beyond self-reporting methods (Carins et al., 2016) by employing covert

observations (in addition to interviews) in response to calls for use of multiple methods in formative research (Carins et al., 2016; Kubacki & Rundle-Thiele, 2017) to gain insights into social and structural factors in addition to individual factors. Fourth, this research contributes to the literature by offering a social marketing formative research study whose aim is to investigate both the individual and environmental factors influencing littering in public spaces in Middle Eastern countries to gain actionable insights that can be used to develop an intervention to reduce littering in cultures outside of a Western context.

1.6.   Structure of thesis

This thesis is structured as a series of papers comprising seven chapters, each with its own focus. Three studies (two submitted and one in final stages of preparation) are presented in journal article format in Chapter 4, Chapter 5, and Chapter 6. Figure 1 below outlines the thesis structure.

Chapter 1: Introduction
Overview of research context, purpose, and design

Chapter 2: Literature Review
Synthesis and critique of current literature, identification of research gaps, formation of central proposition, and outline of research questions

Chapter 3: Research Design and Methodology
Explanation of the research paradigm, justification for the research context and mixed methods formative research design

Chapter 4: A Systematic Review
Littering reduction: A systematic review of research 1995-2015

Chapter 5: Observation of Behaviour
A socio-ecological examination of observing littering behaviour

Chapter 6:
Preventing littering: It's not all about sticks!

Chapter 7: Discussion and Conclusion
Integration of results to address research questions, contributions of the research, future research directions

Figure 1: Overview of Thesis Structure

Chapter 1 provided an introduction to the thesis, outlining the research purpose and design. **Chapter 2** outlines the current literature from the fields of social marketing and littering and the role that social marketing components may play in the development of more effective anti-littering programs. Chapter 2 aims to explain why and how social marketing can bring new insights to littering behaviour. Chapter 2 concludes with the identification of the gaps in the literature and proposes the studies' research questions. **Chapter 3** explains the selection of a mixed methods research design to tackle the research questions, and provides justification for the context in which the research is performed. An outline of the data collection, sampling, and analysis methods for each study is given, and analysis in the data chapters that follow.

Chapter 4 reports on the systematic literature review that investigated litter reduction studies, and reports the extent seven social marketing components were applied along with a methodological quality assessment. The aim was to update the litter reduction evidence base and to provide a contemporary understanding of the elements included in these programs to assist in the development of future behaviour change programs. **Chapter 5** describes a study that employed covert observational techniques to observe the individual–environment-level factors influencing individuals' littering behaviour in parks. Littering behaviour was observed across three different parks in Saudi Arabia. A total of 362 individuals were observed over 12 days. **Chapter 6** presents a qualitative study involving 25 Saudi citizens, which is guided by the motivation, opportunity, ability and behaviour (MOAB) framework (Parkinson et al., 2016). This study examined individual perspective/s on the types of motivation, opportunity, ability and behaviour that can offer long lasting change in individual littering behaviour, as well as influences of the environment and important others surrounding the individual.

In **Chapter 7**, the results of the thesis are integrated and discussed in light of the research questions. The theoretical and practical implications of the overall research are discussed, as well as the strengths and limitations of the research. At

the end of chapter 7, areas for future research are highlighted and an overall conclusion is presented.

1.7.   Conclusion

This chapter has outlined the overall research program for this thesis. It includes the background, the research problem, the research context, research purpose, research gaps, research questions, research approach, the contributions to theory and practice, and has provided an overview of the thesis structure. The next chapter integrates the literature of social marketing and litter issues that informs this research, explains the research gaps, and provides the origins of the research questions for this research program.

Chapter 2: Literature Review

2.1. Introduction

Social marketing has been used to tackle a wide range of issues (Tapp & Rundle-Thiele, 2016). Social marketing has demonstrated that it is a powerful and suitable tool for fostering sustainable behaviour change (Andriamalala et al., 2013). Social marketing strategies are well documented, yet the use of social marketing programs to support the environment has not been widely explored (Takahashi, 2009) particularly in regard to targeting individual behaviour (Peattie & Peattie, 2011; Takahashi, 2009). The absence of published social marketing interventions that aim to reduce littering as an issue is evident (Roper & Parker, 2008). To date, environmental studies have focused on a variety of predictors at the individual (downstream or micro) level such as income and gender (Al-Khatib et al., 2009), and social factors such as group size (Schultz et al., 2013) and/or the environmental (upstream or macro) level, such as the influence of neighbourhood beautification (Weaver, 2015). However, few studies have combined both individual and environmental factors in a single study (Schultz et al., 2013) despite our understanding that many social, health and environmental problems are complex and multi-factorial, and that they require a broader systems understanding (Hoek & Jones, 2011; Milfont & Schultz, 2016; Wymer, 2011). Additionally, a review of the littering literature indicates that studies have not considered broader social influences (midstream- or meso-level).

The purpose of this chapter is to review the existing literature related to the research proposed for this thesis. This chapter seeks to examine the current understanding of factors influencing littering practice, and to situate this thesis within the historical context of work that has previously been undertaken in littering, and to distil both the essence of social marketing and the critical features of social marketing, when applied to littering behaviour. In summary, the proposition of this chapter is that by including a broader system that surrounds individuals, social marketers can advance the ways in which they collect information during formative research, thus designing more efficient programs to benefit individuals and society.

2.2. Social marketing

Social marketing is based on recruitment techniques and systematic steps in the process of social change (Collins, 2015). Social marketing's overall aim is to achieve socially desirable goals and improving the living conditions of individuals and the institutions supporting change initiatives. Social marketing initiatives are directed at social, environmental, health, psychological and developmental problems; problems which impact directly on the present and future of affected communities (Collins, 2015). Social marketing goes beyond encouraging individuals to adopt a desired behaviour and focuses on sustaining and/or maintaining that behaviour (Andreasen, 1994; Cavill & Bauman, 2004; Evans & Hastings, 2008; Walls, Peeters, Loff & Crammond, 2009). Such behavioural change also involves the activities of modifying, sustaining, or encouraging the discontinuation of, a specific action undertaken by a targeted group (Dann, 2010). Today, social marketing vies for acceptance as a legitimate sub-discipline of marketing. Extensively used in both economically developed and developing countries alike, social marketing continues to rapidly expand (Krisjanous, 2014).

2.2.1 Defining social marketing

''Why can't you sell brotherhood like you sell soap?'' asked Wiebe (1951, p. 679) and in asking this question Wiebe extended marketing thinking beyond traditional commercial boundaries. In 1971, Kotler and Zaltman provided the first definition for social marketing: "*Social marketing is the design, implementation and control of programs calculated to influence the acceptability of social ideas and involving considerations of product planning, pricing, communication, distribution, and market research*" (Kotler & Zaltman, 1971, p. 5)*.* Improvement, expansion and debate surrounding social marketing definitions continues today (AASM et al., 2013; French & Russell-Bennett, 2015). Kotler and Zaltman's (1971) definition has been criticised by scholars for confusing social marketing with similar types of marketing, such as societal marketing. Over time, and amid vigorous debate, significant changes have occurred since Kotler and Zaltman's (1971) first social marketing definition.

Two major changes were the move from social marketing as a discipline focussed upon the promotion of ideas to the view that social marketing is a methodology for changing behaviour; and from focusing only on voluntary behaviour change to a focus on both voluntary and non-involuntary behaviours (Andreasen, 1994; Donovan, 2011; Eagle et al., 2013). Notwithstanding the differences in the definitions of the discipline, social marketing practitioners (Lee & Kotler, 2011) agree that the social marketing's end goal is distinguishable from its parent discipline of commercial marketing. Hence, the main goal of social marketing is societal benefit, whereas commercial marketing's concern is profits (Eagle et al., 2013). At the same time, both aspects of marketing are focused on understanding the target audience and using customer orientation and insight before offering a solution (Lee & Kotler, 2011). Table 2 provides a selection of definitions proposed by prominent social marketing scholars over time.

Table 2: Selected social marketing definitions

Origin	Social marketing definition
Kotler and Zaltman (1971)	…is the design, implementation, and control of programs calculated to influence the acceptability of social ideas and involving considerations of product planning, pricing, communication, distribution and marketing research
Fine (1981)	...is the applicability of marketing thought to the introduction and dissemination of ideas and issues
Kotler and Roberto (1989)	...is a social change management technology involving the design, implementation and control of programs aimed at increasing the acceptability of a social idea or practice in one or more groups of target adopters
Andreasen (1994)	...is the adaptation of commercial marketing technologies to programs designed to influence the voluntary behaviour of target audiences to improve their personal welfare and that of the society of which they are a part
Albrecht (1997)	...is the application of commercial marketing techniques for individual and societal benefit, rather than commercial gain which creates induced, yet voluntary, behaviour change through persuasion and is based on strong research related to segmented audience needs, wants and perceived barriers
French and Blair-Stevens (2006)	...is the systematic application of marketing concepts and techniques to achieve specific behavioural goals relevant to a social good
Kotler and Lee	...is a process that applies marketing principles and techniques to

Origin	Social marketing definition
(2008)	create, communicate, and deliver value in order to influence target audience behaviours that benefit society as well as the target audience
Dann (2010)	...is the adaptation and adoption of commercial marketing activities, institutions and processes as a means to induce behavioural change in a targeted audience on a temporary or permanent basis to achieve a social goal
Donovan and Henley (2010)	...is the application of commercial marketing technologies to the analysis, planning, execution, and valuation of programs designed to influence the voluntary or involuntary behaviour of target audiences in order to improve the welfare of individuals and society
AASM et al. (2013)	Social Marketing seeks to develop and integrate marketing concepts with other approaches to influence behaviours that benefit individuals and communities for the greater social good. Social Marketing practice is guided by ethical principles. It seeks to integrate research, best practice, theory, audience and partnership insight, to inform the delivery of competition sensitive and segmented social change programs that are effective, efficient, equitable and sustainable.

Andreasen's (1994) emphasises that changing the individual's knowledge and intention is insufficient; instead, the ultimate goal must be behaviour change. The recent definition used by the International Social Marketing Association [iSMA], European Social Marketing Association [ESMA] and the Australian Association of Social Marketing [AASM] (AASM et al., 2013) also supports Andreasen's ideas stating that social marketing should focus on specific behaviour rather than the promotion of ideas (Dann, 2010) or attitudes, knowledge or beliefs (NSMC, 2010). Donovan (2011) also suggested that some areas of marketing, such as anti-social behaviour, needed to focus on attitudes, beliefs and knowledge, which was in contrast to Alden, Basil, and Deshpande's (2011) view that such marketing was a public health or education task. This thesis takes the view that social marketing's end goal is behaviour change.

2.2.2 Benchmarks criteria

Andreasen (2002) aimed to distinguish social marketing from other change approaches, such as public health, social media and education. Social marketing

benchmark criteria are proposed to ensure that social marketing practice is consistent (French & Blair-Stevens, 2006). Researchers have previously used Andreasen's (2002) social marketing benchmarks to determine the extent to which social marketing components have been applied (Carins & Rundle-Thiele, 2014; Gordon, McDermott, Stead & Angus, 2006; Stead, Gordon, Angus & McDermott, 2007). Andreasen (2002) proposed six benchmarks criteria to provide social marketing with a clear structure of components that should be used to design, plan and implement programs that change behaviour, stating that social marketing must have:

1. <u>Behaviour change</u> as the bottom line
2. <u>Audience research</u> (i.e., formative research) to understand target audiences at the outset of interventions pretesting and monitoring.
3. <u>Segmentation</u> of target audience to ensure maximum efficiency and effectiveness
4. <u>Marketing mix</u> using all four Ps, not only advertising or communications to create attractive benefit packages.
5. Creating attractive and motivational <u>exchanges</u> with target audiences.
6. Consider the <u>competition</u> faced by the desired behaviour.

Andreasen (2002) argued that social marketing campaigns are not required to meet all six benchmarks in order to be labelled social marketing. However, a recent study by Carins and Rundle-Thiele (2014) found that campaigns, self-identifying as social marketing that used significantly more of Andreasen's (2002) criteria were more likely to achieve behavioural change when compared to social marketing studies using fewer criteria.

Scholars have attempted to refine the characteristics of social marketing both before and after Andreasen (2002). Previous social marketing studies while having some similarity to Andreasen (2002), also have some differences in terms of emphasis of some components over others, while other scholars have debated priorities and importance (French & Blair-Stevens, 2006; French & Russell-Bennett, 2015; Lefebvre & Flora, 1988; Lynes, Whitney & Murray, 2014; Walsh, Rudd,

Moeykens & Moloney, 1993). For example the National Social Marketing Centre (French & Blair-Stevens, 2006) (see Table 2), who extended Andresean's (2002) six social marketing benchmarks, recommended the insight and theory as additional benchmarks.

Table 3: Extended Social Marketing Benchmark Criteria

Benchmark Criteria	Definition
Behaviour change	Intervention seeks to change behaviour and has specific measurable behavioural objectives.
Consumer research	Intervention is based on an understanding of consumer experiences, values and needs. Formative research is conducted to identify these elements. Intervention elements are pre-tested with the target group.
Segmentation	Different segmentation variables are considered when selecting the intervention target group. Intervention strategy is tailored for the selected segment/s.
Theory	Uses the behavioural theories to understand behaviour and inform the intervention.
Insight	Based on developing a deeper "insight" approach–focusing on what moves and motivates.
Marketing mix	Intervention considers the best strategic application of the "marketing mix". This consists of the four Ps of "product", "price", "place" and "promotion". Other Ps might include "policy change" or "people" (e.g. training is provided to intervention delivery agents). Interventions which only use the promotion P is social advertising, not social marketing.
Exchange	Intervention considers what will motivate people to engage voluntarily with the intervention and offers them something beneficial in return. The offered benefit may be intangible (e.g. personal satisfaction) or tangible (e.g. rewards for participating in the program and making behavioural changes).
Competition	Competing forces to the behaviour change are analysed. Intervention considers the appeal of competing behaviours (including current behaviour) and uses strategies that seek to remove or minimize this competition.

Because consumer orientation and insight criteria are not mutually exclusive, classification is problematic (Kubacki, Rundle-Thiele, Pang, & Buyucek, 2015). Consequently, consumer orientation and insight criteria are combined into a single component of audience research as listed in Andreasen's (2002) original six principles, and similarly in other research (Gracia-Marco et al., 2011). Theory use in social marketing remains limited (Luca & Suggs, 2013; Truong, 2014), however has

been identified as an important element for successful programs (Truong, 2014). Therefore, this study applies Andreasen's (2002) six components to consider the extent of social marketing use along with the French & Blair-Steven's (2006) theory component that extends the social marketing scorecard applied in earlier studies from 6 to 7 components (e.g., Carins & Rundle-Thiele, 2014).

2.2.3 Application of social marketing to environmental behaviour

Behaviour change is fundamental to the quest for a sustainable future (McKenzie-Mohr & Schultz, 2014). Behaviour change will also be crucial in achieving substantive progress towards sustainability, including change among consumers, householders, citizens, businesses, communities, voters, investors and decision-makers (Peattie & Peattie, 2011).

Social marketing has been shown to be a valuable approach to tackling complex social issues for example, obesity (Sothern, 2004); healthy eating (Carins et al., 2016); condom use (Warner, Gallo & Macaluso, 2012); sexual violence (Potter & Stapleton, 2012); alcohol use (Deshpande & Rundle-Thiele, 2011; Dietrich, Rundle-Thiele, et al., 2015); increasing physical activity (Scarapicchia et al., 2015); malaria prevention (Mathanga, Campbell, Taylor, Barlow & Wilson, 2005); sustainable behaviour (McKenzie-Mohr, 2011); and safe water (Parker et al., 2006). Recently the use of t h e social marketing approach has grown significantly (Truong, 2014). Thus, reviewing the recent social marketing interventions in the environmental domain to determine their effectiveness is needed.

Takahashi's (2009) assessment of social marketing for environmental behaviour shows that the limited social marketing environmental literature is widely dispersed, which limits understanding the effectiveness o f the programs. This finding is consistent with previous research that shows health-related issues have tended to dominate social marketing practices and scholarship (Peattie & Peattie, 2011; Roper & Parker, 2008; Takahashi, 2009). Although efforts have been made in

response to the attention on environmental protection studies by social marketing researchers (Lutzenhiser, 2002), the role of social marketing in targeting behaviour change in the environmental arena remains under-researched (Bator et al., 2011). As Leiserowitz, Kates and Parris (2005) suggested, while the unsustainable interaction between humankind and the planet is the result of a range of human behaviours, social marketing has the potential to play a fundamental role in environmental protection.

In terms of strategies used, most social marketing environmental studies focused explicitly on raising awareness through education or an information campaign rather than targeting behaviour change, thereby causing confusion between social marketing and social advertising (Takahashi, 2009). A review of interventions that attempt to decrease environmentally destructive behaviour shows they are more focused on attitude change than they are on behavioural change, which is frequently the source of the problem and the best target for a solution (Takahashi, 2009). This is consistent with Lehman and Geller (2005) who claim that focus on behavioural interventions has been declining while studies in environmental attitudes have flourished. In addition, Andreasen (2002) emphasises that programs that rely solely on communications strategies are not social marketing. Similarly, using social marketing as an overarching framework in which marketing, policy-based, and education approaches are integrated under the same program is limited (Takahashi, 2009). As all individuals erect different barriers to behaviour change and these barriers are often multiple, little would be achieved until the right combination of strategies is found (Stern, 2000). A combination of strategies (e.g., marketing, education, law) is gaining prominence (Stern, Dietz, Abel, Guagnano, & Kalof, 1999). Education is appropriate when awareness and knowledge of an issue is sought (Rothschild, 1999). However, an educational approach alone is unlikely to achieve improvement in behaviour change (Kotler & Lee, 2008). As suggested by Kennedy (2010) it is vital for individuals to receive consistent information and messages in order to inform and educate them about the issue at hand. However, information-based education only programs will achieve little to overcome environmental degradation issues. It is agreed that a willing attitude and knowledge are essential factors for environmental action. However, they do not appear to sufficiently motivate

positive environmental behaviour, and these factors alone may not solve environmental problems (Ballantyne et al., 2001; McKenzie-Mohr, 2000; Pelletier et al., 1998).

In terms of broadening the scope of application of social marketing, Takahashi (2009) found there is no evidence of the use of programs targeting all levels in influencing individual behaviour (downstream, midstream and upstream). This undermines the program's effectiveness by deflecting social marketers away from changing social environments, and contexts, which is a central factor of an effective strategy (Donovan & Henley, 2010; Edgar, Huhman & Miller, 2015; Lefebvre, 2013; Truong, 2014). Lefebvre (2013) argues that social marketers would be more likely to achieve behaviour change when aspects of the natural and built environment surrounding the individual are considered in addition to the individual targeted for change. Further, other factors influencing individual behaviour (e.g., group influence, contextual factors) are ignored (Truong & Dang, 2017). Weaver (2015) argues a greater understanding of the contexts that cultivate or facilitate the increase of antisocial behaviours in an area or place is needed. Schultz et al. (2013) emphasised that improving individual interest and attitudes towards littering do not necessarily prompt change in behaviours although it is important. Although there are multiple levels of influence on behaviour (Carins et al., 2016), individual influences have been the dominant focus of interventions targeting behaviour (Truong, 2014). Studying the broader system surrounding individuals to extend understanding of behaviour is therefore fundamental.

A review of the literature indicates a lack of scholarly investigation into the use of social marketing in tackling littering behaviour outside of Western contexts, particularly in the case of Middle Eastern countries. If this trend continues, the social marketing field may remain geographically limited (Truong & Dang, 2017). For example, reviews of environmental studies almost exclusively focus on issues in developed countries (Takahashi, 2009). Scholars outside the English-speaking world need to further their research (Truong & Dang, 2017).

Environmentally-oriented social marketing campaigns have tended to focus on a relatively narrow range of behaviours, including recycling, energy-saving, and

transportation (Peattie & Peattie, 2009; Takahashi, 2009). Study in the area of public behaviours such as littering and graffiti might be different from recycling and energy conservation, which have different influences at the environmental and individual levels. This indicates that there is a need to consider why there is the inconsistency between individual knowledge/intention and actual behaviour, in order to examine whether alternative explanations of behaviour can enrich social marketing practice by suggesting other influences on behaviour beyond knowledge, which is usually achieved by education.

2.3. Theories of behaviour and behaviour change in social marketing

The use of theory has long been an essential part of social marketing intervention design (Rice & Atkin, 2000). Interventions informed by well-developed theories can be more successful in altering individual behaviour than those not built on theory (Glanz, Rimer, & Viswanath, 2008). Sound theory is imperative to identify shared factors in successful interventions (Truong, 2014). Theories provide a background and justification for the research that is being conducted, and a framework within which social issues can be answered and the research outcomes interpreted (Bryman, 2016). Theory helps researchers to understand, predict or explain a phenomenon in a way that is more consistent (Bates, 2010).

Theory use in social marketing has been called for (French & Blair-Stevens, 2006; Luca & Suggs, 2013), yet reviews of social marketing found that the majority of social marketing studies are not theoretically based, and when used the theories are not clearly reported, or the purpose of using theories is unclearly stated (Helmig & Thaler, 2010; Truong, 2014; Truong & Dang, 2017). Bates (2010) found no evidence of theory in a review of ocean environmental social marketing. Additionally, Binney, Hall and Oppenheim (2006) argued that most theories reflect a public health bias because many social marketing interventions are developed by social and behavioural scholars who focus on public health goals rather than areas such as the environment.

Social marketing models that have been used to foster environmental

behaviour have also received some criticism; for example, the five-step community-based social marketing (CBSM) model by McKenzie-Mohr (2011) and the ten-step approach that draws on conventional commercial marketing models by Kotler and Lee (2008) (Lynes, Whitney, & Murray, 2014). Lynes et al. (2014) argue the relationship between the implementation of these models and the success of a given intervention is still under researched. For example, Lynes et al (2014) argues that using these types of models for a specific context or issue may not increase the chance of program effectiveness, rather, some steps of these models may be more appropriate in certain cases than others.

Theories that have been used to tackle environmental behaviour are focused on understanding factors influencing individual behaviour. Examples of these are the Micro-economic theory (Khawaja & Shah, 2013); Value-Belief-Norm Theory (van Riper & Kyle, 2014), Social Learning Theory (Hansmann & Scholz, 2003), Theory of Planned Behaviour (Brown, Ham & Hughes, 2010), and the Theory of Normative Conduct (Cialdini, Reno & Kallgren, 1990; Sussman & Gifford, 2013). With the exception of Collective Socialisation Theories (Weaver, 2015) and Sub-Theory of Social Space (Liu & Sibley, 2004), these models all assume that behaviour is controlled by the individual, an assumption that sometimes overlooks a number of external influences. This is not intended to be a comprehensive list of behaviour change theories, but more a way to demonstrate the dominance of cognitive behaviour theories that have been used in social marketing environmental interventions. Extending beyond the environmental context reviews of social marketing have found the most commonly used theories are focused on individual behaviour change (Bryant et al., 2014; Luca & Suggs, 2013; Truong, 2014). Hence, the link between attitude and behavioural compliance is still theoretically problematic, with only tentative links drawn between attitudes and intent, and some still-ambiguous findings relating to intent and eventual behaviour (Brennan & Binney, 2010).

Caruana (2007) argued that the emphasis on individual intention and perspective has led to a bias on research examining the cognitive aspects of individual behaviour and behavioural change. Still, such theories pay scarce consideration to other factors that might influence individual behaviour, such as social processes, contexts, and structures that embed behaviour (Carrigan, Moraes & Leek, 2011). Consistent with Farr Wharton, Foth and Choi (2014), the findings that external influences such as public policies in places support behaviour are frequently neglected in theories. While understanding individual attitudes to behaviour is important, it is necessary to also recognise the influences of the social and physical environments (Bryant et al., 2014; Truong, 2014). A problem with the past studies is that they have narrowly examined a range of predictors from singular approaches rather than combining both psychological and socio-cultural factors in a single study (Ojedokun & Balogun, 2011). Using a singular approach might prevent researchers and practitioners from seeing the complex nature of the phenomenon, which may be hazardous. A unified theory combining individual, contextual and social factors is expected to deliver multidimensional explanations (Ojedokun & Balogun, 2011).

As stated previously, theory use in social marketing environmental intervention is limited to Theory of Planned Behaviour (TPB) (Brown et al., 2010) and Focus Theory of Normative Conduct (Kallgren, Reno, & Cialdini, 2000; Sussman & Gifford, 2013). Previous studies have criticised the use of these theories for public behaviour such as littering. For example, TPB has been criticised as it describes only the proximate causes of behaviour and ignores the other contextual factors that may influence individual behaviour, TPB also proposes a causal relationship among its predictors of intention, and behaviour; however, they are not organised to test for causal relationships (Cole & Fieselman, 2013; Farr Wharton et al., 2014; Kaiser, Hübner, & Bogner, 2005; Sheban, 2014). Finally, TPB is incompletely identified, meaning that it does not specify a direction, or order of influence, for the relationship between its component parts, "*does attitude influence perceived control, or the other way around*" (Cole & Fieselman, 2013; Farr Wharton et al., 2014; Kaiser et al., 2005).

Thus, most of these theories are focused on the individual; that is, they have a downstream intervention focus, which seeks to change individual factors such as intention, attitude or knowledge. Only a few interventions report use of theories taking the wider environment surrounding the targeted individual into account. For example, Social-Cognitive Theory or the Ecological Model have been used to understand the broad contextual and environmental influencers of the behavioural choices of the target audience (Truong & Dang, 2017). For instance, with an ecological model, positive change was achieved at multiple levels, from individual behaviours, intention, to social norms and beyond these areas, to the broader community and society at large, thus allowing the chance of sustainable change (Bryant et al., 2014). Gordon (2011) argued that there is support for social marketing to move further upstream, but at this point the downstream remains the dominant focus (Bryant et al., 2014; Truong, 2014).

To date, one study has been identified in the literature, which has investigated the influence of both individual and environmental factors to predict littering behaviour; however, this study was not based on theory (Schultz et al. 2013). There is a need to improve the theoretical underpinnings of social marketing and to develop appropriate models and frameworks that can be used to guide social marketing programs (Binney et al., 2006). Theories and frameworks capturing the complex nature of actual littering behaviour where interactions occur between individual and environmental factors warrant consideration (Parkinson, Schuster, et al., 2016). In this context, theories and frameworks which consider individual-level and environmental-level factors, including structural, supply, and socio-cultural factors, are recommended to help understand littering behaviours from both the individual and environmental perspectives (Parkinson, Schuster, et al., 2016).

2.4. Littering as a social issue: a global overview

Currently, the unprecedented scale and cumulative impact of individual behaviour on the natural environment threaten the balance of the world's ecosystem, hence efforts to preserve the earth are important (Milfont & Schultz, 2016; Veiga et

al., 2016; Weaver, 2015). Sadly, *"the impact of our individual actions upon the environment can last many lifetimes, and the cumulative impact of humanity on the planet is far greater than that caused by any other species"* (Milfont, 2012, p. 1). Despite rising awareness of environmental issues and a growing concern amongst the general public since the 1970s, the destruction and overuse of environmental resources continues to pose a serious danger to humanity and the planet (Mehmetoglu, 2010). The extent of the earth's ability to regenerate has not been identified, and it is possible that, at some point in time, it could be overwhelmed (Lehman & Geller, 2005). One universal human behaviour which contributes to many environmental problems is littering (Chitotombe, 2014). Litter is "any domestic or commercial waste or any refuse, debris, or rubbish that is disposed of improperly" (Oluyinka Ojedokun, 2015, p. 552). It is also defined as "any piece of misplaced solid waste" (Schultz et al., 2013, p. 2). Litter differs from other types of municipal solid waste in that it is waste not placed in suitable receptacles. Litter includes any domestic or commercial waste, as well as any material a person might reasonably believe is debris, refuse or rubbish. For example, litter can include: cigarette butts, soft drink bottles, paper, caps, food packaging, fast food wrappers thrown out of the car window, drink bottles dropped on the ground, and even abandoned furniture (Al-Khatib et al., 2009; Ong & Sovacool, 2012).

Ojedokun (2015, p. 552) defines littering as "the dropping of waste on bare ground in public places as opposed to proper disposal of them", while Hansmann and Scholz (2003, p. 753) define littering as the "careless, incorrect disposal of a minor amount of waste". Littering is the result of human behaviour, either accidental or intentional, and has become a multi-faceted social problem.

Littering causes environmental degradation and is recognised as anti-social behaviour that reduces societal benefits (Baltes & Hayward, 1976; Cialdini, 2003; Cialdini & Baumann, 1981; Reich & Robertson, 1979; Slavin, Grage & Campbell, 2012). Additionally, with the growth of consumerism, new sources of littering continue to grow; however, littering is an area that has received limited research attention (Al-Khatib et al., 2009). According to Peattie and Peattie (2011, p. 345),

"human exploitation of environmental resources is already running at around 30% above a level that the planet can sustain without environmental degradation". Consequently, littering has gone from being viewed primarily as an aesthetic problem in public places, such as parks, paths, roads and public buildings, to a broader environmental issue where it endangers and kills wildlife, degrades water quality, and contributes to flooding through blocked drainage systems (Muñoz-Cadena et al., 2012; Ong & Sovacool, 2012; Pandey, 1990). Previous studies of littering behaviour have found that most littering occurs intentionally (Al-Khatib, 2009; Arafat, Al-Khatib, Daoud, & Shwahneh, 2007; Campbell, de Heer, & Kinslow, 2014; Santos, Friedrich, Wallner-Kersanach, & Fillmann, 2005; Schultz, 2014; Wicherts & Bakker, 2013). Taken together, results indicate that while littering is an individual behaviour, littering is a community problem (Ajaegbo, Dashit, & Akume, 2013) that is influenced by a broad array of factors.

2.4.1 Individual factors

A number of factors have been identified as contributing to littering behaviour at the individual level and include ignorance of environmental programs and anti-littering messages; lack of concern for the environment; negative littering attitudes; personal characteristics such as age, sex, level of education, place of residence, income, type of residence, geographic characteristics, and perception and behaviour towards littering; monthly income; religious convictions constraints; education level; knowledge, experience and understanding; perception; concern; awareness; behaviour and demographic factors (Ajaegbo et al., 2013; Al-Khatib et al., 2009; Arafat et al., 2007; Bateson et al., 2013; Bator et al., 2011; Campbell et al., 2014; Cialdini, 2003; Cialdini et al., 1990; De Kort et al., 2008; Hartley et al., 2015; Liu & Sibley, 2004; Ojedokun, 2011; Ong & Sovacool, 2012; Reams et al., 1996; Santos et al., 2005; Schultz et al., 2013; Wever et al., 2006).

A study by Liu and Sibley (2004) shows attitude salience manipulations failed to change littering behaviour. Similarly, a study by Taylor, Curnow, Fletcher and Lewis (2007) using an education campaign to influence individual awareness and knowledge about littering issues, showed small positive change. Environmental

literature tends to emphasise interventions aimed at increasing public awareness, beliefs and attitudes. However, campaigns to reduce littering may actually entrench attitudes (Dwyer et al., 1993; Huffman et al., 1995); they do not change the nature of the behaviour itself when used alone (Liu & Sibley, 2004). A move beyond focus on the individual has been called for (Milfont & Schultz, 2016; Weaver, 2015).

2.4.2 Socio-cultural factors

Socio-cultural factors shape individuals' views and responses towards environmental changes (Milfont & Schultz, 2016) and play a key role in the growth of environmental engagement (Milfont, 2012). Parkinson, Schuster, et al. (2016) also contend that individual behaviours are strongly influenced by the cultural and social context in which they appear. Further, Milfont (2012) states that individual interactions with the environment vary between cultures and also between individuals within a particular culture. Socio-cultural factors identified as influencing individual littering behaviour include, but are not limited to, social norms, feelings of shame and embarrassment, religion, beliefs, values, culture, and group behaviour (Al-Khatib et al., 2009; Bateson et al., 2013; Berger & Hevenstone, 2016; Brennan & Binney, 2010; De Kort et al., 2008; Grasmick, Bursik, & Kinsey, 1991; Heywood, 2002; Kallgren et al., 2000; Keuschnigg & Wolbring, 2015). The most common strategies applied to environmental issues are social norms, beliefs and values.

For example, a study on social norms in a composting context undertaken by Sussman and Gifford (2013) shows that the use of modelling has significant positive effects on littering behaviour. Another form of social influence on littering behaviour, yet less used, is religion (Al-Khatib et al. 2009). Research on religion has increased considerably during the past decade, and the need to understand more about the effect of religion on society is greatly encouraged (Smith, 2003), especially in the context of the Middle East. Milfont (2012) argues that each culture needs to make a cooperative effort, in accordance with its beliefs, values and behavioural patterns, to change environmental behaviour.

2.4.2 Environmental factors

Liu and Sibley (2004) argue that the structure of the physical environment rather than attitudinal manipulation, influences public behaviour. Previous studies have identified a number of environmental factors that contribute significantly to public environmental behaviour, including availability and accessibility of receptacles, infrastructure, neighbourhood beautification, cleanness, disordered settings (e.g. those with graffiti), and previous litter (Bator et al., 2011; Brown et al., 2010; Cierjacks et al., 2012; Foxall et al., 2006; Keizer et al., 2008, 2013; Krauss et al., 1996; Liu & Sibley, 2004; Ojedokun, 2011; Schultz et al., 2013; Taylor et al., 2007; Weaver, 2015; Zhang & McCord, 2014). Sibley and Liu (2003) argue that by changing the characteristics of the physical environment itself, it is possible to reduce not only the response costs associated with the ways in which a behaviour is performed, but also the antecedent cues for behaviour.

Bates (2010), however, argues that there is insufficient evidence of environmental factors influencing individual behaviour. While other research found that a well-maintained local environment, appropriate infrastructure and scenic vistas can significantly lower littering rates (Taylor et al., 2007; Weaver, 2015). Regardless of the level of factors which influence behaviour change (Dibb, 2014), individuals exist in a range of environmental and social contexts that require a shift towards a more comprehensive approach that acknowledges the importance of the environmental and social contexts for achieving positive behaviour change (Domegan, Collins, Stead, McHugh & Hughes, 2013; Kennedy & Parsons, 2012).

Finally, although each factor appears to have significant influence on individual littering behaviour, Schultz et al. (2013) observe that a multilevel approach including individual, social and environmental factors is limited in previous littering studies. Research in the field has called for more extensive use of multilevel modelling extending focus beyond one level of influence (Milfont, 2012). Stern (2000) argues that the most effective method to foster environmentally significant behaviour change involves a combination of individual, social and environmental

approaches. This research proposes that public environmental behaviour requires a multi-level approach including individual, social and environmental interventions to effectively change littering behaviour. Scholars argue that using a systems approach which encompasses a combination of these techniques should be implemented more widely in social marketing to achieve behaviour change (Carins et al., 2016; Parkinson, Schuster, et al., 2016).

2.4.3 Previous approaches to solve the littering problem

Littering as an environmental problem has lent itself to systematic behavioural research for many years. An early 1968 study, *Keep America Beautiful* (KAB), reports on the beliefs, attitudes and self-reported behaviours among a large national sample. Subsequently, research during the 1970s was used as a foundation for building littering prevention programs (Burgess, Clark, & Hendee, 1971). In the past, many behaviour change approaches have been used to prevent littering, such as incentives (De Kort et al., 2008), penalties, threats, or sanctions (Grasmick et al., 1991), including community residents in clean-up activities (Roales-Nieto, 1988), packaging design (Al-Khatib et al., 2009), increasing public awareness, and decreasing unsolicited advertising (Al-Khatib et al., 2009), litter prevention strategies that target individual-level motivation (McKenzie-Mohr, 2002), the provision of easily identifiable and accessible receptacles (De Kort et al., 2008), publicity, education and legislation (Storrier & McGlashan, 2006), outreach and media messages (Nolan, Schultz & Knowles, 2009), and the presence of prohibition signs (Schultz et al., 2013; Wicherts & Bakker, 2013).

Bitgood et al. (1988) defined four major approaches to controlling littering: environmental education that increases awareness; promoting attitude/behaviour change; environmental design which uses planning and designing facilities to encourage appropriate behaviour; and consequence control that provides positive or negative feedback, such as incentives for good behaviour, and fines or penalties for poor behaviour. Bitgood et al. (1988) found that consequence control is the most effective technique when combined with approaches to improve litter control.

Since the 1960s, littering rates in some countries have decreased significantly; however, littering remains an important environmental and social issue (Al-Khatib et al., 2009). Several studies in developed countries have applied and evaluated strategies that control littering behaviour to reduce pollution (Cialdini et al., 1990; Reich & Robertson, 1979; Reiter & Samuel, 1980; Singhapakdi & LaTour, 1991). On the other hand, in developing countries, little research attention has been given to littering behaviour. Indeed, many developing countries, including Saudi Arabia, suffer from widespread littering problems (Al-Khatib et al., 2009).

2.4.4 Justification for selecting Middle East

In 2010 the Middle East's population reached 357 million people, and current estimates suggest the population will rise to 633 million by 2050, compared to less than 100 million in 1960 (Bashar, 2012). The average Ecological Footprint of the Middle East countries from 1961 has increased by 78 percent, from 1.2 to 2.1 global hectares per capita (Najib, 2012). According to Zafar (2014) in Middle Eastern countries the high rate of population growth, urbanisation, and economic expansion is not only accelerating consumption rates but also raising the generation rate of all sorts of waste. Saudi Arabia, United Arab Emirates, Kuwait, Qatar and Bahrain rank in the top-ten worldwide in terms of per capita solid waste generation, mainly because of the high standard of living and lack of awareness about sustainable waste management practices (Zafar, 2014).

The quantity of Solid Waste alone produced annually in Middle East countries today has reached 150 million tons and is estimated to exceed 200 million tons per year by 2020 (Zafar, 2014). The amount of recycling is estimated to be less than 5 percent of the total waste generated (Najib, 2012). Waste produced per capita in the Gulf countries annually is between 750 to 900 kg, while the average produced per capita the European Union is 350 kg annually (Fahad, 2014; Taribmagazen, 2014). A study by Najib (2012) shows that the average annual cost of environmental degradation in Middle East countries has been estimated at $95 billion, equivalent to five percent of their combined 2010 GDP. An annual expert report on the Arabian

environment suggests that many populous Middle East countries have ecological footprints far below the global average on a per capita basis. Therefore, Middle Eastern countries face the double challenge of high rates of poverty and biocapacity deficits (Najib, 2012). With an approximate population of about 28 million, Saudi Arabia produces approximately 1.3 kilograms of waste per person every day, with waste exceeding 13 million tons of garbage in 2009 (Zafar, 2014).

In the Middle East, the built environment is becoming more conspicuous as a result of rapid population growth and subsequent urbanisation. This, together with the rise of consumerism, has led to a deterioration in the environment and a decrease in natural resources (Ahmed et al., 2011; Zafar, 2014). Croitoru and Sarraf (2010) argue that the Middle East is facing significant risks to already scarce natural resources. The higher standard of living has not always resulted in a better quality of life, nor improved the chances of sustainable living. Resources in the region have also decreased and this, combined with a deterioration in environmental conditions, has caused the region to be on the brink of ecosystem bankruptcy, as well as threatening survival prospects in the region (Najib, 2012).

Littering has been identified as an important health and environmental issue in the Middle East (Arafat et al., 2007). Research has shown that individuals holding collectivist orientations (Middle East region) tend to express higher environmental concern than those holding individualist orientations (Milfont, 2012). However, at present, the Middle East is facing a significant problem in regards to littering and its impact (Abu-Hilal & Al-Najjar, 2009; Al-Khatib, 2009; Al-Khatib et al., 2009; Arafat et al., 2007). Most littering and environmental protection studies have been undertaken in Western contexts (Schultz et al., 2013; Sibley & Liu, 2003; Truong, 2014) with fewer studies on littering in Middle Eastern contexts (Al-Khatib et al., 2009; Al-Khatib et al., 2015; Ojedokun & Balogun, 2011). Even though the Middle East continues to be a vital region geographically, economically and politically, it remains virtually neglected in the international environmental marketing literature (Bhuian et al., 2014). In general, the number of international environmental marketing studies in Middle East countries is limited, thus studying Middle Eastern countries is

significant as environmental concerns are not unique to the Western World (Bhuian et al., 2014; Schultz, 2002). However, there is widespread agreement that while environmental degradation is occurring on a global scale, the responses to it must take place on a local scale (Ahmed et al., 2011). Existing literature shows a lack of literature that empirically examines littering in the Middle East generally (Al-Khatib et al., 2009; Campbell, de Heer, et al., 2014). Thus, research in non-Western cultural contexts is warranted.

2.4.5 Littering in Saudi Arabia

Saudi Arabia, is the largest country in the Arabian Peninsula (Salam, 2013). The per capita GDP of Saudi Arabia is US$20,700 (Khizindar, 2012). Projections indicate that the population of Saudi Arabia will increase to 40 million in 2025 and to 60 million in 2050 (Ashwan, Salam, & Mouselhy, 2012). Saudi Arabia's population growth rate is estimated to be the highest in the world, registering a fivefold increase. This growth affects population density creating pressure on housing, healthcare, education, transport and the environment (Ashwan et al., 2012). A study by Salam (2013) shows an analysis based on national census data collected in 1974, 1992, 2004 and 2010 and underlines the growing size of Saudi native population in the Saudi Arabia. Hence, regions such as Riaydh, Makkah Al-Mokarramah, Eastern Region and Jazan have experienced rapid population rises.

Over the last decade Riyadh has reported an increase in annual growth rate from 18.8% of the Saudi population in 1974 to 23% in 2010, compared to other regions, namely Makah, Al Qassem, Eastern Region, Northern Border, Najran and Jouf (Ashwan et al., 2012).

Salam (2013) argues that the faster growth of the population in Saudi Arabia has resulted from economic growth and progress in public infrastructure including health care, housing, public utilities and education.

Despite governments highlighting the importance of the proper disposal of various forms of waste, the extent of littering continues to rise. Other contributing factors to the problem are cultural, as well as social and environmental

misconceptions (Abuzinada, Al-Wetaid & Al-Basyouni, 2005). This is despite The Ministry of Municipal and Rural Affairs in Saudi Arabia broadcasting awareness bulletins and the installation of signboards as well as leaving containers for rubbish at tourist sites. Additionally, it also has involved children and young people in voluntary work camps to spread the spirit of enthusiasm and increase awareness for the elimination of cans and plastic bottles for water and soft drinks (Affairs, 2006).

A number of effective programs have been implemented in Saudi Arabia for the purpose of increasing environmental awareness towards littering behaviour, such as the "Parks without waste" campaign in Riyadh, as well as the anti-littering campaign launched in Jeddah, which is the second largest city in Saudi Arabia (Al-Shry, 2008; Masrahi, 2010). Despite these programs, the amount of litter is increasing (Abuzinada, Al-Wetaid, et al., 2005; El-Juhany, 2009; Taribmagazen, 2014). While awareness is a first step in finding a solution to the littering problem, an integrated approach is required including family, school, community and the municipality (Abuzinada, Al-Wetaid, et al., 2005). Wetzel et al. (2004) highlighted the need for an integrated approach to the prevention and control of litter, which is consistent with calls in the wider social science and litter literature.

Religion in Saudi Arabia:

Saudi Arabia has a 100% Muslim population (resident citizens) (Khizindar, 2012), Islamic religion makes it clear that Man should not ignore his responsibility of stewardship on earth (Ali, 2011; Qatar, 2014). According to Islamic faith is only when our ethical horizons extend to embrace not only mankind, but also all generations and created beings that individuals can perform the noble role of stewardship on earth (Ali, 2011; Qatar, 2014). Thus, saving nature and its resources are key principles in Islamic values and in Saudi's structure. Islam has been used in different initiatives to change individual behaviour for better (Farrag & Hassan, 2015; Rady & Verheijde, 2016). For example Islam has been used successfully to change individual attitudes towards, organ donation (Sharif, 2012)."

Unfortunately, increases in littering are occurring with some people blaming the cleaners for being negligent in the performance of their work, while others blame

the citizens for their intense ignorance in domestic and public area maintenance. Furthermore, some attribute increases in litter to the citizen's dependence on servants. No matter what social class they are, servants are almost in every house. This littering issue deprives society of its right to inhale clean air and enjoy the beautiful views, clean neighborhoods and recreational facilities without garbage.

2.5. Proposition development

Taken as a whole, this review of the literature suggests that while a considerable body of work has been undertaken additional research to understand how littering can be reduced is warranted. Further, examination of the literature indicates that a focus on individual, social and environmental factors can increase the efficacy of social marketing interventions. This broadening needs to occur in the designing, implementing and evaluation stages.

Formative research must be broadened to ensure that researchers can capture the overall picture of what influences an individual's behaviour, rather than relying on a single level approach. Formative research needs to include methods that examine these factors, and observe behaviour within the context studied, in order to disentangle what the individual and environmental influences may be (Carins et al., 2016). Using these findings and insights, social marketers can then design interventions that can have an effect through these social and environmental contexts.

Subsequently, social marketing interventions must be broadened to include strategies that can enhance proper disposal. The inclusion of these strategies in a social marketing intervention is likely to improve efficacy when compared to an intervention that relies simply on an individual behaviour change (Liu & Sibley, 2004; Schultz et al., 2013; Weaver, 2015). For example, designing an intervention that enhances an individual's awareness about the negative consequences of littering behaviour may be partially effective; however, combining it with environmental and social infrastructure that encourages proper disposal may improve effectiveness (Liu

& Sibley, 2004). The proposition that investigating and including individual, social and environmental factors can improve the efficacy of social marketing interventions, guides this thesis.

2.6. Research questions

This section highlights the knowledge gaps established as a result of the literature review, and proposes the research questions. The core proposition is that taking into consideration the broader system surrounding individuals could broaden understanding beyond the individual targeted for change.

Social marketing has had success in changing environmental behaviour, but has also, at times, produced mixed results or failed to have an effect (Takahashi, 2009). The earlier reviews indicate that predominantly the approaches relied heavily on information provision and education (Kennedy, 2010), however, limited use of social marketing for these behaviour change programs is evident (Evans et al., 2014; Helmig & Thaler, 2010; Takahashi, 2009). Although social marketing has progressed in recent years (Truong, 2014), there is a gap in what is known of the application of social marketing to environmental behaviour, and its efficacy. Therefore, the first research question posed by this thesis is:

RQ1: What are the key characteristics of effective littering interventions designed to reduce littering behaviour?

The theories that underline most social marketing programs were highlighted, and compared with the literature emphasising the importance of exploring the multilevel influences on human behaviour rather than single level influence. From the literature, a key gap has been identified: the lack of social marketing interventions that tackle multilevel individual influences during formative research. To test the proposition that social marketing interventions can benefit from a broader unified approach, a social marketing intervention needs to be designed, implemented and evaluated while considering this wider view. The first step would be to investigate influences on littering behaviour that prompt behaviour during the formative research

stage. In the context of this research, this step triggers the following research questions:

RQ2: What individual and environmental factors are known to influence littering behaviour?

RQ3: What are the factors influencing littering behaviour (motivation, opportunity, ability and behaviour) within the target population?

2.7. Conclusion

This chapter has reviewed the existing literature relating to the research proposed for this thesis. The theoretical and practical nature of social marketing has been discussed, along with explanations of the nature of littering behaviour from the broader environmental literature. From this review, it was concluded that social marketing might benefit from applying a wider view to extend understanding of littering behaviour beyond the individual targeted for change during formative research. The proposition was formed that understanding could be enhanced with the addition of social and environmental factors surrounding the individual. This thesis aims to provide empirical evidence to support that proposition. The next chapter discusses the research design of this thesis overall, which incorporates three studies in a mixed-method approach to addressing the proposed research questions.

Chapter 3: Research Design and Methodology

Research methodology refers to a set of processes used to acquire, arrange, refine and analyse data in order for the data to become manifest and yield conclusions that add to the existing body of knowledge (Leedy & Ormrod, 2005). Mingers (2001, p. 242) defined research methodology as "a structured set of guidelines or activities to assist in generating valid and reliable research results". This chapter explains the approach used to address the research questions. This includes discussion of the research context, research paradigm, the methodology approach, data collection methods and methods of analysis.

3.1 Research Context

The planet's health depends on the quality of the environment (Abraham et al., 2010; Pelletier et al., 1998). The "cornerstone of sustainability is behaviour change" according to Lee and Kotler (2011, p. 3). Personal behaviour has the potential to powerfully affect the health of the earth (Evans et al., 2007). Thus, the future of humans and other species is seriously endangered by detrimental individual environmental behaviour. Therefore, if human behaviour is the issue, an examination of behaviour should provide the technological solutions for turning things around (Hartley et al., 2015; Lehman & Geller, 2005). One behaviour that significantly contributes to many social problems is littering (Chitotombe, 2014). Littering is reported to seriously damage the environment (Keizer et al., 2008; Torgler et al., 2012). Whether intentional or accidental, littering begins with the individual.

Since the 1960s, littering rates in some countries have decreased significantly; however, littering remains an important environmental and social issue (Al-Khatib et al., 2009). Several studies in developed countries have applied and evaluated strategies that control littering behaviour to reduce pollution (Cialdini et al., 1990; LaHart & Bailey, 1975; Reich & Robertson, 1979; Reiter & Samuel, 1980; Schultz et al., 2013; Singhapakdi & LaTour, 1991). On the other hand, in developing countries, little research attention has been paid to littering behaviour. Many countries, including the Middle East, suffer from widespread littering problems (Al-Khatib et al., 2009).

Littering in the context of Middle Eastern countries is a particularly interesting area of research as almost all the littering studies discussed in the review of literature come from Western populations (Ong & Sovacool, 2012).

Studying Middle Eastern countries is significant as environmental concerns are not unique to the Western World and may be even more acute in developing countries where environmental issues may be compounded because of a lack of awareness, knowledge or resources (Bhuian et al., 2014). One such Middle East country that is facing difficulties with tackling littering is Saudi Arabia. Despite the environment in Saudi Arabia being considered a national treasure which must be preserved and conserved to provide the local community with health, beauty, comfort and reassurance (Abuzinada, Al-Wetaid, & Al-Basyouni, 2005; El-Juhany, 2009), littering has become a burden on the environment (Fahad, 2014; Taribmagazen, 2014). While local cities provide bins for waste, littering on streets, roads, public squares and natural parks is a widespread phenomenon in many cities of Saudi Arabia (Fahad, 2014; Taribmagazen, 2014). Ethical clearance was obtained through Griffith University Human Research Ethics Committee (see Appendix 1&2) to conduct research in the kingdom of Saudi Arabia.

3.2. Research Paradigm

Marketing research aims to define, assess and explain a social science phenomena (Healy & Perry, 2000). Selection of a suitable paradigm is critical in providing an appropriate conceptual framework that will guide the work of the researcher. A research paradigm is defined as, "a way of understanding reality, building knowledge, and gathering information about the world" (Tracy, 2012, p. 38), a "basic set of beliefs that guide action", in general telling researchers "what is important, what is legitimate, what is reasonable" (Guba, 1990, p. 17). Research paradigms are important as they represent fundamental belief systems, which direct the researcher (Parkhe, 1993).

This research adopts a pragmatism paradigm, as it is the most reflective of the researcher's worldview and the research program. According to a pragmatist, the meaning of individual experience exists neither exclusively in the objective real world nor exclusively in the internal mind of the knower, rather it lies instead in their interaction (Greene, 2007). Ontologically, pragmatism rejects that truth regarding reality can be determined, "unsure if one explanation of reality is better than any other" (Teddlie & Tashakkori, 2009, p. 92). Also pragmatism agrees with positivists on "the existence of the external reality independent of our minds" (Teddlie & Tashakkori, 2009, p. 92). Epistemologically, pragmatism values objectivity and subjectivity, each could be relevant at different stages of the research cycle (Johnson & Onwuegbuzie, 2004; Teddlie & Tashakkori, 2009). Pragmatism believes that epistemological issues do not occur on two opposing poles, but on a continuum (Teddlie & Tashakkori, 2009, p. 90). Table 1 represents the pragmatism paradigm point of view.

Table 4: Pragmatism perspective

	Pragmatism
Methods	Both qualitative and quantitative; researcher answers questions using best methods
Logic	Both inductive and hypothetico-deductive
Epistemology (research /participants' relationship)	Both objective and subjective points of view, depending on stage of research cycle
Axiology (role of value)	Value important in interpreting results
Ontology (the nature of reality)	Drivers viewpoints regarding social realities; best explanations within personal value systems
Possibility of causal linkages	Causal relations, but they are transitory and hard to identify; both internal validity and credibility are important
Possibility of generalisation	Ideographic statements emphasised; both external validity and transferability issues important

Source: (Teddlie & Tashakkori, 2009, p. 88)

Methodologically, it does not matter which methods are used as long as the methods selected have the potential to answer the unknown question (Feilzer, 2010). Pragmatism frequently underpins mixed methods studies (Teddlie & Tashakkori, 2009). Pragmatism involves deciding single or mixed methods based on the existing research questions and the "ongoing phase of the inductive –deductive research cycle" (Teddlie & Tashakkori, 2009, p. 87). Furthermore, Yin (2009) indicates that mixed methods research allows investigators to collect a deeper and solid selection of evidence and tackle more complex research questions than can be achieved by any single method alone.

According to Prestin & Pearce (2010), social marketing's framework emphasises the significance of formative research to improve an understanding of a target audience's perceptions of the behaviour and its related benefits and barriers. Qualitative research has been the most prominent method used by social marketers. According to Truong (2014), in some cases the effectiveness of social marketing interventions is qualitatively reported; however mixed methods are gaining prominence (Truong, 2014). Further, Helmig and Thaler (2010) claim that moving beyond self-reporting is needed.

3.2.1 Mixed Methods Research

The bias inherent in any method would be avoided once used in conjunction with other methods (Johnson, Onwuegbuzie, & Turner, 2007). Mixed methods research is defined as "the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g. use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration" (Johnson et al., 2007, p. 123). Mixed methodology provides answers that cannot be achieved by quantitative or qualitative approaches alone (Creswell & Clark, 2007). Furthermore, it allows for the identification and understanding of a target audience's needs, characteristics, interests, behaviours, values, aspirations, and everyday lives which influence their decisions and actions (Tashakkori & Teddlie,

2010). Mixed methodology enables the researcher to address a range of confirmatory and exploratory questions together with both the qualitative and quantitative tactics; delivers greater inferences and offers the opportunity for a better assortment of divergent views (Teddlie & Tashakkori, 2009). The use of a mixed methodology also helps to increase the validity and credibility of the study (Johnson et al., 2007).

The most commonly used mixed methods research designs are: convergent parallel design, exploratory sequential design, explanatory sequential design and embedded design. Embedded design has been used for this research (Bryman, 2016). This thesis employs an embedded design for a number of reasons. First, it can prioritise either the qualitative or quantitative research approach and subsequently draw on the other approach as well within the framework of the study. Second, the need for this particular design can occur when the researcher needs to enrich either qualitative or quantitative research with another approach. Third, the data gathering may be simultaneous or sequential. Fourth and finally, the need for embedded design occurs when the researcher feels that quantitative (or qualitative) research only will be insufficient for understanding the issue under investigation (Bryman, 2016). Figure 2 shows how this research implemented embedded design.
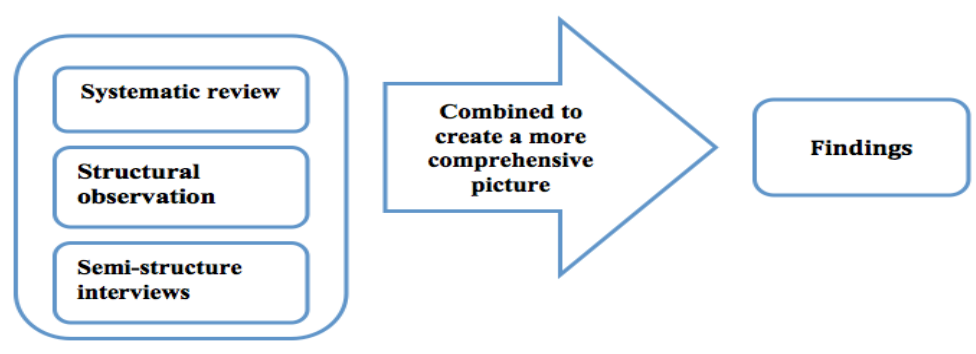
Figure 2: Embedded design Adopted from (Bryman, 2016)

3.2.2 Mixed Methodological Approach Adopted

A number of approaches can be used in mixed methods research to enable

triangulation or increase validity (Bryman, 2016). To enable a rigorous study to be undertaken, this research will use multiple methods of data collection to allow triangulation of the data (Bryman, 2016, p. 697). Triangulation is defined as, "the combination of multiple methodological practices, empirical materials, perspectives, and observers in a single study and is best understood as a strategy that adds rigor, breadth, complexity, richness, and depth to any inquiry" (Denzin, 2012, p. 82). A systematic literature review study (1), a combination of two methods, namely structural covert observation (study 2) to understand the current littering behaviour in a Middle Eastern context and semi-structured interviews (study 3) held with Saudi Arabian adults were implemented for data collection.

It was clear that neither a qualitative or quantitative approach alone was sufficient to achieve the research aims. Thus, mixed-methods research seemed to be the most appropriate research design, considering the research questions and methods that could be used in this type of research. Therefore, this thesis adopts a mixed methods approach, using both qualitative and quantitative methods as outlined in Section 3.3 - Research design.

3.3. Research design

A major function of research design is to maximise the validity of the conclusions drawn during the research process (Altmann, 1974). Hence, it includes specifying a research plan outlining methods and procedures to be used in gathering and analysing the necessary data (Burns & Bush, 2003; Malhotra, Hall, Shaw & Oppenheim, 2004).

This study comprises two stages. The first stage is a systematic literature review, which will be conducted to examine the more recent littering behaviour change intervention literature, and extract key lessons to guide the development of the social marketing intervention. The first stage will also help to understand the different

techniques and methods used for littering interventions as well as identifying the gaps in the literature. In the second stage, a formative research study was undertaken.

Two methods were selected for the formative research study (Study 2) – observation (structured- quantitative methods) and (Study 3) in-depth interviews (semi-structured interviews qualitative methods). Structured observations of the target audience were undertaken to identify the individual and environmental factors that can be used to influence adults to change littering behaviour. Semi-structured interviews were conducted to identify the influences, motivations and behavioural intentions of the target audience and the target audiences understanding of littering in Saudi Arabia and their perspective on the issue.

Structural covert observation (quantitative) helps the inflow of data quickly; is time flexible and economical; has a high observation rate; allows behaviour to be observed directly; allows more accurate reconstructions of large scale social episodes; provides more reliable information about events; has greater precision regarding their timing, duration, and frequency; has greater accuracy in the time ordering of variables; is more accurate and effective than getting people to report on their behaviour through surveys; and uncovers unexpected topics or issues. On the other hand semi-structured interviews (qualitative) offer the opportunity to reveal information about both behaviours, attitudes and social backgrounds; permit participants to provide in-depth information; allow the researcher to control over the line of questioning; allow questions which focus directly on the study topic; and can control additional data (Bryman, 2016; Creswell, 2013; Tashakkori & Teddlie, 2010).

3.3.1 Study 1: Littering reduction: A systematic review of research 1995-2015

In order to gain greater knowledge in the area of social marketing and littering, evaluating past empirical studies will be undertaken through a systematic review of the literature (Truong, 2014). One of the most beneficial and appropriate approaches for evaluating a field's accrued understanding is by reviewing published research in

peer-reviewed journals (Williams & Plouffe, 2007). Following Bates' (2010) procedural study, one will examine littering campaigns focusing on changing littering behaviour published from 1995. The aim is to understand the main characteristics, effectiveness and the extent that change has (or has not) occurred previously in littering interventions. A current or contemporary understanding of how littering campaigns have been applied to improve littering behaviour was required to understand key success factors for an intervention. This systematic literature review is intended to deliver a comprehensive overview of the academic literature relevant to interventions and social marketing that were designed to change littering behaviour. This study will provide the researcher with the background knowledge needed to design an effective social marketing littering intervention.

Method: Relevant literature published since 1995 (Dwyer et al., 1993) was identified initially through keywords searched (*PubMed, PsycINFO, SinceDirect, ProQuest, SAGE, EBSCO, MEDLINE, Web of Science, Green FILE, ProQuest ERIC, and Taylor & Francis*) . Search terms included the following: "litter" or "waste" or "garbage" or "rubbish" or "trash" AND "intervention*" or "randomised controlled trial" or "evaluation" or "trial" or "campaign*" or "program*" or "study" or "studies" or "behaviour change" AND "social marketing". These terms were consistent with searches reported in previous systematic literature reviews in social marketing (Carins & Rundle-Thiele, 2014; Kubacki et al., 2015) in the areas of healthy eating and problem alcohol use. The titles and abstracts of retrieved articles were reviewed and references were discarded if they were not related to littering or did not meet the inclusion criteria. The full text of articles was obtained for further clarification on the measures and study objective. Further searches were conducted using the references lists and "cited by" searches on Google Scholar. The literature searches were conducted in May 2015. The lead author conducted searches and both co-authors independently reviewed the articles for eligibility for inclusion. Further methodological details are provided in Chapter 4, Section 4.3.

3.3.2 Study 2: Individual and Environmental factors influencing littering behaviour: an observation study

To date there is scant literature on observation studies of littering behaviour in developing countries, particularly Middle Eastern countries, with most previous research using interviews or surveys (Al-Khatib, 2009; Al-Khatib et al., 2009; Arafat et al., 2007). No observation studies have been identified targeting littering behaviour in the context of Middle Eastern countries. Therefore, the purpose of this paper is to look at the environmental, social and individual factors that influence littering behaviour using a specific conceptual framework (Behavioural Ecological framework (Brennan, Binney, Hall, & Hall, 2015)). Observation is appropriate for this research, as using observations allows the researcher to record what individuals truly do, not what he/she claims to have done, which is important in the context where social desirability may impact reporting (e.g. littering). The researcher employed a structured observation method, which is the most frequently used observation method in the littering behaviour change research (Cierjacks et al., 2012; Lindemann-Matthies et al., 2012; O'Connor, Lerman, Fritz & Hodde, 2010;Wever, Van Onselen, Silvester & Boks, 2010).

Method: A convenience sample was employed in this study (Marshall, 1996; Patton, 2002). Natural settings in three parks in Riyadh were chosen as the basis for the observational study. Structured observations were conducted from December 2014 to February 2015 in a total of three different outdoor sites (two different open parks and one gated park). The behaviour of individual adults who were littering was observed following the Schultz et al. (2013) protocol and code sheet. Statistical analysis was undertaken to assess the individual and environmental variables that were predictive of littering. The analysis was conducted using only data from observations where a disposal facility was located (either proper or improper) (N=295). The analyses were conducted in SPSS 22 using Generalized linear models, specifically a binomial family and logit link. Further methodological details are provided in Chapter 5, Section 5.5.

3.3.3 Study 3: Preventing littering: it's not all about sticks!

In line with previous methods designed to investigate littering behaviour decisions, individual in-depth interviews were conducted with participants and transcripts were analysed using thematic analysis. A qualitative approach seeks to arrive at an understanding of a specific phenomenon through the eyes of those experiencing it (Vaismoradi, Turunen, & Bondas, 2013). The crucial role of formative research in the development of effective social marketing intervention requires the collection of data that will deliver a deep and nuanced understanding of the target audience's current knowledge, beliefs, values, and norms regarding the behaviour promoted by the intervention. In-depth interviews provide the opportunity to observe body language, tone of voice, and any reaction to the issues that arise during the interview (Bowerman & DeLorme, 2013; Gill, Stewart, Treasure, & Chadwick, 2008; Barriball & While, 1994). According to Longhurst (2003) semi-structured interviews are not only about talking; they are also 'about listening'.

Method: In order to access participants who meet the criteria for this study, the following recruitment method was used: word of mouth through the researcher's acquaintances using a purposeful sampling technique to gain maximum variation (Seidman, 2006). Interviewees were reached using a non-probability snowball sample technique with a 0% rejection rate experienced. All participants provided their written consent for their data to be used in the research. Adults aged 20-40 years old were approached to participate in the study. A diverse range of respondents was sought to accommodating for heterogeneity in the market as far as practical. In total, 25 interviews (11 male and 14 female) were held from December 2014 to May 2015 with Saudi adults; a sample of this size which was deemed to be appropriate for this type of investigation. Saturation, where no unique or greater research findings will be achieved from more participants (Mason, 2002), was achieved. Information was gathered using audio recordings and note taking. To encourage discussion and to ensure understanding, questions were clarified, and re-framed questions were used. The purpose of the interviews was to understand how the interviewees felt about: littering practices in public places; their overall concern and motivation; their ability and opportunity to litter and its effect on the environment; knowledge of littering

infrastructure in their area (e.g. placement of littering containers); the effect of peer influence and opinions about littering; effects of the media; their opinion of effective/ineffective programs and advertisements; and their recommendations for future techniques that might encourage the prevention of littering. The results were analysed through thematic analysis, guided by the motivation, opportunity and ability (MOAB) theoretical framework (Parkinson, Schuster, et al., 2016). Further methodological details are provided in Chapter 6, section 6.4.

3.4. Conclusion

This chapter has outlined the research design. First, it illustrated the pragmatic philosophical position used by the researcher and how that guided the research. Following this, the research methodology of the three studies within the research design was briefly described by illustrating the data collection, sampling, and analysis methods selected. The next three chapters present, in article form, how these methods were implemented, providing more detail on the methodology in addition to the results.

Chapter 4 (study 1) Littering reduction: A systematic review of research 1995-2015

Contributors
The study was designed by Yara Almosa with support from Sharyn Rundle-Thiele. The study was analysed by Yara Almosa, Sharyn Rundle-Thiele and Joy Parkinson. Yara Almosa led the writing, Sharyn Rundle-Thiele and Joy Parkinson provided input on the analytical interpretation and critical contribution to the writing.

Conflict of Interest

None of the authors declare any competing interests.

Author Signatures

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4.1. Abstract

Littering continues to be a problem worldwide. The purpose of this paper is to update earlier systematic reviews on littering and using a scorecard of seven social marketing components, assess the extent of social marketing use in identified littering programs. Following Centre for Reviews and Dissemination guidelines the search included all peer-reviewed studies published between 1995 and 2015 in the English language available through ten databases. A total of 1220 articles were initially identified and resulted in a final set of 17 that met the study criteria. The analysis revealed key insights including a lack of social marketing use in litter prevention efforts to date providing an opportunity for future research. Limitations of the current study and opportunities for future research are outlined.

4.2. Background

Littering continues to be a problem across the globe. Littering is not only unattractive; it also threatens the environment (Huffman, Grossnickle, Cope, & Huffman, 1995). In this study, litter is considered as any piece of inappropriately placed waste matter (Schultz, Bator, Large, Bruni, & Tabanico, 2013). Discarded items may not be equally counted as litter for example, a discarded cigarette butt versus an abandoned refrigerator. While both are unsightly, studies in this review focus on individual pieces of litter that can be held in the hand of an individual and can be deposited in a trash can, and excludes matter such as abandoned motor vehicles and white goods including refrigerators and washing machines, which may require vastly different intervention approaches.

Litter that can be held in the hand and disposed of in a trash can has evolved from being viewed primarily as an aesthetic problem to a broader environmental issue, and generally involves paper, bottles and food packaging (Al-Khatib, 2009). Littering not only reduces the aesthetic appeal of public places including streets, parks and waterways but can also degrade water quality, endanger and kill wildlife, and

contribute to flooding by blocking drainage systems (Abu-Hilal & Al-Najjar, 2004; Al-Khatib, Arafat, Daoud, & Shwahneh, 2009; Chitotombe, 2014; Hartley, Thompson, & Pahl, 2015). Littering is a social behaviour (Ong & Sovacool, 2012; Spacek, 2004; Stephen & James, 2014). Thus, designing and evaluating litter management from a social perspective is important (Ma & Hipel, 2016).

A variety of approaches have been employed to reduce littering including public policy (Ong & Sovacool, 2012), technology, educational and awareness programs (Hartley et al., 2015), infrastructure (Hoppe, Bressers, de Bruijn, & Franco-Garcia, 2013), persuasive messages (De Kort, McCalley, & Midden, 2008) and community development (Liu & Sibley, 2004). A distinct absence of social marketing interventions targeting litter in the literature has previously been observed. Social issues such as littering require multi-faceted approaches to achieve behaviour change which can include a variety of disciplines (Parkinson, Schuster, & Russell-Bennett, 2016). Each discipline has evolved with its own unique theories, tools and techniques, and a lack of connectedness between behaviour change fields has been noted with the behaviour change sector being criticised for operating in silos (Tapp & Rundle-Thiele, 2016) suggesting there is merit in understanding the extent that discipline understanding is applied across the behaviour change sector.

Social marketing has been identified as a useful, yet underused approach in environmental issues, particularly when targeting individual behaviour (Takahashi, 2009). Social marketing, which involves the application of marketing thinking, tools and techniques to achieve social change (Donovan & Henley, 2010), may provide an important and valued contribution to the reduction of littering, thereby enhancing the environment and public health domains. Centred on audience understanding social marketing may assist to deliver innovative solutions catering to heterogeneous populations (Tapp & Rundle-Thiele, 2016).

Systematic literature reviews allow essential benchmarking of development in a field while also informing direction for future research with respect to program effectiveness. Additionally, systematic literature reviews assist in identifying topical, theoretical, and methodological trends (Truong, 2014; Williams & Plouffe, 2007). There is a scarceness of rigorous reviews and meta-analyses of environmental interventions in general (Bates, 2010), and recent litter-oriented campaigns in particular. Therefore, the first aim of this paper is to update earlier systematic literature reviews of littering by Dwyer, Leeming, Cobern, Porter, and Jackson (1993) and to provide a contemporary review of interventions aiming to reduce littering. The Dwyer, Leeming, Cobern, Porter, and Jackson (1993) review categorized littering intervention studies based on antecedent and consequence conditions. The review revealed that antecedent strategies have a long lasting effect when compared to a consequence strategy. Dwyer et al. (1993) concluded that behaviour change programs used basic intervention strategies rather than strategies that could be considered innovative. Furthurmore, Dwyer et al. (1993) criticized the lack of adoption of effective and valuable strategies that has identified from programs and concluded this may impact minimal effects observed. Dwyer et al. (1993) noted the importance of applying theories when designing programs in order to foster long lasting behaviour change.

To differentiate social marketing from other fields such as public health Andreasen (2002) developed six components defining social marketing. Researchers have previously used Andreasen's (2002) six components to determine the extent that social marketing has been applied in social marketing and other behaviour change interventions (Carins & Rundle-Thiele, 2014; Gordon, McDermott, Stead, & Angus, 2006; Stead, Gordon, Angus, & McDermott, 2007). Recent research indicates that behaviour change is more likely when more of Andreasen's (2002) six components are applied (Carins & Rundle-Thiele, 2014). Theory inclusion in the development of behaviour change programs has also been identified as an important element for successful programs (Truong, 2014) and the National Social Marketing Centre (French & Blair-Stevens, 2005), who extended Andresean's (2002) six social marketing components added theory as a component. Therefore, this study includes Andreasen's (2002) six components along with the NSMC's (2005) theory component

extending the social marketing scorecard applied in earlier studies (for examples see Kubacki et al. 2015; Carins and Rundle-Thiele, 2014). A scorecard of recent interventions aiming to reduce littering may assist future researchers to understand how social marketing components can be applied and in turn how intervention effectiveness may be enhanced. Thus, the final aim of this paper is to deliver a social marketing scorecard for identified studies. Overall, the study aims to update the litter reduction evidence base and to provide a contemporary understanding of the elements included in these programs to assist in the development of future behaviour change programs.

4.3. Method
Study Design

The authors adopted steps outlined in the Centre for Reviews and Dissemination guidelines (CRD) (Tacconelli, 2010) to conduct the systematic review of littering interventions. The guidelines aim to avoid introducing bias. The steps followed involved developing the background of the study, the questions the review sought to answer, inclusion and exclusion criteria, and defining the outcomes of interest. A narrative technique was used to report findings, as meta-analysis was not possible due to study heterogeneity, including variation of data analysis approaches (i.e. both qualitative and quantitative) and the absence of a common statistical measure including reported effect sizes for interventions.

Search Method

Relevant literature published since the Dwyer et al. (1993) and Huffman et al. (1995) reviews was identified initially through keyword searches in PubMed, PsycINFO, ScienceDirect, ProQuest, SAGE, EBSCO, MEDLINE, Web of Science, Green FILE, ProQuest ERIC, and Taylor & Francis (see Table 1). Search terms included the following: "litter" or "waste" or "garbage" or "rubbish" or "trash" AND

"Intervention*" or "randomized controlled trial" or "evaluation" or "trial" or "campaign*" or "program*" or "study" or "studies" or "behaviour change" AND "Social marketing". These terms were consistent with searches reported in previous systematic literature reviews in social marketing (see Carins & Rundle-Thiele, 2014; Kubacki, Rundle-Thiele, Pang, & Buyucek, 2015) in the areas of healthy eating and problem alcohol use. The titles and abstracts of retrieved articles were reviewed and were discarded if they were not related to littering or did not meet the inclusion criteria. The full text of articles was obtained for further clarification on study measures and objectives. Further searches were conducted using references lists and "cited by" searches on Google Scholar from papers identified in the initial review. The literature searches were conducted in May 2015. Searches were conducted by the lead author and two co-authors independently reviewed the articles for eligibility for inclusion.

Inclusion criteria

Original quantitative research published in peer-reviewed journals between January 1995 and May 2015 that were written in English were included in the current study. Research was eligible if either self-reported or objective measures of littering behaviour in an identified program, experiment or intervention were included. For all studies the inclusion criteria for outcome measures were littering behaviour. Several potentially relevant articles identified during the literature search process did not meet the inclusion criteria as no program or intervention was identified. As only full-length articles were considered, a number of publications including editorials, abstracts, book reviews, practitioner profiles, research notes, and commentaries were excluded.

Table 5: Databases and articles retrieved in initial search

Databases	Number of articles retrieved
Science Direct	153
ProQuest all data bases	120
Web of Science	420
SAGE	8
Emerald	61

EBSCO all data bases	260
PubMed	12
Taylor & Francis	67
Psyc INFO (Ovid)	88
ERIC	31
Total	1220
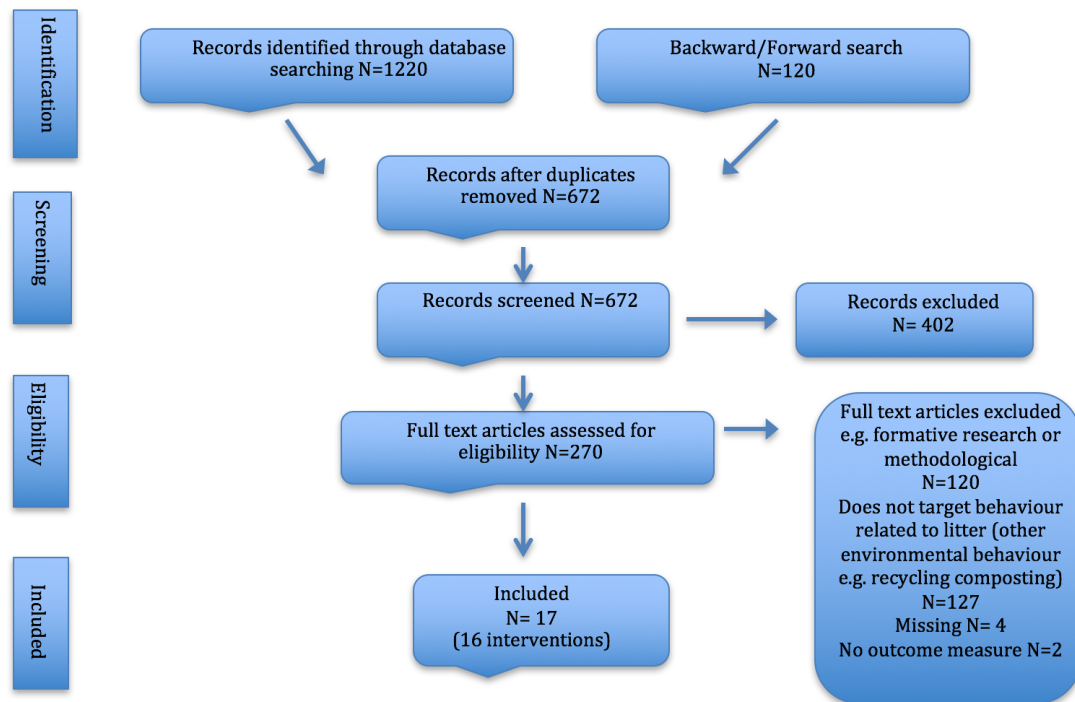
Figure 3: Systematic review process

Search Outcomes

The initial literature search yielded 672 potential articles after removing duplicate records (see Figure 1). Of these, 17 met the inclusion criteria. Although all of the interventions described in this paper targeted littering behaviour, they were carried out in a diverse range of contexts and often included different outcome measures without effect size. This study focused on identifying whether positive, negative or no change was observed, without attempting to determine the size of the effect.

Quality Appraisal

Previous systematic literature reviews on littering (Dwyer et al., 1993; Huffman et al., 1995) have not undertaken quality assessments. The studies included in this review were assessed for their methodological quality using the Mixed Methods Appraisal Tool (MMAT) developed by Pace et al. (2012). This tool has been used previously in reviews of literature examining the physical environment (Joseph, Choi, & Quan, 2015). Using the MMAT allows the researcher to evaluate the quality of a study quickly and efficiently, by responding to a set of questions dependent on the study type. A study quality score is calculated based on the criteria met. Two authors independently evaluated the quality of the 17 papers, and an inter-rater reliability score was calculated using Cohen's Kapper (0.81) indicating substantial agreement. Across the studies, the quality criteria were fulfilled differently, and no studies were excluded after the appraisal process. Interestingly, the papers which used only self-report behaviours (Daniels & Marion, 2005; Hartley et al., 2015) did not report the use of any validated scales in their papers, which was an apparent weakness of the studies. Two studies, Bateson, Callow, Holmes, Roche, and Nettle (2013) and Sussman and Gifford (2013) reported using an independent data point design to ensure the observations were likely to be independent of each other providing a rigorous approach to their observation experiments.

A variety of methods were used in the assessed studies. Of the 17 papers examined, ten reported mixed methods (observation and survey), four reported observation alone, and three quantitative (survey). Within the studies, the most common method used was observations with 14 of the 17 papers using this technique, which as Schultz and colleagues note (Schultz et al., 2013) is the most appropriate method in the littering space.

Data abstraction and synthesis

From the final 17 papers reporting on 16 studies the following data were extracted (see Table 2) including authors' name and date journal published, study location, year, participants, study design, exposure(s), outcomes(s) needed, analytical methods, behaviour measured, evaluation and theories if used, discipline field, outcome variables, results, and quality assessment. By "a study" we mean all the published papers reporting on a single evaluation of a specific program. To understand which essential ingredients should be present in a littering intervention, the scorecard developed using Andreasen's (2002) social marketing components and theory were used to assess interventions (see Table 3). In order to increase inter-rater reliability all excerpts were reviewed, compared, and discussed by two social marketing researchers. If no evidence of a criterion was identified by any of the researchers a 'not reported' outcome was assigned to the intervention against the specific criterion.

4.4. Results

First, an overview of the contexts of the included studies is presented. This is then followed by the scorecard assessment. The studies looked at a range of different littering environments (see Table 2). Five studies were undertaken in university settings; three were conducted in community settings (one in a beach community, one in a commercial precinct, and another in a local council area); two were conducted within shopping areas (one in a shopping center and the other an outdoor shopping strip); two took place in a national park or forest setting; two were conducted in public areas (one on a train, one in a cinema); and one study was conducted in a school setting.

Table 6: Study overview

References	Location, study year, participants	Study design	Exposure(s)	Outcomes(s)	Analytical methods	Behaviour measured	Evaluation	*Results	MMAT Quality Score
Bateson et al. (2013)	England Six bicycle racks on the campus of Newcastle University, October to December 2012 Cyclists student and staff – 439 males and 181 females (ages 18 and 40).	Experimental	* Durable Signs featuring a large pair of staring eyes preinstalled on the wall above the rack & manipulate the amount of litter present in the ground.	Behaviour	Generalised linear models with binomial probability distribution and a logit link function.	Littering dropping decision	Observations	*No evidence that images of watching eyes make behaviour more normative (p=0.060).	High
Brown, Ham, and Hughes (2010)	Tasmania Russell Falls Track in Mt Field National Park, 2006 - 2007 Park visitor (18 years or older) 29 interviewed, 68 surveyed and 571 observed & surveyed.	Experimental	* Different messages containing the logo of the park, reference to the location of the rubbish bin * A crushed aluminium can placed	Beliefs Attitude Behaviour	One way ANOVA, T-Test and Chi-square	Pick up other people's Litter	Interviews Survey Observation	* 15-20 % increase in litter pick up. (p = 0.009 and 0.039)	High
De Kort et al. (2008)	Netherlands Shopping centre, (Year not reported *Study one: Public - 315 people surveyed (17-60 years old) 68% female- 32% male *Study two: - 1,755 persons observed (20-40 years) 54% female- 46% male. *Study three: 70 people (41 male-30 female)(age not reported)	Experimental	* Persuasive trash-can design, verbal prompt. Messages formulated regarding personal, injunctive and descriptive norms * 8 trash-cans were designed with different arm gestures that communicate anti-litter norms. * Mirror over the trash-can. * Flyers (with information not relevant to the majority of people) were offered to all passers-by while observers coded behaviour	Behaviour Norms	Factor analysis- Reliability analysis- ANOVA- Chi-square	Littering norm activation	Observations and survey	*Control- 19% of flyers littered Treatment conditions- 10%,11%,12% of flyers littered (X^2 = 27.9, df, 6, p < .001)	High

			*Sign placed over the trash-can, large, bright red, wooden sign, 2 m high and 75 cm wide						
de Lange, Debets, Ruitenburg, and Holland (2012)	Netherlands Dutch trains (Year not reported) Participants (not reported)	Experimental	*50 milliliters of perfume oil "Capitaine" was added to every litre of cleaner in two compartments	Behaviour	ANOVA	Littering behaviour change	Counts	* The amount of littering was significantly reduced in train compartments where cleaner scent was dispersed compared to control compartments. $F(1,60)=10.86, p<.01, n=.15$	High
Ernest-Jones, Nettle, and Bateson (2011)	England Self-cleaning cafeteria Newcastle University 2007 - 2009. Student, staff, visitors to campus	Experimental	*Posters featuring images of pair of human eyes or of some flowers (control) colour contrast equalised using Adobe Photoshop, and verbal messages (congruent or incongruent) with littering behaviour. Hung at eye-level around the walls of the cafeteria	Behaviour	Logistic regression	Clear one's litter in university cafeteria	Observation	* Significant effect of eye images $F(1, 29)=19.86, p<.01$, but not of message congruence $F(1, 29)=0.87$, ns, on the proportion of tables littering	High
Hansmann and Scholz (2003)	Switzerland Ten Cinemas June 2001 4,329 visitors	Experimental	Two step communication strategies *Step one: ambiguous message presented on the cinema screen to achieve high motivation for the cognitive processing of the subsequent anti-littering information. *Step two: picture projected on the screen immediately following the message of step one, displayed a common sign representing correct waste disposal, resolving the ambiguity	Behaviour	Not reported	Reduce littering behaviour in cinema	Counts	*Significant improvement 28.3% * The effect of the size of the audience was not significant, $F(1, 18)=0.09, p=.77$	Moderate
Hartley et al. (2015)	England 9 Schools (Year not reported) 176 School children (8–13 years) (76 males; 99 females)	Intervention	*Multiple techniques (posters and artwork, demonstrations, and mini-experiments) *Activities (sea kayaking, beach conservation, and a tour of the aquarium)	Perception Concern Awareness Attitude Behaviour	Non-parametric statistical methods. Post hoc Wilcoxon matched-pair ranks tests (Z	Litter reducing behaviour, greater problem awareness and concern about marine	Survey 176 responses Follow-up one week later	* Children reported significantly greater levels of appropriate litter disposal action and encouraging family and friends	Moderate

								to perform more litter-reducing behaviours after the intervention p< .001	
				score)	litter				
Kallgren, Reno, and Cialdini (2000)	USA - Stairwell Arizona State University (Year not reported) 296 Students (138 female and 158 male)(age not reported) - 149 visitors to public urban hospital (98 female and 51 male) age median 35.0 years. -107 student (37 female 43 male)	Experimental	*Arousal (focus on normative information) participants were led to a landing atop a stairwell. *Confederate (focus on injunctive social norm against littering) exposes some participants to individual picking up a piece of litter in public parking garage, and the other participants were exposed to an individual who simply walked past + 1 or 2 large handbill tucked under windshield. *Self-focusing techniques. Expose participants to a closed circuit TV picture of themselves or geometric shapes	Behaviour	Log-linear model/ Hierarchical model/ chi-square	Encourage pro-social behaviour (littering)	Observation Survey	The least littering occurred in the high norm-focus/ two-handbill condition - $\chi2$ (1, N = 149) = 7.54, p < .01, 9.4% versus 34.2%. The high norm-focus/two-handbill condition produced less littering (9.4%) than either the low norm-focus/two-handbill condition (42.5%), $\chi2$ (1, N = 149) = 9.72, p < .01, or the high norm-focus/one-hand	High
Khawaja and Shah (2013)	Quaid-i-Azam University Islamabad October 2012 Randomly chosen participants. Baseline and Cost treatment, (were 40 participants) Undergraduate students (School of Economics)	Experimental	*Examines whether the negative externality of littering can be internalized by associating a cost to the act by imposing a fine on the litterers	Behaviour	One-tailed Wilcoxon rank-sum test	Reduce litter behaviour	Counts	The distribution of number of waste pieces outside the waste envelope in the Baseline treatment is higher than the distribution of number of waste pieces outside the waste envelope in the Cost treatment (p <0.01)	High
Lindemann-n-Matthies, Bönigk, and Benkowitz (2012)	Germany Karlsruhe Forest. March- April 2011 *171 Children (80 girls and 91 boys) Grade 1 to 3 7-9 years old	Experimental	*Forest tour *Verbal appeal (asked not to litter and pick up litter already in forest ground and put it in a bag) *Modelling tour guide deliberately picked up litter and placed it in a bag	Behaviour	General linear models Linear regression	Not litter in forest school tour. Picking up litter, putting it in a bag	Observation Interview Survey	A combination of verbal appeal and demonstration more positively influenced children's litter behaviour than the appeal alone. 8.55, p=.026	High
Liu and Sibley (2004)	New Zealand Quadrangle Victoria University of	Intervention	*Phase 1: Attitude salience interventions using prompts, modelling	Attitude Behaviour	Inferential statistics (chi-square	Solve the problem of littering at	Observation Survey Number of	Structural intervention (adding ashtrays	High

	Wellington 1996-1999 2397 students observed and surveyed (1143 female; 1186 male)		*Prompt using a banner hung in the Quad. Smaller notices with similar slogans were posted around the steps area - green and red stickers with slogan were offered *Model pick up 5 pieces of litter left in Quad *Structural interventions (e.g. changing the permanent physical characteristics) *Feedback on the percentages of males and females who littered		test) Parallel analysis	university - Quad	participants unstated 2 weeks later	and litter bins) reduced cigarette littering by 64% =74.44, (p,0.001) without changing attitudes towards littering. Posted feedback significantly reduced cigarette littering by 16.9% =12.45, (p<0.001)	
Sibley and Liu (2003)	New Zealand The Victoria University University of Wellington Quad 1996-1999 452 people (146 female; 302 male) (age not reported)	Intervention	*Feedback; posted daily feedback on the percentage of men and women who littered. Feedback was provided through two mediums. First, an article was published in the student magazine. Second, a banner (1.3 m by 5 m) was hung directly above the quad steps *Environmental design intervention; additional litter receptacles and ashtrays were placed in the environment	Behaviour	Multinomial analysis of variance Wald chi-square test	Reduce active and passive littering behaviour	Observation Number of participants not reported 2 days later	Posted feedback significantly reduced cigarette littering by 17% =133.74, (p<.001) and no cigarette littering by 19% = 22.16, (p<.001)	High
Reams, Geaghan, and Gendron (1996)	Louisiana Baton Rouge 3 selected neighborhoods December 1990-May 1991) Participants (age and sex not reported)	Field study	*Recycle program- Education literature mailed (emphasis the environmental, economic and energy benefits) *Structural interventions (bins were provided at no charge)	Behaviour - correct recycling of litter (reduce recyclable litter) Awareness, Understanding	Simple linear regression with analysis of covariance (ANCOVA)	Litter less or/ and pick up more accumulated litter	Counts	Lower levels of recyclable litter in treatment areas than control (p = .0032) Using a recycling program to reduce littering behaviour was not effective with the general litter, it was not statically significant (p=.4533)	Moderate
Sussman and Gifford (2013)	Canada Shopping center + Restaurant (Year not reported) 562 participants (47% female and 53 % male	Intervention	*Sign; Simple three-panel signs 8.5″ × 11″ colour sheets of paper and folding them in thirds to form a triangle, placed on table tops *Visual prompt; above	Behaviour	Log-linear	Encourage the use of public compost bins	Observation Interview Survey	Models were more effective than signs (p < .001) Signs did not significantly	High

variety of ages)			compost bin Modelling; A total of 28 volunteers combined to form 23 pairs of confederates to act as models.					influence behaviour (p> .05)	
Taylor, Curnow, Fletcher, and Lewis (2007)	Melbourne Suburb/ Oak Park 2002-2004 81 Merchants and 342 public surveyed (age and sex not reported)	Education campaign	*Merchants related elements; brochure, one-to-one site visits, meetings with merchants, a cooperative clean-up event, a fact sheet, maintenance of infrastructure in the street (including bin-related infrastructure), posters in shop windows, windproof ash-trays and drain stencilling *Public-related elements; posters in shop windows and a nearby railway station, stormwater drain stencilling, brochures distributed by merchants and maintenance of the local environment (e.g., clean-up of dumped rubbish and improvement to local Council- managed infrastructure)	Awareness, Knowledge, Attitude, Behaviour	Analysis of Variance (ANOVA) with Tukey's HSD Post-hoc Test	Reduce littering in commercial areas.	Interview Survey Observation Counts Number of participants not reported Seven months later	Small positive change. This result was not, statistically significant (P = 0.34)	High
Uneputty, Evans, and Suyoso (1998)	Eastern Indonesia Ambon Bay November 1994-May 1995 Village community (age and sex not reported)	Education campaign	*Clean up event, Speech, seminar, Assistance government member for cleaning)	Behaviour	Mann Whitney U test)	Reduce litter pollution on shores	Counts	There were significantly lower densities of litter after the cleanup event than before it (W=153; p<0.001; Mann Whitney U Test)	Moderate

Wever, Van Onselen, Silvester, and Boks (2010)	Netherlands Coffee outlet canteen area Delft University of Technology 4000 consumers (age and sex not reported) Dutch National Rowing Championships in Amsterdam 898 consumers (age and six not reported) Suburban shopping centre	Experimental	*Anti-littering labels applied to disposable coffee cups in both conspicuous and inconspicuous forms	Behaviour	Chi-square test	Influence of the characteristic of an object on littering behaviour	Counts Observation Number of participants not reported Several weeks later	* The litter percentage was 11.2% with the labels applied, this dropped to 6.7%. In the after-test some weeks later, the percentage had increased again to 14.1%. This reduction was found to be significant ($p < 0.001$) but the labels do not seem to cause a memory effect	Moderate

Table 7: Scorecard assessment

No	Authors	Behaviour	Audience	No. Of scorecard principles	Behavioural objective	✗Audience segmentation	✗Formative research	✗Exchange	Marketing mix	Competition	✗Theory
	Bateson et al. (2013)	Littering dropping decision	Cyclists (students + staff)	2	✓(ns)	✗	✗	✗	0	✓	✗
	Brown et al. (2010)	Littering behaviour	Park visitors	5	✓(+)	✗	✓	✗	2 (Promotion, product)	✓	Theory of Planned Behaviour
	De Kort et al. (2008)	Littering norm activation	Public (20-60 years)	5	✓(+)	✗	✓	✗	2 (Promotion, product)	✓	Focus Theory of Normative Conduct
	de Lange et al. (2012)	Littering behaviour	Commuters	2	✓(+)	✗	✗	✗	1 (Product)	✓	✗
	Ernest-Jones et al. (2011)	Littering behaviour	Students, staff, visitors to campus	2	✓(+)	✗	✗	✗	1 (Promotion)	✓	✗
	Hansmann and Scholz (2003)	Littering behaviour	Visitors	3	✓(+)	✗	✗	✗	1 (Promotion)	✓	Reputation and Punishment Models
	Hartley et al. (2015)	Littering behaviour	Schoolchildren (8–13 years)	4	✓(+)	✗	✓	✗	2 (Promotion, product)	✓	Social Learning Theory
	Kallgren et al. (2000)	Littering behaviour	Students	4	✓(+)	✗	✓	✗	0	✓	Focus Theory of Normative Conduct
	Khawaja and Shah (2013)	Littering behaviour	Undergraduate students	1	✓(+)	✗	✗	✗	1 (Price)	✗	✗
	Lindemann-Matthies et al. (2012)	Littering behaviour	Children grade 1 to 3 (7-9 years)	2	✓(+)	✗	✗	✗	1 (Product)	✓	✗
	Liu and Sibley (2004); Sibley and Liu (2003)	Littering behaviour	Students	5	✓(+)	✗	✗	✓	3 (Promotion, product, place)	✓	Micro-Economic Theory
	Reams et al. (1996)	Littering behaviour	Households	3	✓(+)	✗	✗	✗	4 (Promotion, product, place, price)	✓	✗
	Sussman and Gifford (2013)	Encourage the use of public compost bins.	Community	4	✓(+)	✗	✗	✗	3 (Promotion, product, place)	✓	Sub- Theory of Social Space
	Taylor et al. (2007)	Littering behaviour	Merchants + public	4	✓(ns)	✗	✗	✗	3 (Promotion, place, product)	✓	Two-Stage Process Model
	Uneputty et al. (1998)	Littering behaviour	Community	3	✓(+)	✗	✗	✗	1 (Promotion)	✓	Schwartz Altruism Model
	Wever et al. (2010)	Littering behaviour.	Public	4	✓(+)	✗	✗	✗	2 (Promotion, product)	✓	Focus Theory of Normative Conduct

Scorecard assessment

The scorecard assessment found that most of the included studies used a range of social marketing components. Each scorecard component is briefly summarized in turn.

Behaviour change

All 16 studies reported a specific littering behaviour change goal and five of the 16 studies included additional change objectives. For example Taylor et al. (2007) measured littering knowledge and attitudes and general stormwater management. The majority of studies reported objective littering measures (e.g. observed littering behaviour (n=5) or litter volume (n=4). Two studies used self-report behaviour (Daniels & Marion, 2005; Hartley et al., 2015) as their outcome variable.

Fourteen studies reported litter behaviour change. For example, Brown et al. (2010) reported a 15-20% increase in litter pick up (p=0.009) and Hartley et al. (2015) reported a significant reduction in children's littering behaviour (p<.001). Three studies reported moderate outcomes. Bateson et al. (2013) found weak evidence that an image of watching eyes makes behaviour more normative (p = 0.060). Reams et al. (1996) reported being partially successful with lower levels of recyclable litter found in treatment areas when compared to control areas (p = .0032), with limited spillover effect. Reams et al. (1996) applied a recycling program to change littering behaviour suggesting the activation of social norms that lead to one desirable environmental behaviour also has potential to lead to other desirable environmental behaviours, such as disposing of litter correctly. Finally, Taylor et al. (2007) reported no effect on reducing litter (p=0.34).

Formative research

Formative research is crucial in the development of any behaviour change intervention to understand what people in the target audience would value (Andreasen, 2002). Behaviour change practitioners and researchers use formative research to gain insights into the motives, opportunities, barriers, and triggers that surround behaviour changes (Tapp & Rundle-Thiele, 2016). Only four studies reported use of formative research to inform their intervention. Brown et al. (2010) used interviews with visitors to a national park where the intervention was to take place to identify a set of salient beliefs that could be used to influence park visitors. A scenario study using a survey was used by De Kort et al. (2008) to understand how various types of norms could be used to activate social judgments. Kallgren et al. (2000) drew upon an observation experimental study conducted by Cialdini, Reno, and Kallgren (1990), and Hartley et al. (2015) used a literature review on previous littering research focused upon children to develop their intervention. Limited reported use of formative research to understand the target audience offers considerable room for improvement.

Audience segmentation

Segmentation relies on dividing a total population targeted by an intervention into smaller groups using multivariate techniques such as cluster analysis. Following identification of segments marketing activities and materials tailored to the unique needs and wants of one or more unique groups are delivered to one or more target segments (Dietrich et al. 2017). While segmentation is recognized as a key component of social marketing, a recent umbrella review of segmentation use in social marketing indicates that full application of the segmentation process is limited (Kubacki et al., 2017). Segmentation is a three step process that in any large market comprises of segmenting, targeting and positioning (Dietrich et al., 2015). While one study (Taylor et al., 2007) developed different offerings for two distinct target audiences, segmentation was not evident as there were no attempts to understand whether distinct segment groups existed within both merchants and the public visiting the intervention precinct. Some studies targeted specific groups. For example, the Hartley et al. (2015) study developed a program specifically for children aged 8-13 years, however there was only one program offered with no reported use of segmentation analysis prior to target selection. Given that segmentation seeks to develop accurate, robust and meaningful

understandings of population subsets that share common characteristics and these segments are internally homogeneous meaning people in the segment are similar in for example, their attitudes or beliefs, age, gender, physical location and most importantly for social marketing, share similarities in their behaviours (French, 2017) we deem the Hartley et al. (2015) study provides evidence of targeting but not the full segmentation process.

Exchange

Stead et al. (2007) explain that in a behaviour change context, an exchange occurs when individuals have to give something up in order to receive the proposed benefits offered by an intervention. Hence, the use of exchange (including incentives, disincentives, and an appropriate environment) is what distinguishes marketing from education (Takahashi, 2009). This indicates it is essential for social marketers and other behaviour change disciplines to consider what would motivate people to engage voluntarily with the intervention or desired behaviour and offer them something beneficial in return (Stead et al., 2007). Only one study in this review, the Victoria University Quad study, explicitly mentioned exchange (Liu & Sibley, 2004; Sibley & Liu, 2003) where students were rewarded for performing the desired behaviour via incentives and punished for not performing the behaviour. The incentive was to receive a green sticker for making the effort to dispose of litter correctly. The punishment was receiving a red sticker if litter was disposed of incorrectly (e.g. dropping litter on the ground or leaving it where they sat).

Marketing mix

Consistent with French & Blair-Stevens' (2006) claim that to be classified as using a marketing mix an intervention must use at least two elements of the marketing mix (product, price, place or promotion) studies in this review were classified as using the marketing mix if they reported using at least two marketing mix elements. Of the studies reviewed in this paper, only the Reams et al. (1996) employed the full marketing mix. Two studies used three elements of the marketing mix, first, the Victoria University Quad study (Liu & Sibley, 2004; Sibley & Liu, 2003) reported the use of product, place and promotion in their program. They

investigated the differences between using only promotion and promotion plus infrastructure change, by way of adding additional rubbish bins and cigarette ashtrays in the areas where high levels of littering occurred, thus addressing product and place of the marketing mix. There were significantly higher levels of litter disposed of correctly in the intervention using three elements of the marketing mix than the intervention that only used promotion. Second, Sussman and Gifford (2013) reported the use of compost bins which were conveniently placed next to the garbage and recycle bins in a community shopping centre food court with table-top signs used to promote the benefits of composting, this resulted in reduced levels of litter.

Ten interventions in this review reported using products, both tangible and intangible. Tangible products included, for example, extra litter-bins and new ashtrays (Sibley & Liu, 2003), and compost bins (Reams et al., 1996; Sussman & Gifford, 2013). Intangible product offerings incorporated scent exposure on trains (de Lange et al., 2012), services which included maintenance of infrastructure at Snell Grove commercial areas (Taylor et al., 2007), educational programs for school children on the harm of litter on marine life (Hartley et al., 2015), and a demonstration for school children on how to clean up litter in a forest (Lindemann-Matthies et al., 2012).

Evidence of promotion was identified in 11 interventions. The interventions used a wide range of promotional tools such as events (n = 2), brochures (n = 2), cinema advertising (n = 1), table top signs (n = 1), posters (n = 4), newsletters (n = 1), and banners or signs (n = 2) to raise awareness of the harms of littering, change beliefs and attitudes towards littering, and change littering behaviour.

Place, the location where the target audience enter into an exchange was identified in three interventions, for example in the Victoria University Quad study, extra litter bins and new ashtrays were placed in convenient locations where students gathered to eat and smoke cigarettes and left large amounts of litter (Liu & Sibley, 2004). Sussman and Gifford (2013) reported placing compost bins next to general litter bins and recycling bins in a shopping center food court to make it convenient for shoppers to place their food waste in compost bins and reduce the amount of compostable materials going into landfill. Finally price was

only identified in the intervention discussed in Reams et al. (1996) where dedicated recycling bins were provided at no charge to residents living in the trial area.

Competition

Competitive analysis means that program developers must consider the competition posed by alternate behaviours, in terms of time and attention, to the ones being targeted in the intervention, and employ strategies which seek to minimise this competition (Stead et al., 2007). An intervention was classified as having met the competition component of social marketing if at least one form of competition was identified in the analysed studies. Ten intervention studies recognised competition to their desired behaviour of disposing of litter in bins (de Lange et al., 2012; Liu & Sibley, 2004; Sibley & Liu, 2003; Taylor et al., 2007), picking up litter (Brown et al., 2010; De Kort et al., 2008; Ernest-Jones et al., 2011; Lindemann-Matthies et al., 2012; Uneputty et al., 1998) not putting recycling into general litter bins (Reams et al., 1996) and composting (Sussman & Gifford, 2013).

Theories and models used in the programmes

The use of theory in intervention design has long been argued to be important (Glanz & Bishop, 2010; Rice & Atkin, 2000). Stead et al. (2007) posit the use of a theoretical framework, combined with the use of formative research helps translate theoretical constructs into persuasive and acceptable interventions, which is a significant pre-requisite for success. Ten interventions were theoretically informed. The Focus Theory of Normative Conduct was used in three interventions (De Kort et al., 2008; Kallgren et al., 2000; Sussman & Gifford, 2013) with significant positive effects on littering behaviour observed in all three studies. Brown et al. (2010) used the Theory of Planned Behaviour to design their intervention and Hansman et al. (2003) used Social Learning Theory, and both reported significant positive effects on littering behaviour. Taken together, use of The Focus Theory of Normative Conduct, the Theory of Planned Behaviour, and Social Learning Theory in intervention design and delivery may assist to reduce littering behaviour.

4.5 Discussion

This paper extends earlier systematic literature reviews in littering (Dwyer et al. (1993) and provides a contemporary review of interventions aiming to reduce littering. Both studies were designed to evaluate previous littering behaviour interventions, focusing on interventions that target behaviour change. However, the current review study differs in term of strategies used. For instance in the Dwyer et al. (1993) review study, littering programs were evaluated based on antecedent (e,g commitment) and consequence (feedback) conditions. The current study applied a scorecard of seven social marketing components to assess the extent of social marketing use in identified littering programs. Previous reviews of littering have not included a quality assessment (Dwyer et al., 1993). Consideration of study quality assists by informing future intervention design, measurement and reporting which in turn may assist to enhance intervention effectiveness over time. Thus this paper extends understanding by assessing the methodological quality of included studies.

Additionally, this paper applied a quality assessment of the included studies which has not been reported previously. Finally, this paper introduces a scorecard which establishes the extent that social marketing components have been used to change littering behaviour.

An absence of social marketing studies in the context of littering was evident, which is surprising given Takahashi's (2009) call for social marketing use to combat environmental issues. However, a broad range of approaches were observed in the reviewed studies offering some important lessons. There have been widespread efforts to change littering behaviour ranging from images picturing watching eyes to the building of environmental infrastructure. Littering interventions and /or programs identified in the review have used both individual behaviour change and infrastructure change to built environments to reduce littering. Assessing each study against the social marketing scorecard has demonstrated there is room to improve intervention planning and design to centre programs on the target audience's needs and wants. Furthermore, the findings of this study provide additional evidence that there may be merit in using theory to develop programs aimed at changing behaviour.

Extending on earlier reviews summarising more than 100 studies on littering (see for example Dwyer et al. (1993) and Huffman et al. (1995)) this systematic review of the literature identified 17 peer-reviewed journal articles reporting on 16 littering studies

published between 1995 and 2015 that met the study's inclusion criteria. The quality of the studies was also examined with a mixed range of scores observed. The quality assessment identified a lack of consistent and validated measures for outcome assessment.

This review summarised the extent that the developed social marketing scorecard based on Andreasen's (2002) six social marketing components with the addition of theory, has been applied to change littering behaviour. A total of seven components were assessed in the current review. This study, together with earlier reviews (Kubacki et al. 2015; Rundle-Thiele and Carins, 2014) in other contexts, provides an overview that researchers and practitioners alike can access to better understand how social marketing components have been applied in programs. Formative research and segmentation were not widely used in the current review and this represents a considerable opportunity to more closely orient programs to meet the needs and wants of the target audience(s), rather than applying a one-size-fits-all approach.

4.6 Conclusion, Limitations and future research directions

The results of this study present several opportunities for future research. First, to follow systematic review protocols and for quality assurance, only published academic peer reviewed papers were included in this review. Thus, books, government reports and other grey literature, working papers and reports were not considered in the current study. Future research is recommended to extend our understanding beyond the academic peer reviewed literature. For example, the scorecard employed in this study could be used to review the grey literature to understand what other strategies and approaches have been successfully used to change littering behaviour. Second, the current study was restricted to interventions and randomised control trials. Future research should also consider evaluations that do not include randomisation, control groups or do not refer to themselves as programs or interventions, to provide deeper understanding of the littering issue. Another important limitation is that the majority of evidence considered in this review is from studies conducted in developed countries. Future research is recommended to focus on applying a broad range of behaviour change approaches in developing countries to extend our understanding beyond developed countries. In addition, more detail on sample recruitment, response rates, and matched control groups would improve the quality of reported studies. Finally, study

heterogeneity, including different methodological approaches and the absence of a common statistical measure, prevented meta-analysis from being undertaken. To address the identified limitations in this study, future littering research should aim to use consistent outcome measures and research designs to enable rigorous and systematic literature reviews and meta-analyses to be undertaken.

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Chapter 5(study2) A socio-ecological examination of observing littering behaviour

Contributors

The study was designed by Yara Almosa with support from Sharyn Rundle-Thiele. The study was analysed by Yara Almosa, Sharyn Rundle-Thiele and Joy Parkinson. Yara Almosa led the writing, Sharyn Rundle-Thiele and Joy Parkinson provided input on the analytical interpretation and critical contribution to the writing.

Conflict of Interest

None of the authors declare any competing interests.

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5.1. Abstract

Despite evidence of the negative health, environment and economic impacts, littering continues to be a problem and therefore warrants ongoing research attention. Guided by a Behavioural Ecological Framework this study observed individual, social and environmental level factors on littering behaviour across three different parks in Saudi Arabia. A total of 362 individuals were observed over 12 days. Approximately half of all disposals were improper with litter left on the ground. The most commonly littered object was nuts (29.4%). The findings revealed several environmental factors had a significant impact including the amount of existing litter, beautification and the distance to rubbish bins. The only significant individual factor to have any impact on littering behaviour was group size. Implications for litter prevention are discussed. Future research opportunities are outlined.

5.2. Introduction

Calls to move social marketing efforts upstream are not new (Wymer, 2011) yet social marketing research and practice and littering intervention efforts continue to be dominated by downstream approaches targeting individuals to change (Schultz, Bator, Large, Bruni, & Tabanico, 2013; Truong, 2014; Weaver, 2015). Social marketing scholars advocate for the need to move behaviour change practice upstream (Gordon, 2013; Hoek & Jones, 2011; Wymer, 2011) targeting the social support system surrounding an individual to support the desired change, or the decision makers who can implement policies or allocate financial resources to deliver an environment supportive of the desired behaviour. Complementary perspectives advocate adoption of a wider systems' view to achieve behavioural change, extending focus to the broad array of interactions and actors within a complex system to understand how the desired change can be effected (Duane, Domegan, McHugh, & Devaney, 2016). Taken together, perspectives extending our understanding beyond the individual are warranted (Weaver, 2015).

Guided by socio-ecological thinking, the current study seeks to examine the individual, social, and environmental factors that influence littering behaviour, extending research enquiry beyond understanding how an individual may be motivated to change in the context of littering, which is an important environmental and social problem (Hansmann &

Steimer, 2016). Litter includes domestic or commercial waste including debris or rubbish that is not placed in an appropriate receptacle (Ojedokun, 2015, p. 552) and encompasses a variety of materials including cigarette butts, cans, bottles, paper, caps, food packaging, or fast food wrappers (Al-Khatib, Arafat, Daoud, & Shwahneh, 2009; Ong & Sovacool, 2012).

A review of the literature indicates a broad array of factors that are known to contribute to littering behaviour. Individual, social, and environmental factors have all previously been associated with littering behaviour, with few studies considering all three types simultaneously. Further, a review of the literature indicates that littering interventions have focussed on individuals with efforts aimed at increasing public awareness, beliefs, and attitudes (Liu & Sibley, 2004). The current research makes three key contributions to the literature. First, it applies the Behavioural Ecological Framework to understand littering behaviour and how it may be prevented (Brennan, Binney, Hall, & Hall, 2015). By extending understanding of the complex interplay of individual, social, and environmental factors involved in littering, insights can be gained to understand which behavioural change approach(es) offer the greatest potential to be effective. Second, by employing an observational method to understand littering behaviour, this research makes a methodological contribution addressing the call to extend formative research studies beyond self-report methods (Kubacki & Rundle-Thiele, 2017). Third, and finally, this research contributes to the littering literature offering a formative research study whose aim is to understand selected individual, social, and environmental factors influencing littering in public spaces in Middle Eastern countries, a context that has received limited attention to date in comparison to Western countries contexts (Bhuian, Amyx, & Shamma, 2014; Ong & Sovacool, 2012; Schultz, 2002), and to gain actionable insights that can be applied to littering prevention decision making efforts.

5.3. Literature Review

Identifying the factors that influence littering behaviour is crucial for designing efficient strategies (Al-Khatib et al., 2009). Factors such as demographics, context, and infrastructure that impact littering behaviour are important to consider when seeking to change this behaviour (Schultz et al., 2013; Weaver, 2015).

Studies to date have focused on a variety of predictors at either the individual level such as income and gender (Al-Khatib et al., 2009), or at the environmental level such as neighborhood beautification (Weaver, 2015). Few studies have combined consideration for both e individual and environmental factors simultaneously (Schultz et al., 2013). Utilization of a single focus (e.g. individual or environmental) may prevent full understanding of the littering problem by ignoring the possible complex interplay between individual, social, and environmental factors. Therefore, there is a need to shift from a single focus to a multilevel approach. One study was identified in the literature, which had investigated the influence of both individual and environmental factors to predict littering behaviour, however this study was not informed by theory (Schultz et al., 2013). In order to understand how to effectively tackle littering, application of a unified theory, such as the Behavioural Ecological Framework is needed (Ojedokun & Balogun, 2011; Schultz et al., 2013). The Behavioural Ecological Framework (Brennan et al., 2015) is based on the tenet that the characteristics of the physical environment itself, in addition to social and individual factors, impact behaviour.

To develop better management strategies that can deliver behavioural change benefitting the environment, a greater understanding of the contexts that cultivate or facilitate the increase of antisocial behaviours in an area or place is needed (Weaver, 2015). For example, Schultz et al. (2013) examined both individual and environmental level predictors using a multilevel modelling framework to observe littering behaviour. Al-Khatib et al. (2009) outlined a multiple level intervention to tackle littering including a range of individual and environmental elements, such as proactive infrastructure, education, behavioural research, and policy development.

5.4. Conceptual Development

According to the Behavioural Ecological Framework there are three factors that warrant research attention, namely individual, social, and environmental. The three factors, and their main characteristics, are discussed in turn.

Individual factors

Recent studies at the individual level indicate that age and gender predict littering behaviour. Taken together, prior studies suggest that females litter less than males, and older citizens litter less than younger citizens (Ojedokun & Balogun, 2011; Wever, Gutter, & Silvester, 2006). Thus, the following hypotheses are proposed:

H1. Younger individuals will leave behind more litter than older individuals.

H2. Males will leave behind more litter than females.

Social factors

A number of studies indicate that group size has an impact on littering behaviour. For example, it has been suggested that factors such as social disapproval may influence littering such that people are less likely to litter when they were part of a larger group (Bator, Bryan, & Schultz, 2010; Meeker, 1997). Thus, the following hypothesis is proposed:

H3. The larger the group size of individuals, the less litter will be left behind.

Environmental factors

The effect of the environment on littering behaviour has been examined previously (Weaver, 2015). For example, Weaver (2015) demonstrates that the more disorderly a neighborhood is perceived to be, the lower is its quality, and, in turn, the more antisocial are its populations. Built environments are widely believed to contribute to litter levels in both

developed and developing countries, with littering being higher in areas where graffiti is more frequently observed (Keizer, Lindenberg, & Steg, 2013; Zhang & McCord, 2014).

Environmental infrastructure such as rubbish bin placement has been found to significantly influence littering behaviour in public spaces. For example, people tend to litter less in places where rubbish bins are readily available, are in close proximity, and are easily accessible (Foxall, Castro, James, Yani-de-Soriano, & Sigurdsson, 2006; Ong & Sovacool, 2012). Thus, the following hypothesis is proposed:

H4. Less littering will occur when rubbish bins are easily accessible.

Previous research has found that higher rates of littering occur in areas where litter is already present; that is the presence of litter encourages more littering (Anderson & Francois, 1997; Keizer et al., 2013; Krauss, Freedman, & Whitcup, 1996). Also research found that keeping a location litter-free could decrease the amount of littering in certain settings (Brown, Ham, & Hughes, 2010; Schultz et al., 2013). Thus, the following hypothesis is proposed:

H5. Higher levels of litter present will result in higher levels of litter left behind.

Another factor found to affect littering behaviour is beautification (Bator et al., 2010). For example, higher quality contexts such as prestigious residential areas, have less litter than lower quality contexts, for example low socio-economic residential areas (Weaver, 2015). Similarly, previous research found that a well-maintained local environment, for example scenic vistas and green spaces, can significantly lower the littering rate (Taylor, Curnow, Fletcher, & Lewis, 2007; Weaver, 2015). Thus, the following hypothesis is proposed:

H 6. The more beautiful a park is, the less litter that is left behind.

Furthermore, spatially based attributes influence individual environmental behaviours so that well-developed infrastructure and clean environments can significantly lower littering rates (Spacek, 2004; Stephen & James, 2014; Taylor et al., 2007). As stated previously, individuals are more likely to litter when litter or other signs of disorder including graffiti or

spilt beverages are present at the location (Weaver, 2015). Thus, the following hypothesis is proposed:

H7. Overall park cleanliness influences litter left behind.

Another factor found to affect littering behaviour is crowdedness (the number of people within the location) (Bator et al., 2010). Previous researchers have found that people tend to litter less in crowded places which are frequented by large numbers of citizens such as public parks compared to open spaces such as spaces along highways (Ong & Sovacool, 2012). Bator et al. (2010) found those who littered more had fewer people present in their current setting, because there is an increased risk of being noticed or caught. Thus, the following hypothesis is proposed:

H8. Higher levels of crowdedness results in less litter left behind.

Additionally, previous researchers have examined the effect of fencing on littering rates, where parks with fencing decreased littering significantly (Cierjacks, Behr, & Kowarik, 2012). Thus, the following hypothesis is proposed:

H9. There is more litter left behind in non-fenced parks than fenced parks.

To understand the social and environmental factors which influence littering behaviour it is important to choose a method which meets the objectives of the study (Saunders, Thornhill, & Lewis, 2003). In comparison to self-report methods (Ajaegbo, Dashit, & Akume, 2013; Hartley, Thompson, & Pahl, 2015) fewer studies employing observation methods have been used to understand littering behaviour (Bateson, Callow, Holmes, Roche, & Nettle, 2013; Weaver, 2015). Of the studies conducted in Middle Eastern countries research has investigated individual factors using interviews or surveys (Al-Khatib et al., 2009; Arafat, Al-Khatib, Daoud, & Shwahneh, 2007) suggesting research employing observational methods that consider environmental factors is warranted (Kubacki & Rundle-Thiele, 2017). The current study aims to examine the demographic, social and environmental factors that influence littering behaviour guided by the Behavioural Ecological Framework (Brennan et al., 2015) .

5.5. Methodology

An observational approach was used for this study. Using observations allows the researcher to record what individuals truly do, not what they claim to have done, which is important in contexts where social desirability may impact reporting (e.g. littering) (Rundle-Thiele, 2009). Structured observations, which involves the observation and recording of actual behaviour, have previously been used to observe littering behaviour (de Lange, Debets, Ruitenburg, & Holland, 2012), assess littering interventions (Bateson et al., 2013; De Kort, McCalley, & Midden, 2008), and picking up of litter (Brown et al., 2010). Specifically, a structured covert observation method was used for this study (Lindemann-Matthies, Bönigk, & Benkowitz, 2012; O'Connor, Lerman, Fritz, & Hodde, 2010), with observations conducted from December 2014 to February 2015.

Brown et al. (2010) found that managers had previously identified littering as the single most important visitor problem in parks. Therefore this research selected three parks to conduct the research. Parks in Saudi Arabia suffer from littering (Abuzinada, Al-Wetaid, & Al-Basyouni, 2005). The research design encompassed the completion of structured observations of littering behaviour in three parks in a large city in Saudi Arabia. The parks chosen for this study were, Alaquq, Alnahdah (non-fenced) and Alsalam (fenced) parks to maximise heterogeneity. The unfenced parks are free to access while the fenced and the gated park had a small entrance fee. These parks were selected because of an identified littering problem. These three parks are also the most popular parks in Riyadh ("Riyadh Municipality," n.d) . These parks are destinations for residents from different parts of the city ("Riyadh Municipality," n.d). Alaquq Park is located in the north of the capital, while Alnahdah park is located in the central district and the Alsalam park is located in the south of Riyadh.

Data on individual littering behaviour was collected using a convenience sample (Marshall, 1996; Patton, 2002) of people who were visiting the park at the time of the observations. An observation protocol and coding sheet (Shultz et al. 2013) which has been previously used for littering behaviour was employed to record the observations of individual littering behaviour as they moved within each park. The observations were undertaken in two phases. First the environmental characteristics of the park were examined to understand the potential influences on individual behaviour. The second phase employed structured observations of individual littering behaviour. All observations were conducted by one

member of the research team.

The environmental characteristics of the physical area of the park and surroundings were first recorded. Details including the time of day, an estimation of the amount of existing litter in the location, types of litter, perceived cleanliness, number of rubbish bins, distance to rubbish bins, littering signage present and crowdedness were also recorded. Vantage points were chosen to enable the researcher to clearly observe individual littering behaviour from an unobtrusive location. Observations were conducted across 12 days at various times of the day and day of the week to maximise heterogeneity in types of behaviour observed. Observation periods ranged between three and a half hours to six hours.

Figure 4: AL-Akeek Park, Riyadh (2015). Personal photograph by Yara Almosa. 4 January 2015

Figure 5: AL-Dana Park, Riyadh (2015). Personal photograph by Yara Almosa. 25 January 2015

The amount of litter was first determined in each setting using a scale from 1 = *not at all littered* to 5= *extremely littered* (continuous measure). Covariates consisting of crowdedness, efforts to enhance the aesthetics of the location including garbage collectors, walkability, existence of antilittering signs and park beautification, were also recorded. Additionally, observations of group size were undertaken to determine if the subject was part of a group or not.

Disposal options were observed to first identify if the subject had an object to dispose of. Following the identification of an object requiring disposal, observations were made to determine if the subject left the site with the object, or disposed of the object in a rubbish bin and subsequently recorded. No further recordings were made of subjects who had no object to dispose of or who left the site with the object. The researcher made additional recordings for only those subjects who disposed of an object. They recorded whether the object was disposed of properly or improperly. A proper disposal is any disposal that resulted in the objects placed in a rubbish bin, including a trashcan or recycling bin. Conversely, improper disposals involve disposals of objects on the ground, in planters, or disposals on or around receptacles. Thus, these recordings involved capturing whether the object was disposed of in a rubbish bin, the type of object disposed, the littering strategy and the subject's distance from rubbish bins as well as the individual's activities before or after the disposal.

5.6. Data analysis

Analysis was conducted using data from observations where a disposal (either proper or improper) (N=295) occurred. The analyses were conducted in SPSS 22 using Generalized linear modelling. Specifically, a binomial family and logit link, which is a statistical technique that specifies the probability distribution (Nelder & Baker, 1972), was employed to understand the factors impacting littering. For ease of interpretation, we have presented the results in the original probability units (0 = proper; 1 = improper).

5.7. Results and discussion

Across the three parks a total of 362 observations were made. There were more than 10 rubbish bins located at each of the three parks. On average, the distance to a rubbish bin at the time of littering was nine meters. The most common type of rubbish bin was fixed and uncovered. The overall littering rate was 48.9% (improper disposals), which is high compared to previous studies (Al-Khatib et al., 2009). Furthermore, the results showed that in the majority of instances (40.7%) the litter was occurred intentionally. The frequency and percentages for all observations recorded are shown in Table 9.

Table 8: Frequencies and percentages of descriptive statistics

Variable	Total=326	
Time of the day	Frequency	Valid%
Am	40	11
Pm	322	89
Sunset	Frequency	Valid%
Before	288	79.6
After	74	20.4
Gender	Frequency	Valid%
Female	167	46.1
Male	195	53.9
Age	Frequency	Valid%
20	43	11.9
25	54	14.9
30	67	18.5
35	83	22.9
40	63	17.4
45	21	5.8

50	20	5.5
55	5	1.4
60	6	1.7
	(*M*=33.77, *SD*=9.13)	
Group	Frequency	Valid%
Yes	278	76.8
No	84	23.2
Left the site	Frequency	Valid%
With no object	41	11.3
With object	26	7.2
Disposed	295	81.5
Variable	Total=295	
Disposed	Frequency	Valid%
Properly	118	40
Improperly	177	60
Disposal method	Frequency	Valid%
Rubbish bins	9	3.1
Pocketing	109	36.9
Ground	177	60
Object disposed	Frequency	Valid%
Beverage Bottle: Plastic	50	16.9
Beverage Can	13	4.4
Beverage Cup	26	8.8
Food Wrapper	1	.3
Food Remnants	24	8.1
Cigarette Butt (21+ only)	19	6.4
Paper	9	3.1
Napkin/Tissue	33	11.2
Plastic Bag	19	6.4
Combo/Mixed Trash	46	15.6
OTHERS (NUTS)	55	18.6
Variable	Total=177	
Litter strategies	Frequency	Valid%
Drop with intent	72	40.7
Drop with no intent	53	29.9
Flick/fling	52	29.4
Gender	Frequency	Valid%
Female	83	46.9
Male	94	53.1
Age	Frequency	Valid%
20	20	11.3
25	26	14.7
30	32	18.1
35	34	19.2
40	35	19.8
45	9	5.1
50	12	6.8
55	3	1.7
60	6	3.4
	(*M*=34.632, *SD*=9.914)	
Group	Frequency	Valid%
Yes	147	83.1
No	30	16.9

Individual and social level

The first set of analyses focused on individual-level and social-level predictors of littering behaviour: age, gender and number in a group (see Table 10). The results showed a consistent and statistically significant effect for age, with young adults (20-33) more likely to litter than older adults. The negative relation between age and littering behaviour has been documented in several studies (Cialdini, Reno, & Kallgren, 1990; Ong & Sovacool, 2012). This means that younger people are more likely to litter. The number of people in a group was also a significant predictor of littering behaviour, with individuals being more likely to litter when they were in a group of four people or less. This finding is consistent with previous studies (Bator et al., 2010; Meeker, 1997; Schultz et al., 2013), however is contrary to other studies where people in larger groups were found to litter more than people in smaller groups (Wever, 2006). Gender was not found to predict littering behaviours in this study (see Table 10). However, preliminary classification trees (R) (Therneau, Atkinson, & Ripley, 2015) indicated that age and gender were likely to form significant interactions. The effect of gender on littering amounts was observed in the initial analysis; however, no significant effects occurred. Consistent with the findings of Liu and Sibley (2004), no significant interactions were detected between littering behaviour and individual demographic characteristics (gender and age). Hence, gender was not included in further analyses.

Environmental level

The environmental predictors of littering behaviour analysed in this study included the presence of existing litter, cleanliness, beautification, crowdedness of the location, distance to rubbish bins at the time of disposal, and the presence of a fence around the park. All three parks were found to have at least some litter in the setting at commencement of the observation session; the mean amount of litter was M = 2.7 (SD = 1.3), (based on a 1 to 5 scale, 1=not at all littered; 5=extremely littered).

Furthermore, the results from the analyses revealed three uniquely and statistically significant predictors: amount of litter on the ground, beautification, and distance to rubbish

bins (see Table 11). The role of litter present is consistent with results of previous studies (Anderson & Francois, 1997; Schultz et al., 2013) and supports the removal of existing litter as an effective starting point and strategy for inhibiting potential littering behaviour. Our results also indicate that people are less likely to litter in a beautiful park, reinforcing the finding by Weaver (2015) that less beautiful neighbourhoods have higher levels of litter. Lastly, the finding that people were more likely to litter as the distance to rubbish bins increased, is consistent with the results of previous studies (Schultz et al., 2013), and supports the placement of rubbish bins closest to areas where people congregate, as an effective means to reduce the amount of litter (Brown et al., 2010).

Finally, simultaneous analysis of individual and environmental factors was undertaken. The amount of litter on the ground, number of people in a group, beautification, and distance to rubbish bins, were found to be significant predictors of littering behaviours (see Table 12). The supported hypotheses are presented in Table 13. While all levels of influence are important to understand littering behaviour, the findings of the current study indicate that environmental factors have more impact on littering behaviour than other factors.

Table 9: Parameter Estimates summary of Generalized linear model Analysis for Individual Variables predicting littering behaviour (N = 295)

Parameter	B	Std. Error	Wald	df	Sig.	Exp(B)
(Intercept)	.746	.4879	2.339	1	.126	2.109
Number in a group	-.145	.0515	7.915	1	**.005**	.865
[Gender =1.00]	.388	.2533	2.342	1	.126	1.473
[Gender =2.00]	0[a]	.	.	.	.	1
Age	-.028	.0136	4.207	1	**.040**	.972
(Scale)	1[b]					

Table 10: Parameter Estimates summary of Generalized linear model Analysis for Environmental Variables predicting littering behaviour (N = 295)

Parameter	B	Std. Error	Wald	df	Sig.	Exp(B)
(Intercept)	-1.924	1.5867	1.471	1	.225	.146
[Fence =1.00]	-.289	.7382	.153	1	.696	.749
[Fence =2.00]	0[a]	.	.	.	.	1
Distance to rubbish bins	.061	.0181	11.465	1	**.001**	1.063
Cleanness	.269	.2972	.821	1	.365	1.309
Beautification	-1.220	.4232	8.303	1	**.004**	.295
Crowdedness	.279	.1802	2.398	1	.121	1.322
Amount of litter exist	.786	.2544	9.539	1	**.002**	2.194
(Scale)	1[b]					

Table 11: Parameter Estimates summary of Generalized linear model Analysis for Individual and Environmental Variables predicting littering behaviour (N = 295)

Parameter	B	Std. Error	Wald	df	Sig.	Exp(B)
(Intercept)	.373	1.1114	.113	1	.737	1.452
Distance to rubbish bins	.063	.0184	11.796	1	**.001**	1.065
Beautification	-.843	.2905	8.418	1	**.004**	.430
Amount of litter exist	.581	.1246	21.750	1	**.000**	1.788
Age	-.028	.0149	3.447	1	.063	.973
Number in a group	-.158	.0619	6.549	1	**.010**	.854
(Scale)	1[b]					

Table 12: Statistics Test Results of the Hypotheses

Hypotheses	Results	Significance
H1.Younger individuals will leave behind more litter than older individuals.	Not confirmed	*p* =.063
H2. Males will leave behind more litter than females.	Not confirmed	*p* =.126
H3.The larger the group size of individuals, the less litter will be left behind.	**Confirmed**	***p* =.010**
H 4.Less littering will occur when rubbish bins are easily accessible.	**Confirmed**	***p* =.001**
H5.Higher levels of litter present will result in higher levels of litter left behind.	**Confirmed**	***p* =.000**
H6.The more beautiful a park is the less litter that would be left behind.	**Confirmed**	***p* =.004**
H7.Overall park cleanliness would influence litter left behind.	Not confirmed	*p* =.365
H8 Higher levels of crowdedness will result in less litter left behind.	Not confirmed	*p* =.121
H9.There will be more litter left behind in non-fenced parks than fenced parks.	Not confirmed	*p* =.696

5.8. Discussion

The purpose of this paper was to understand which individual, social and environmental factors influence littering behaviour in Saudi Arabia. This study makes three key contributions to the literature. First, this research has addressed the call to apply theory in behaviour change programs (Luca & Suggs, 2013; Truong, 2014), by

applying the Behavioural Ecological Framework, to a littering study. Second, this research addresses the call to extend beyond self-report methods (Rundle-Thiele, Russell-Bennett, Leo, & Dietrich, 2013) reporting the use of an observational research method to understand littering behaviour. Third, this research contributes to the literature offering a formative research study to gain insights into the complex interplay between individual, social, and environmental factors influencing littering in public spaces in Middle Eastern countries, a context that has received limited attention to date in comparison to Western countries contexts (Ojedokun & Balogun, 2011; Schultz, 2002) to gain actionable insights that can be used to inform litter reduction strategies. These will now be discussed in turn.

The Behavioural Ecological Framework acknowledges a number of factors which influence behaviour including individual, social, and environmental factors (Brennan et al., 2015). This study assessed the influence of selected individual, social, and environmental factors on littering behaviour in Saudi Arabia, Middle Eastern countries, and empirically examined the interplay between the three levels outlined in the Behavioural Ecological Framework. Although the dominant focus in littering prevention efforts has been on individual factors impacting littering behaviour (Schultz et al., 2013), the results of this study reveal environmental factors have a stronger impact on littering behaviour than individual factors.

This finding has important implications for future research and practice. In particular, it is imperative for researchers and practitioners alike to extend their attention beyond the individuals they are seeking to change. Without understanding the social and environmental setting surrounding the individual, behaviour change attempts may not be successful. According to the results of the current study, changing the behavioural environment surrounding the individual may offer the greatest potential to alter littering behaviour.

Results of this study found people placed more litter in bins when these were conveniently located. This is consistent with previous studies, showing that a structured program that makes the desired behavioural action easy and convenient, increases the likelihood of individuals changing behaviour (Anderson & Francois, 1997; Bator et al., 2010; Schultz et al., 2013). This indicates small environmental modifications such as placing more bins in convenient locations in public areas can assist citizens to adopt positive social behaviours such as proper disposal of litter.

Using the Behavioural Ecological Framework as a guide provides unique insights into littering behaviour suggesting social and environmental factors influence individual littering behaviour (Weaver, 2015), in addition to individual characteristics. Theoretically, the findings from this study demonstrate the usefulness of the Behavioural Ecological Framework (Brennan et al., 2015) for more effectively addressing littering behaviour extending beyond known individual factors, which are the dominant focus in littering studies (Weaver, 2015). Furthermore, the results of the current study suggest the Behavioural Ecological Framework (Brennan et al., 2015) can be applied in Middle Eastern contexts.

This study demonstrates the efficacy of the use of observation methods when examining anti-environmental behaviour such as littering, where individuals may not report their true behaviours. According to Anderson and Francois (1997) observation methods are usually more effective and accurate than getting an individual to report on their behaviour. Therefore, methodologically the study answers the call (see Kubacki & Rundle-Thiele, 2017) to extend the repertoire of applied research methods beyond self-report formats, such as interviews and questionnaire surveys, which dominate the field.

Implications for change practice

The results of the current study indicate that research and practice need to take a broader view in order to effect behavioural change. Environmental factors, when analysed together with individual and social factors, were most influential on littering behaviours, and this finding has important implications. Notably, behaviour change is a process, not an event, and is best co-created. Change requires taking a holistic view recognising that interventions involving multiple stakeholders achieve greater impact, reach and ultimately a larger degree of change. In order to enable change, researchers have previously highlighted the importance of creating infrastructure before initiating change programs (Brennan, Binney, Parker, Aleti, & Nguyen, 2014).

The findings from this research suggest that an effective approach to change littering behaviour will need to engage a variety of stakeholders to effect change. For example, decision makers who set policies that govern development could mandate bin distances ensuring that bins are located within distances known to deliver lower littering rates. In order for policy change to be enacted decisions makers would need to be presented with evidence leading to 'buy-in' or an understanding of the important role that policy decisions have on the target behaviour. It is important to note that policy alone will not induce behavioural change. Ideally, park management operators need to be involved in a change program ensuring that maintenance and upgrades are designed to include adequate provisions for litter, such as bins located in easy distance to all areas frequented by park users. The greater availability of bins supports beautified parks, which in turn will deliver decreases in littering behaviour.

Similarly, day to day practices of companies care-taking for parks influence littering behaviours. Ensuring parks are well kept and beautiful is a requisite strategy to reduce litter. Findings from this study demonstrate that where a lot of litter is present, littering levels are higher. Therefore, park management practices should involve emptying of bins more frequently.

5.9. Conclusion, limitations and future research

The framework presented in this research presents a useful step forward in understanding the complex interplay between individual, social, and environmental factors. By adopting a wider view guided by behavioural ecological thinking to understand how littering behaviour may be decreased, the current study identified that focus on environmental factors is likely to reduce littering behaviour. Moving beyond an individual level focus offers the potential to change littering behaviour, which in turn reduces economic, health, and environmental costs for government and communities. Using a combination of structural modifications and turning the focus towards actors within the system (e.g. park management companies, local councils, and governments responsible for planning and development applications), reductions in littering are more likely to ensue.

This study is not without limitations. Firstly, only three parks that were conveniently selected were included in this study in one city and, secondly, many aspects of the built environment were not measured such as whether the park has kiosks, or the quality of the neighborhood where the park is located. Future research is required to examine the wider role of the built environment and individual factors on littering behaviours. A large scale study ensuring sufficient sample sizes within each observed park could employ multi-level modelling permitting park-specific factors to be isolated from individual factors and deliver an enhanced understanding.

Future research may extend understanding of the Behavioural Ecological Framework by examining additional individual, social and environmental factors extending beyond those identified in the Schultz et al, (2013) protocol. A key limitation of the current study is a methodological one. Observations do not permit people's thoughts to be captured, nor does it permit exact age to be captured, thus limiting our understanding to observed behaviours only. Psychological factors such as awareness, motivations, perceived risks, perceived benefits and barriers of littering

were not captured in the present study, and this offers considerable opportunity for future research. Future research should also include consumer insight studies, which can be used to triangulate findings from observations and potentially provide further understanding of littering behaviour and more precise measurement of factors such as age.

This study was conducted in winter; therefore future research is recommended to extend observations to other times of the year to determine if season has an influence on littering behaviours. Finally, this study used human observation; an alternative for future research could be the use of mechanical observations (for example, video cameras or CCTV). The use of video cameras would offer safety, time efficiency and non-biased judgments (Simons-Morton, Lerner, & Singer, 2005).

5.10. References

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Chapter 6 (study 3) Preventing littering: It's not all about sticks!

Contributors
The study was designed by Yara Almosa with support from Sharyn Rundle-Thiele. The study was analysed by Yara Almosa, Sharyn Rundle-Thiele and Joy Parkinson. Yara Almosa led the writing, Sharyn Rundle-Thiele and Joy Parkinson provided input on the analytical interpretation and critical contribution to the writing.

Conflict of Interest
None of the authors declare any competing interests.

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6.1. Abstract

Social marketing, a proven behavioural change approach, offers one means to reduce littering behaviour. Few studies in social marketing are theoretically guided ignoring a key social marketing benchmark. This research focused on understanding individual's littering behaviours using the Motivation, Opportunity, Ability and Behaviour (MOAB) framework (Parkinson et al. 2016) delivering a first application of the MOAB framework demonstrating how MOAB can be applied in formative research to overcome social marketing theory deficiencies. Guided by the MOAB framework, the current study gained insights to assist the design of a subsequent social marketing campaign aiming to reduce littering behaviour. A total of 25 qualitative semi-structured interviews were conducted, drawing on a purposeful sample of adults aged 20-40 years (14 females and 11 adult males), from Saudi Arabia. Qualitative thematic analysis was undertaken using Nvivo. Findings revealed the interplay between motivations, opportunity and ability and each was an important factor for littering behaviours. Although individual factors have always been the focus of littering studies, this research shows that the environmental and social factors surrounding the individual have a critical role to play when it comes to littering behaviour. This study emphasises that environmental public behaviour such as littering needs different strategies than other anti-environmental behaviour (such as recycling or energy saving) that accrue mainly at home and influence by individual itself only. Several implications are noted and some guidelines that may be considered in future social marketing and intervention strategies designed to prevent littering are discussed.

6.2. Introduction

Social marketing has been used to tackle a wide range of issues (Tapp & Rundle-Thiele, 2016). There are four main behavioural domains to which social marketing interventions are applied: health improvement, safety/ injury prevention, community involvement and environmental protection (Lee & Kotler, 2011; Peattie & Peattie, 2011). While protecting the physical environment plays an important role in

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our well-being and quality of life, heath related issues have tended to dominate within social marketing practice and scholarship (Peattie & Peattie, 2011). Social marketing has been identified as a useful, yet underused approach in environmental issues and one which is still developing (Takahashi, 2009). Further, an absence of published social marketing research on littering behaviour is noted (Roper & Parker, 2008).

Littering is one of many social issues that contributes significantly to environmental issues (Adeoye, Sadeeq, Musa, & Adebayo, 2016; Chitotombe, 2014; Hansmann & Steimer, 2016; Ojedokun, 2016; Van Dyck, Nunoo, & Lawson, 2016). Interventions that rely on information/education programs play an important role in raising individual awareness about an issue. However, their impact on behaviour change may be more limited (Kennedy, 2010; Manning, 2003). Litter is not caused by a single behaviour, therefore focus on unique littering behaviours is required to inform reduction design strategies (Ernest-Jones, Nettle, & Bateson, 2011; Wever, Van Onselen, Silvester, & Boks, 2010).

To date, littering studies have focused on a variety of predictors at the individual (downstream or micro) level including factors such as income and gender (Al-Khatib, Arafat, Daoud, & Shwahneh, 2009), social factors (midstream or meso) such as group size (Schultz et al., 2013) and/or the environmental (upstream or macro) level where the influence of factors such as neighborhood beautification have been considered (Weaver, 2015). However, few studies have combined both individual and environmental factors in a single study (Schultz, Bator, Large, Bruni, & Tabanico, 2013), despite our understanding that many social, health and environmental problems are complex and multi-factorial requiring a broader systems understanding (Hoek & Jones, 2011; Wymer, 2011). Moreover, a review of the littering literature indicates that few studies have considered broader social influences. In social marketing, calls have been made to move away from a reliance on downstream with calls to move understanding towards the upstream ensuring that the individual's environment, social and cultural including the influence of friends and

family (Carins, Rundle-Thiele, & Fidock, 2016; Giles & Brennan, 2015; Vega, Ojeda-Benitez, Aguilar-Virgen, & Taboada-Gonzalez, 2010) are considered in intervention design and planning.

Theories and frameworks capturing the complex nature of actual littering behaviour where interactions occur between individual and environmental factors warrant consideration (Parkinson, Schuster, & Russell-Bennett, 2016). The Motivation, Opportunity, Ability, Behaviour (MOAB) framework (Parkinson et al., 2016), which considers individual level and environmental level factors including structural, supply and socio-cultural factors have been recommended as one guiding framework to understand littering behaviours from both an individual and wider social and built environmental perspective. In terms of context, most littering and environmental protection studies have been undertaken in Western contexts such as the USA and Australia (Hughes & McConnell, 2016; Schultz et al., 2013; Sibley & Liu, 2003). However, Schultz et al. (2013) identified that environmental issues are not only a concern for Western developed society, but also for developing societies. In particular, littering behaviour has received relatively little research attention in the Middle Eastern context (Al-Khatib et al., 2009; Ong & Sovacool, 2012). Thus, research in non-Western cultural contexts such as the Middle East is warranted.

The study aims to extend theory use in social marketing by applying the Motivation, Opportunity, Ability and Behaviour (MOAB) framework (Parkinson et al., 2016) to understand littering behaviours. The aims of this study are to explore individual perception of littering behaviour using the (MOAB) framework. An in depth exploration permits an understanding of an individual's motivation, opportunity and ability to perform the desired behaviour. Second, this research addresses the call to apply theory in social marketing studies (Luca & Suggs, 2013) extending beyond the individual to the social and built environment influences providing an understanding of the forces opposing the desired behaviour. The MOAB framework (Parkinson et al. 2016) is explored in the current study as a guide to

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understand the motivation, opportunity and ability levels of the target population and uncover behavioural characteristics. Third and finally, this research seeks to contribute to the literature delivering a study that can inform littering prevention strategies in the Middle Eastern context.

6.3. Littering behaviour

Studies focussing on littering, recycling, energy use and household food waste have mainly focused on identifying individual factors influencing behaviour. Individual factors that have been identified that influence behaviours include barriers (Prestin & Pearce, 2010; Steg, 2008), motivations (Graham-Rowe, Jessop, & Sparks, 2014), practice (Arafat, Al-Khatib, Daoud, & Shwahneh, 2007), attitudes (Hartley et al., 2015; Vicente & Reis, 2008), value (Cole & Fieselman, 2013; Stephen & James, 2014), beliefs (Farr-Wharton, Foth, & Choi, 2014), government policy (Anderson & Francois, 1997; Taylor, 2000), social norms (De Kort, McCalley, & Midden, 2008; Heywood, 2002), understanding, perception and concern (Hartley et al., 2015; Reams, Geaghan, & Gendron, 1996). While these individual factors may be important precursors for change, a focus on the individual alone does not appear to be sufficient to achieve behavioural change (Ballantyne, Fien, & Packer, 2001; McKenzie-Mohr, 2000; Pelletier, Tuson, Green-Demers, Noels, & Beaton, 1998). This is consistent with Schultz et al (2013) who emphasise that improving individual interest and attitude towards littering does not necessarily prompt a change in behaviour.

Interventions informed by theories can be more successful in altering individual behaviour than those not built on theory (Glanz, Rimer, & Viswanath, 2008). While theory used has been identified as an important element for successful intervention (Truong, 2014), in social marketing theory remains limited (Luca & Suggs, 2013; Truong, 2014). Theoretical understanding is important to focus attention on common factors (Truong, 2014). Environmental behaviour theories have been used effectively to change individual behaviour. For example, study by Hartley et al. (2015) shows significantly greater level of appropriate litter disposal action using

Social Learning Theory.

Many of the theories that have been utilized to tackle littering behaviour are focused on understanding factors influencing individual behaviour such as: micro-economic theory (Khawaja & Shah, 2013), Social Learning Theory (Ralf Hansmann & Scholz, 2003), Theory of Planned Behaviour (Brown, Ham, & Hughes, 2010), and the Theory of Normative Conduct (Cialdini, Reno, & Kallgren, 1990; Sussman & Gifford, 2013). With the exception of Cultural evolutionary theory (Weaver, 2015) and Sub- Theory of social space (Liu & Sibley, 2004), in the cases where theory is applied few theories applied seek to examine influences beyond the individual.

The motivation, opportunity and ability (MOA) framework (Rothschild, 1999) was first used within information processing then subsequently advertising and social marketing research (Jepson et al., 2014). The MOA framework has been used to tackle a number of behaviours such as: knowledge-sharing behaviour among employees (Siemsen, Roth, & Balasubramanian, 2008), travelers' behaviours (Leung & Bai, 2013), eating behaviour (Brug, 2008), land use management (Binney, Hall, & Oppenheim, 2006; Binney, Hall, & Shaw, 2003) public transport (Thøgersen, 2009), to increase community engagement (Jepson, Clarke, & Ragsdell, 2014; Lockstone, Jepson, Clarke, & Ragsdell, 2013), and to understand condom use in Ghana (Ankomah, Adebayo, Anyanti, Ladipo, & Ekweremadu, 2013). The MOA framework helps managers by suggesting the various tactics that should be employed in order to achieve the manager's goals in turn affecting the desired behaviour change sought (Rothschild, 1999). Apart from being used in the environmental problem of land use management (Binney et al., 2006; Binney et al., 2003), MOA has not been used widely in the environmental behaviour context, or when used the items in the model have been addressed separately (Siemsen et al., 2008). While the MOA model has been found to be useful, it has some shortcomings in that it does not consider the characteristics of the desired behaviour.

The Motivation, Opportunity, Ability, Behaviour (MOAB) framework (Parkinson et al., 2016) extends the Motivation–Opportunity–Ability (MOA) framework adapted by Rothschild (1999) to include legal and regulatory, supply, and socio-cultural factors in opportunity and the characteristics of the target behaviours. The Motivation–Opportunity–Ability–Behaviour (MOAB) framework was first proposed as a way of identifying the complexity of a behaviour within a specific context and for a particular target group (Parkinson et al., 2016). Binney et al. (2003) found that motivation, opportunity and ability are not independent and can be highly interdependent for some behaviours. Thus Parkinson et al. (2016) proposed that more complex behaviours will have higher levels of interdependency or multiple interactions within and between the target audience's motivation, opportunity and ability and that these in turn will be influenced by the characteristics of the specific behaviour. Therefore, the MOAB framework (Parkinson et al., 2016) will be used to guide this study.

Motivation

In tackling environmental behaviours, it is essential that individual motivations and differences in behaviour are understood. Motivation refers to the need for an individual "to be moved to do something" (Ryan & Deci, 2000, p. 54) and has also been referred to by scholars as "goal-directed arousal" (Rothschild, 1999, p. 31) or a willingness to act (Siemsen et al., 2008). An individual's motivation can affect the direction and intensity of behaviour (Jepson et al., 2014) and therefore motivation is considered as 'a recurrent concern for a goal state based on a natural incentive that energizes, orients, and selects behaviour" (Binney et al., 2003, p. 390). Rothschild (1999) proposes that self-interest is a main component of motivation. There has been some research conducted previously in the area of motivation for littering behaviour for example, religious conviction (Al-Khatib et al., 2009). Within environmental behaviour, identifying individual motivations and barriers has shown promising results (Graham-Rowe et al., 2014). Graham-Rowe et al. (2014) argues that

motivation was an important component to reduce paper used and environmentally preferable purchasing behaviour.

Motivation includes the intrinsic and extrinsic drivers to perform a behaviour (Morel et al., 1997). Individuals that are intrinsically motivated are those who are motivated by performing the behaviour itself, who participate well because they find the task enjoyable or completing the task challenging regardless of external rewards (Ryan & Deci, 2000). Whereas, extrinsic motivations induce consumers to engage in certain tasks and adopt behaviours, which allow them to obtain incentives or external rewards such as money or fame (Biddle & Mutrie, 2001; Reiss, 2012; Ryan & Deci, 2000).

The use of extrinsic motivations have been recommended in some studies due to the potential strong and immediate influence on environmental behaviour (Heywood, 2002; Jacobs & Bailey, 1982). However, extrinsic motivations could harm people's intrinsic motivation (Cameron & Pierce, 2002; Reiss, 2012). Other studies show that intrinsic motivation helps to create the type of motivation that is necessary to create behaviour change in environmental behaviours (Binney, Hall, & Oppenheim, 2006; Hastings & Saren, 2003; Osbaldiston & Sheldon, 2003). Yet, some studies could not prove the relationship between intrinsic motivation and environmental behaviour change (Seguin, Pelletier, & Hunsley, 1999; Wymer, 2015). The role of motivation (intrinsic and extrinsic) in environmental behaviour change initiatives has been questioned. Hence, this led to the suggestion that motivation can be shaped by the external environment, not by the type of motivation itself.

Therefore, the role of motivation and the effectiveness of its type (intrinsic and extrinsic) remain unclear, hence more research on motivations are needed. Consequently, there is a need for further investigation of intrinsic and extrinsic motivation in the MOAB framework to advance our understanding and enhance the development of theory in social marketing (Binney et al., 2006; Gordon, Tapp, & Spotswood, 2013; Siemsen et al., 2008). Identification of intrinsic motivations (e.g.

health, relationships), and adoption of a more critical perspective to deliver an understanding of extrinsic motivations (e.g. image, wealth) (Ryan & Deci, 2000) is warranted to move understanding beyond an individual focus. Therefore, this study seeks to understand what motivates or prevents the target audience from performing the desired behaviour.

Opportunity

Opportunity refers to the extent to which external circumstances or contextual mechanisms facilitate or inhibit engaging in a particular behaviour (Siemsen et al., 2008). Parkinson et al. (2016) emphasise that a broader definition of opportunity is required, one which includes legal and regulatory factors (e.g. laws and policy, infrastructure and geographical location), supply factors (e.g. competition, access, time and money) and socio-cultural factors (e.g. culture, ethnicity, social norms and reference groups). For example, within the context of littering the absence of rubbish bins on streets was identified as one of the main inhibitors for correct disposal of litter (Al-Khatib, 2009). Furthermore a lack of opportunity influencing an individual's ability to act may be due to the lack of the environmental tools such as money, time and access (Binney et al., 2003; Rothschild, 1999). Therefore, opportunity may be influenced not only by the availability of infrastructure and built facilities such as rubbish bins, which provides a supportive environment for the individual to engage in desired behaviours such as correct disposal of litter but also by social norms of disposing of litter correctly.

Ability

Ability refers to the extent to which consumers have the necessary skills or capabilities to engage in certain behaviour to achieve an outcome (Binney et al.,

2003). Broadly speaking, ability includes a group of factors such as experience, skills, knowledge, awareness, and accessibility to information (Jepson et al., 2014; Siemsen et al., 2008). Littering educational interventions targeting individual perceptions, concerns, awareness and attitudes have increased litter disposal (Hartley et al., 2015). According to Binney et al. (2006), ability reflects the individual's internal skill set, whereas opportunity relates to the external environmental factors.

Behaviour

Behavioural characteristics are generally not modifiable (or are more difficult to modify) relative to factors encapsulated by motivation, opportunity and ability. Performing behaviour repeatedly has been established in social marketing as being more difficult than performing once-off behaviours (Parkinson, Russell-Bennett, & Previte, 2012). These more complex behaviours therefore require maintenance or continued participation over time (French, 2009). In addition, the more time between the benefit from the behaviour and the self, the more difficult the behaviour is to maintain (Parkinson et al., 2016; Rothschild, 1999). Citizens need to visualize and make decisions for a future self when the behaviour has proximal costs and distal benefits (Hall & Fong, 2007), highlighting the complexity of performing the behaviour. In a littering context this means citizens need to dispose of litter correctly now to ensure the environment is protected for the future. Furthermore, Parkinson et al. (2016) emphasise the importance of determining the beneficiary of the behaviour: the self (e.g. wearing a seatbelt), others (e.g. blood donation), or self and others (e.g. littering). When the benefit is to the self and others this broadens the number of factors that influence performance of the behaviour, increasing the need to consider the interrelatedness of the MOAB factors. For example, littering not only affects the individual, but also the community and more broadly the nation.

6.4. Methodology

This study conducted a series of in-depth semi-structured interviews with Saudi Arabian adults. Word of mouth through the researcher's acquaintances using a purposeful sampling technique was used to gain maximum variation (Seidman, 2006). Interviewees were reached using a non-probability snowball sample technique. All participants provided their written consent for their data to be used in the research and there were no rejections to participate in this study. The study targeted 20-40 years old adults. In total, 25 interviews (11 male and 14 female) were held during December 2014 to May 2015, a sample size that was deemed appropriate for this type of investigation (Mason, 2002). The interview questions were informed by the literature review (Chapter 4) and the observation study (Chapter 5).

6.5. Data analysis

Following data collection, data was transcribed. The researcher conducted, recorded and transcribed all the interviews that were conducted in Arabic; the transcription was assigned to a commercial office. The transcripts were re- read by the interviewer while listening to the audio files to ensure accuracy of the transcriptions. The audiotapes were identified with participants' codes. The transcripts were made initially on paper and then stored in the computer using Nvivo software. Lastly, corrections were made on an electronic file and saved.

All interview transcripts were translated into English and analysed thematically. Next NVivo software package was utilized to assist in storing and managing the data.

6.6. Results

We used the MOAB framework (Parkinson et al., 2016) as a lens through which to examine the data. This study supports the a priori themes generated from the framework. Following the developmental framework used for this research the emphasis of the analysis of the stories include the intrinsic and extrinsic motivations, the environment and social norms, the ability of the participants to perform the desired behaviour and the behavioural characteristics. Table 14 shows participants' behaviour, gender, age, marital status, education, income level and number of children. The quotes used serve primarily as illustrations of the identified themes.

Motivation

Extrinsic motivations

Examining the theme of extrinsic motivations several subthemes were identified in this study including neighbourhood quality, shame and embarrassment.

High-quality neighbourhoods

The first extrinsic motivation identified from the study was the clean environment, which is illustrated, in the following quotes:

In a high-class neighbourhood, I would try to put litter in bins [13]

I would litter less if there were rubbish bins nearby, as well as when the place is clean [19]

The effect of high-quality neighbourhoods have been identified in earlier studies where higher quality environments for example, more prestigious residential areas, have less litter than lower quality contexts, for example low socio-economic residential areas (Keizer, Lindenberg, & Steg, 2013; Weaver, 2015; Zhang & McCord, 2014). Berger and Hevenstone (2016) reveal that the signs of disorder (e.g. graffiti or litter) can cause higher littering rates. Even though, there is a scarceness of rigorous reviews of the influence of environmental factors on individual behaviour in general (Bates, 2010), previous research found that a well-maintained local environment, scenic vistas and green spaces can significantly lower the littering rate (Taylor, Curnow, Fletcher, & Lewis, 2007; Weaver, 2015).

Ashamed and embarrassed

Ashamed and embarrassed were identified as extrinsic motivations that would prevent participants from littering.

I would be ashamed and sometimes I feel embarrassed [16]

I do not do it. And if I did it, I'd feel wrong, I'd feel bad to go against them [21]

The avoidance of the negative feelings such as "ashamed and embarrassed" has been identified previously. For example, Wever et al. (2010) found that in most cultures littering is considered socially unacceptable. Previous studies have identified that the use of internal sanctions such as "shame" and informal sanctions such as "embarrassment" can be invoked to reduce littering behaviour (Heywood, 2002).

Intrinsic motivation

Intrinsic motivations identified in this study were; desire to not waste food, religion, beliefs, values and a sense of responsibility.

Don't let it go to waste

Interestingly, participants reported feeling guilty about throwing food leftovers in the general rubbish bins. Participants expressed a strong desire not to be wasteful and explained they throw food waste into the natural environment or leave food scraps outside of the bins so the birds would eat them.

To be honest, sometimes when I go out in the morning I would take leftovers of chicken for example and place them near a bin. I know this might ruin the appearance or leaves it dirties, but I see it better than putting leftover food in the bin. Food is a blessing; I leave it so animals would eat it, it is nice to have separate bins for leftovers food and other types of litter [5]

Food should not be littered. Sometimes I'd have food that I don't want to litter but I have no choice but to litter. We need special bins designed specifically for food litter [14]

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Participants argued there is a need to have special containers for composting to avoid the need to throw food in general rubbish bins or on the ground. The benefits of composting are well documented (Karnchanawong & Suriyanon, 2011; Levis, Barlaz, Themelis, & Ulloa, 2010) and appeared to be a strong motivator.

Religion, beliefs and values

Participants from different age groups have emphasized the significant role of religion, believe and value on littering behaviour as illustrated by the following statements:

There are religious and societal values installed, but they are not aware [25]

Reminds them for the rewards from Allah we have the right values when it comes to cleanliness, they just need to be reminded of them, [22]

This finding is consistent with the Al-Khatib et al (2009) study which found that 27% of participant's religion convictions would prevent littering. Research on religion has increased during the past decade, and the need to understand more about the effect of religion on society is greatly encouraged (Smith, 2003). A number of studies illustrate that religion often serves as a factor fostering promising and healthy results in different contexts and populations (Chapra, 2007; Odimegwu, 2005; Smith, 2003). Using religion to appeal to the values of individuals and influence their world-views may offer one means to change behaviours (Farr Wharton et al., 2014; Stern, 2000). Further, individual's frequently behave in a way that is consistent with how he or she express their values and beliefs (Heimlich & Ardoin, 2008).

Sense of responsibility

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Being a good parent and role model was found to be an important intrinsic motivation for many participants in this study as illustrated in the following quote:

Being a mother of two kids makes me always trying to preserve the environment and never littering [23]

The parent role includes associated roles such as caregiver, provider or teacher and the meaning of good parent and how this is enacted has an important influence on the decision-making process and outcomes of those decisions (Parkinson et al., 2016). The strong desire to be a good role model suggests that the sense of parental responsibility is an important intrinsic motivation.

Opportunity

A number of environmental barriers were identified in this study including lack of infrastructure, social norms and a littered environment.

Lack of infrastructure

Participants' responses regarding infrastructure were unsurprising. Lack of infrastructure, specifically the provision of rubbish bins was identified as one of the main barriers to dispose of litter properly.

Maybe provide rubbish bins and place them in the right places. I have noticed that they are misplaced, either placed far or somewhere where it can't be seen. [13]

If I had to, I would throw it anywhere. It won't bother me much because I didn't find a rubbish bin to use [1]

This finding is consistent with previous studies on littering behaviour, which found appropriate and sufficient infrastructure could support proper disposal of litter (Berger & Hevenstone, 2016; Linh, 2014). Participants reported the importance of having enough rubbish bins available in public locations to assist them to dispose of litter correctly. Not only did they report that there needed to be a sufficient number of rubbish bins, but also that bins provided need to be clean and not full, as well as easy

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to put the rubbish into. Having supportive infrastructure will allow a clean environment to become commonplace (Farr-Wharton et al., 2014; Prestin & Pearce, 2010). Previous studies suggest that if the litter services and necessary infrastructure are poor, people are less likely to use them (De Kort et al., 2008; Gunggut, Hing, & Saufi, 2013; Schultz et al., 2013).

Social norms

Social norms are a powerful socio-cultural influence on behaviour, and are highly influential in determining individual littering behaviour (Baltes & Hayward, 1976; Cialdini et al., 1990; Heywood, 2002; Kallgren, Reno, & Cialdini, 2000; Sheban, 2014). Participants would not litter when those around them disposed of their litter correctly. Participants were more likely to litter when others were also leaving litter behind. This finding is consistent previous research where (Berger & Hevenstone, 2016; Keuschnigg & Wolbring, 2015) disorder was found to considerably impact on individual littering behaviour.

> *If the parks were litter free I would never litter [3]*

> *When I see my neighbour throwing rubbish outside the rubbish bin I would do the same because the place is already becoming dirty [1]*

While many participants agreed that littering was a harmful behaviour for the environment they would still litter if there were already litter present on the ground.

> *It's not ok to litter and harm the parks, we do not except littering behaviour, but I seriously found it ok specially if the rubbish bins are not easily accessible I would litter, but I would never be littering if the park clean even if I have to get the rubbish bag in my car [20]*

> *Litter free environment would never allow me to litter, but even it's rarely happened I would litter if the park were already littered [15]*

Participants felt they could not individually make any difference where high amounts of litter were present. This finding is consistent with previous studies where

a littered environment works to significantly restrict the individual's overall opportunities for action (Seligman & Csikszentmihalyi, 2014). Previous research has found that higher rates of littering occurs in areas where litter is already present; that is the presence of litter encourages more littering and by keeping a location litter-free could potentially decrease the amount of littering (Cialdini et al., 1990; Keizer et al., 2013; Ojedokun, 2011).

These findings show that individual littering behaviour is greatly influenced by their environment. That is if they see others around them littering or if there is already litter on the ground they will also litter. This is exacerbated further in cases where the environment is not set up to facilitate the desired behaviours (Berger & Hevenstone, 2016; Brown et al., 2010; Keuschnigg & Wolbring, 2015; Schultz et al., 2013). Providing enough bins in convenient locations in public places will assist in keeping the environment free from litter thus encouraging citizens to dispose of litter correctly.

Ability

A lack of knowledge regarding what constitutes litter was found in the study. Participants were unaware of some of the negative consequences of littering, environmental programs and were unaware of certain litter items.

Unaware of littering's negative consequences

In general, participants were globally minded, showing concern for the environment; and they appeared knowledgeable about littering issue. Participants were also aware of the importance of not littering, with some antilittering attitudes and knowledge of the issue already in place.

> When I go to the wild, I burn my litter. I was not informed about this, I only followed what other people did who cares about the environment. I am not sure if this is true or not [14]

I know it harms the environment but not sure how [1]

This is very important issue everyone should take part litter can block sewers, spoils water quality and can also kills animals when swallowed [12]

While knowledge about litter issue did exist, some cases reported behaviours were not in line with the knowledge and hence guilt was identified as one motivating factor. Some participants demonstrated a limited understanding of the negative consequences of littering on the environment. Recent studies show that an individual's lack of understanding of the serious impact of environment was found to be one of the most significant factors contributing to negative littering practice (Ajaegbo, Dashit, & Akume, 2013).

Lack of information about litter

Participants had comparatively different knowledge levels and understanding about what is and is not litter. For example, they faced difficulty in determining whether common items such as food were litter. This is an important finding, as knowledge of what materials are litter is positively linked to littering behaviour (Al-Khatib et al., 2009; Arafat et al., 2007).

I'm in the backyard of our house and we're eating fruits. I might litter because they are good for the environment [2]

Everything I don't need it or not use it anymore I count it as litter [4]

In this study it was clear that not everyone was aware of the negative consequences of littering, a finding that supports previous research (Graham-Rowe et al., 2014). A general lack of knowledge about litter items generated has been documented in prior research. Moreover, individual knowledge was commonly mentioned as a barrier to positive littering behaviour and improving misperceptions over what is and what is not litter may assist in overcoming negative environmental behaviour. Even though some studies argue that information campaigns alone will rarely bring about behaviour change (Kennedy, 2010; Lee & Kotler, 2011; Manning,

2003; Wymer, 2015) awareness of what constitutes litter remains an important step to reduce litter (Ballantyne et al., 2001; Damerell, Howe, & Milner-Gulland, 2013; Lehman & Geller, 2005). According to Marion & Reid (2007), Individual knowledge and understanding of the issue is one component in a wider behavioural change program.

Behaviour

Benefit for self and others

The beneficiary of littering behaviour was found to be not only the individual or "self" but also "self and others" where not littering has the potential to benefit the individual, and also those surrounding the individual. Participants show their awareness of the benefit of not littering being not only for themselves but also for their family. Parents reported that they felt responsible for protecting the environment to preserve it for the future for their family and their community.

> *This is my country as well, and I'm responsible for it, too. I feel responsible towards my kids, community; and public places in my neighborhood [16]*

Personal responsibility of caring for the environment is often cited as an important requirement for the prevention of anti-environmental behaviour (Cox et al., 2010). Positively, the majority of participants acknowledge that a clean environment is their responsibility not the cleaners or the authorities.

Table 13: Participant details

Interview Number				Demographics			Did you litter in the past month
	Gender	Age	N of kids	Marital status	Education	Employment Status	
1.	Male	20	0	Single	High school	Student	Yes
2.	Male	22	0	Single	Bachelor	Student	No
3.	Male	28	1	Married	Master	Self-employed	Yes
4.	Male	20	0	Single	Bachelor	Student	No
5.	Male	25	0	Single	Bachelor	Self-employed	No
6.	Male	39	3	Married	Doctorate	Employed	No
7.	Male	40	2	Married	Master	Student	No
8.	Male	27	2	Married	Bachelor	Student	Yes
9.	Male	35	3	Married	Doctorate	Employed	No
10.	Male	40	3	Married	Bachelor	Employed	No
11.	Male	26	0	Single	Diploma	Self-employed	No
12.	Female	40	3	Married	Doctorate	Employed	No
13.	Female	22	0	Single	Bachelor	Student	No
14.	Female	40	7	Married	Diploma	Retired	No
15.	Female	35	5	Married	Bachelor	Employed	No
16.	Female	33	3	Married	Diploma	Self-employed	No
17.	Female	25	1	Married	High school	Self-employed	No
18.	Female	27	1	Married	Bachelor	Self-employed	No
19.	Female	24	1	Married	Bachelor	Self-employed	No
20.	Female	24	2	Married	Bachelor	Student	No
21.	Female	32	7	Married	Bachelor	Employed	No
22.	Female	37	4	Married	Master	Employed	No
23.	Female	32	2	Married	Bachelor	Self-employed	No
24.	Female	33	0	Single	Bachelor	Employed	No
25.	Female	25	1	Married	Diploma	Student	Yes

6.7. Discussion

In line with the stated aims of this paper this study makes three contributions. First, this research has addressed the call to apply theory in social marketing studies (Luca & Suggs, 2013; Truong, 2014), by applying the MOAB framework to gain insights to inform littering reduction. Second, this research addressed the call to empirically test the MOAB framework. The current study applied the MOAB framework to gain insight into behaviour for a particular audience within a specific context. Third, this research contributes to the literature offering a social marketing formative research study whose aim is to understand motivation, opportunity, ability and behaviour factors influencing littering in Middle Eastern countries to gain actionable insights that can be used to develop an intervention to reduce littering.

Guided by the MOAB framework this study demonstrated how littering behaviour can be reduced when the focus is extended beyond the individual whose behaviour may need to change. While individuals may be motivated not to litter, they may not have the required knowledge about the consequences of littering and how to dispose of litter correctly, thus there is evidence that both individual and environmental factors may have a strong influence on littering behaviour. The environment surrounding the individual including social influence, social norms and infrastructure contribute significantly to motivate and/ or restrict littering behaviour. Thus, the solution to the issue at hand becomes clear by changing the environment surrounding the individual to facilitate the desired behaviour. This finding is consistent with Donovan's (2011) conclusion that using a combination of strategies simultaneously may be the most practical option to reach the desired behaviour change. Highlighting the modifiable factors influencing littering behavior is important in order to design and implement an effective antilittering social marketing intervention.

Social marketing's end goal is to achieve behaviour change to benefit

individual, community and society as whole. Consideration of the individual whose behaviour may need to change within the wider context in which they are surrounded helps to identify the factors that can be used to influence the targeted behaviour (Evans & Hastings, 2008). Context can include infrastructure, in this case cleanliness of the environment, bin locations, ease of bin use, state of the bins, and socio-cultural factors, in this case social norms. To effect change, these modifiable environmental factors identified could be targeted by change agents.

Theory Implications

Applying the MOAB framework in this research highlights how the environmental surrounding individual such as the cleanliness of parks and accessibility of rubbish bins (opportunity) and information on litter items (ability) may be improved to reduce littering behaviour. The findings from this research demonstrate that behavioural context is important as we see that the behaviour is not only an individual or "self" behaviour but also is a "self and other" behaviour (Parkinson et al., 2016), affecting those around the individual as well. This affects the decisions to litter or not and serves as an extrinsic motivation to perform the desired behaviour.

Although an individual might have an interest to not litter, external or contextual factors such as social norms and infrastructure can prevent them from pursuing that initiative and therefore, confirms the findings of Liu and Sibley (2004) indicating using attitude manipulations in isolation may not be enough to change littering behaviour.

Policy implications

Previous research has emphasized the role of social norms on individual behaviour particularly littering behaviour (Berger & Hevenstone, 2016), yet norms would be activated when the right opportunity structure is applied. Therefore, interventions and programs that address government involvement is a requisite means

to influence sustained anti-littering behaviour. This study demonstrates the importance of removing existing litter by creating a supportive climate to enhance the litter free environment. Having an environment that is free from litter has a strong influence on littering behaviour. Drawing on earlier results confirmed in this study policy maker should provide appropriate infrastructure. Infrastructure of rubbish bin location needs to be consistent, attractive, available and accessible to encourage consistent proper disposal behaviour.

Implications for social marketing

Social marketing should be enabling engagement between downstream (individual) and upstream (infrastructure) level in developing social marketing interventions targeting littering behaviour, this in return would potentially increase the effectiveness of such programs. This study revealed that littering behaviour might need a combination of individual and environmental level strategies in order to achieve the desired behaviour. First, this study demonstrates a need to increase awareness to ensure people know what is (and is not) litter and how to dispose of litter correctly. For example, signage could be installed in public spaces delivering pictures of items that are considered litter to increase understanding of litter in target communities. The study also found that intrinsic and extrinsic motivations could be harnessed to influence littering behaviour in combination with changing social norms surrounding littering behaviour. Finally, this study found environmental factors that might assist in reducing littering behaviour including improved infrastructure and accessibility.

6.8. Conclusions, limitations and future research

In conclusion, this paper presents an attempt to identify influences on littering behaviour to understand whether individual or environmental influences are more modifiable. The current study has identified strategies that may be used to target littering behaviour reduction initiatives in a Middle Eastern context. Future research

in this area should also focus on the influence of non-residents and children in the formative research stage. This research is limited in that it only considers one country; future research should consider other Middle-Eastern countries to understand if the MOAB can be used across Middle-Eastern contexts. Second, a convenience and snowball sampling method was employed and so the results cannot be generalized. Studies using a larger study are also recommended to increase the generalisability of the findings.

6.9. References

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7. Chapter VII: Discussion and Conclusion

7.1. Introduction

This thesis sought to apply a broader perspective to social marketing formative research in order to explore further influences on individual littering behaviour. Overall, this thesis aimed to explore individual, social and environmental factors influencing littering behaviour in the Middle Eastern context.

At present, the Middle East is facing a significant problem in regards to littering (Abu-Hilal & Al-Najjar, 2009; Al-Khatib, 2009; Al-Khatib et al., 2009; Arafat et al., 2007). Most littering and environmental protection studies have been undertaken in Western contexts (Schultz et al., 2013; Sibley & Liu, 2003; Truong, 2014). In contrast, fewer studies on littering in the Middle Eastern context are evident (Al-Khatib et al., 2009; Al-Khatib et al., 2015; O Ojedokun & Balogun, 2011). Even though the Middle East continues to be a vital region geographically, economically and politically, it remains virtually neglected in the international environmental marketing literature (Bhuian et al., 2014).

This chapter aims to provide an overarching discussion of the findings of this thesis which was reported as a series of papers in three previous chapters. This chapter starts with a brief summary of the research objectives and research design in section 7.2, followed by discussion of the results that address all research questions in section 7.3. Next, sections 7.4 and 7.5 outline the theoretical and practical contribution of the thesis, followed by research limitations in section 7.6. In the final part of this chapter, section 7.7, future research suggestions are outlined, and then in section 7.8, an overall conclusion is made.

7.2. Research Purpose and Design

A comprehensive understanding of customers (audience research) during formative research is one of social marketing's core principles, which then guides intervention design, development and implementation, and finally evaluation (Andreasen, 1994; Kubacki & Rundle-Thiele, 2017). Formative research helps to gain insights into the motives, opportunities, and barriers that trigger behaviour changes (Tapp & Rundle-Thiele, 2016). A deep understanding of the individual during formative research is essential when designing social marketing programs in order to get closer to the target audience's perspective and their perception of the behaviour and its associated factors (Andreasen, 1994; Donovan, 2011; Hastings, 2007; Krisjanous, 2014). Insights gained as a result of formative research assist in attracting and retaining interest in the individual (Page & Sharp, 2012).

Lefebvre (2013) argues that the methods used during social marketing formative research are too limited. Reliance on a relatively narrow range of methods may constrain understanding of the individual's behaviour and associated influences. As a result, calls have been made to diversify methods in order to provide a holistic picture of the behaviour (Carins et al., 2016) which may assist to deliver interventions that in turn can achieve greater impact (Kubacki & Rundle-Thiele, 2017). These issues drive the ultimate purpose of this research, which was:

To examine the broader system surrounding individuals to extend an understanding of littering behaviour beyond limited self-report methods.

In order to achieve the research objectives, guided by a pragmatic philosophical approach, a mixed methods research design was employed. Firstly, a systematic literature review was undertaken to examine previous programs and interventions and review their efficacy in bringing about behavioural change in the area of littering. Secondly, a covert observation study based on a convenience sample observed littering behaviour. The observation study aimed to understand individual,

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social and environmental factors which influenced littering behaviour in public places. Thirdly, qualitative analysis comprising in-depth interviews with Saudi Arabian adults aimed to extend understanding further investigating individual, social and environmental factors influencing littering behaviour in the Middle Eastern context.

The main findings are chapter specific, and were summarised within the respective chapters: Chapter 4 (Study 1): Littering reduction: A systematic review of research 1995-2015; Chapter 5 (Study 2): A socio-ecological examination of observing littering behaviour: An observation study; Chapter 6 (Study 3): Preventing littering: It's not all about sticks!. The next section will synthesise the empirical findings to answer the study's research questions. The result of the three studies and how they address the research questions of this thesis is outlined in the next section.

7.3. Addressing the Research Questions

7.3.1 Research Question 1

The first research question (RQ1) asked: ***What are the key characteristics of effective littering interventions designed to reduce littering behaviour?*** A systematic literature review, conducted to address this question, sourced 672 publications, from which 17 studies were finally selected for detailed examination. Studies aimed to reduce littering behaviour. Studies were carried out in a diverse range of contexts and often included different outcome measures for identifying whether positive, negative or no effect was observed, without attempting to determine the size of the effect. The results of Study 1 extended earlier systematic literature reviews on littering by Dwyer et al. (1993) and provided a contemporary review of interventions aiming to reduce littering. The study identified an absence of social marketing studies in the context of littering. However, a broad range of approaches was observed in the reviewed studies and they offer some important lessons.

There have been widespread efforts to change littering behaviour, ranging from images picturing watching eyes, to the building of environmental infrastructure. Littering interventions and/or programs identified in the review have used both individual behaviour change and infrastructure changes to build environments to reduce littering. Extending to an interdisciplinary approach will help to close the gap between individual and societal interests. Assessing each study against a social marketing scorecard highlights additional areas that could be employed to potentially further increase intervention effectiveness.

The quality of the studies was also examined in the systematic literature review. Mixed results were found, with a range of scores and study types including observations, studies utilising both observations and surveys, and studies based on surveys only identified in the quality assessment. The quality assessment found consistent and validated measures were lacking across studies reported in this review.

This review summarised the extent that the developed social marketing scorecard, based on Andreasen's (2002) six social marketing principles with the addition of theory as a social marketing component, had been applied previously to change littering behaviour. All of the included studies had behavioural objectives and developed strategies aimed at achieving these objectives.

Overall, studies using targeted approaches and more of the scorecard elements had higher success rates. Studies which used a combination of environmental and individual factors also tended to be successful at changing behaviour by providing opportunities and a place for participants to perform the behaviour. This indicates that each target audience and their motivations need to be acknowledged when developing programs and deciding on which elements to include to change behaviours.

Behaviour change practitioners and researchers use formative research to gain insights into the motives, opportunities, barriers, and triggers that surround behaviour changes (Tapp & Rundle-Thiele, 2016). Yet, formative research and segmentation were not widely used in the current review and this represents a considerable

opportunity to more closely orient programs to meet the needs and wants of the target audience, rather than applying a one-size-fits-all approach.

7.3.2 Research Questions 2 and 3

Findings from Study 1 show how behaviour change approaches have been applied to change littering behaviour, with limited evidence of formative research in littering interventions identified. The next two research questions (RQ2 and RQ3) in combination guided a broader investigation of the influences on littering behaviour in the Middle East context.

The second research question (RQ2) asked: ***What individual and environmental factors are known to influence littering behaviour?*** A structured observation method was used, which is the most frequently used method in the littering context (Cierjacks et al., 2012; Lindemann-Matthies et al., 2012; O'Connor et al., 2010). This study examined the environmental, social and individual factors that influence littering behaviour. The behaviour of individual adults was observed following the Schultz et al. (2013) protocol and code sheet, which has been shown to have good reliability in past studies. This study assessed the influence of selected environmental, social and individual factors on littering behaviour in a Middle Eastern country. Littering behaviour was observed across three different parks in Saudi Arabia. A total of 362 individuals were observed over 12 days.

Highlighting the factors influencing littering behaviour is important in order to plan and implement an effective antilittering social marketing intervention. While previous studies have examined individual factors which influence littering behaviour (Al-Khatib et al., 2009), the findings from this observation study reveal environmental factors have a stronger impact on littering behaviour than individual factors.

Furthermore, this study found that changing the environment surrounding the individual offers the greatest potential to promote antilittering behaviour, thus intervention focus needs to include changing the environment in which the behaviour occurs. Prior research indicates that making rubbish disposal easy and convenient through reducing distance, or increasing the number of bins increases disposal (Amutenya, Shackleton, & Whittington-Jones, 2009; Vega, Ojeda-Benitez, Aguilar-Virgen & Taboada-Gonzalez, 2010). This study found that people placed more litter in bins when they were easily accessible. This indicates that small environmental changes such as placing more bins in convenient locations in public areas will assist citizens to adopt positive social behaviours such as proper disposal of litter.

This study emphasises the efficacy of the use of observation methods when examining anti-environmental behaviours such as littering where individuals may not report their true behaviours. According to Bryman (2016), observation methods are usually more effective and accurate than getting an individual to report on their behaviour. Therefore, methodologically this study extends beyond self-reported methods, such as interviews and questionnaire surveys, which have been used previously in studies in Middle Eastern countries addressing the call to broaden methods used in social marketing formative research studies (Kubacki and Rundle-Thiele, 2017).

The third research question (RQ3) asked: *What are the factors influencing littering behaviour (motivation, opportunity, ability and behaviour) within the target population?* A qualitative study exploring motivation, opportunity, ability and self-reported behaviours of 25 Saudi citizens was conducted. An in-depth, semi-structured interview method was used. Semi-structured interviews were conducted between February 2014 and July 2015 with adults aged 20-40 years old from Saudi Arabia. Qualitative thematic analysis was undertaken using Nvivo software to identify key factors which may be used in future to influence individual littering behaviour through the lens of the MOAB framework. Few studies have combined both

individual and environmental factors in a single study (Schultz et al., 2013) despite our understanding that many social, health and environmental problems are complex and multi-factorial requiring a broader systems understanding (Hoek & Jones, 2011; Wymer, 2011).

Moreover, a review of the littering literature indicates that studies have not considered broader social influences. This article sought to move away from a reliance on downstream and focused on understanding what would prevent a person from changing behaviour. Guided by the MOAB framework (Parkinson et al. 2016) this study aimed to explore the individual's environment, social and cultural influences.

This study shows that littering behaviour is clearly not an individual behaviour that needs to be changed. It is the environment surrounding the individual, including social influence, social norms and infrastructure which contribute significantly to motivate and/ or restrict littering behaviour. Social marketers need to extend focus beyond the down-stream.

This formative research study was comprised of three studies. The first study included a systematic review of previous littering studies, the second study was an observation study that involved the researcher observing littering behaviour and third and final study employed interviews to gain insights into the target audience. It is evident from the current study that using a mixed methods approach in the formative research helped capture the complex nature of actual littering behaviour (Parkinson, Schuster, et al., 2016). It seems obvious that the environment surrounding the individual in public places plays a crucial role in influencing littering behaviour. This has received little attention in previous studies targeting environmental behaviour.

It may seem simple to change a littering behaviour but, in fact, this thesis shows it is actually more complex. To simply develop an awareness/education program, expecting awareness and education alone will change behaviour, is not the right option as wider efforts addressing environmental deficits are needed to effectively change the behaviour. Study 2, the observation study, shows that the role of the built environment on individual littering behaviour, combined with Study 3, the interview study, which uncovered the importance of social and cultural influences, including the environment, on the individual.

7.4. Implications for Theory

This research has addressed the call to apply theory in social marketing studies (Luca & Suggs, 2013) and focussed on the need to extend understanding beyond the individual to the social and built environment influences and provides an understanding of the forces opposing the desired behaviour to enhance program effectiveness. This study provides further evidence that there is merit in using theory to develop programs aimed at changing behaviour. Theories and frameworks capturing the complex nature of actual littering behaviour where interactions occur between an individual and environmental factors warrant consideration (Parkinson, Schuster, et al., 2016). From the systematic review the dominant theories, namely Focus Theory of Normative Conduct, the Theory of Planned Behaviour and Social Learning Theory do not address the built environment surrounding the individual targeted for change. According to the results of this thesis looking at the issue from the individual perspective only, and neglecting the environmental and social context, would limit the effectiveness of social marketing programs. This thesis supports recent study findings suggesting that social marketing needs to extend beyond the individual targeted for change (Carins et al., 2016; Kubacki & Rundle-Thiele, 2017).

Through formative research, this thesis contributes to a further understanding of the broader systems and context surrounding the individual, which is one of the key

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principles of social marketing. Carins et al. (2016) argue that extending beyond self-report methods during the formative research stage can provide an understanding of the forces opposing the desired behaviour which potentially limit the program's effectiveness. This thesis provides further empirical evidence in an environmental context demonstrating how a mixed-method formative research approach can assist social marketers to understand the broader system surrounding individuals to gain a wider understanding of how littering behaviour can be effectively changed.

The systematic literature review provides a contemporary update of littering intervention effectiveness identifying a lack of formative research. More importantly, the systematic literature review shows that most of the studies were focused on the individual, therefore influences beyond the individual were rarely tested indicating calls to extend social marketing upstream remained unanswered (Carins & S. Rundle-Thiele, 2014; Wymer, 2011). The current study highlights how an observation study can gain actionable insights that can be used to inform public policy on how to reduce littering. Second, the observation study which was guided by the behavioural ecological model, and the interview study guided by MOAB (Parkinson et al. 2016), both shed light on the importance of built environment and social factors on littering behaviour responding to calls in recent littering studies (Berger & Hevenstone, 2016; Weaver, 2015).

This research has addressed the call to apply theory in social marketing studies (Luca and Suggs, 2013; Truong, 2014). An important contribution of this thesis is the application of the MOAB framework by Parkinson, Schuster, et al. (2016). This research applied the MOAB framework to gain insights into littering behaviour. By applying the MOAB framework this research highlights how the environmental surrounding individual such as the cleanliness of parks and accessibility of rubbish bins (opportunity) and information on litter items (ability) may be improved to reduce littering behaviour.

7.5. Implications for Practice

This thesis makes a number of contributions to social marketing practice. Firstly, the results of this thesis indicate that a combination of upstream, midstream and downstream interventions may be more effective than a downstream only focused intervention – a proposition that can be empirically tested utilising an experimental design in future studies.

Secondly, each MOAB factor was found to be an important influence on individual littering behaviour. While some studies suggest that if two of the MOAB factors are present the third can be overcome, this study supports the notion that there is interplay between all the factors in the framework (Parkinson, Schuster, et al., 2016; Siemsen et al., 2008). Therefore, the environment surrounding the individual, both structural and socio-cultural, contributes significantly to influence or restrict littering behaviour. Consequently, to develop an exchange offering to reduce littering which may be characterised as a "we" behaviour (Parkinson, Schuster, et al., 2016), both extrinsic and intrinsic motivations should be considered along with the social and structural environment and this provides an opportunity for future research.

Social marketing programs for litter prevention should include strategies targeting an individual's extrinsic motivations, knowledge, and ability as well as structural environmental changes including making access to rubbish bins easier and more convenient. Governments should also ensure that public spaces such as parks are kept clean, as this is also an important influence on an individual's littering behaviour. For example, this study demonstrates the importance of removing existing litter by creating a supportive culture for environmental behaviour, which enhances the litter free environment. Having an environment which is free from litter has a strong influence on littering behaviour and provides an opportunity for governments to assist citizens to practice anti-littering behaviour. Rubbish bin location needs to be

consistent, attractive, available and accessible to encourage consistent, proper disposal behaviour.

People placed more litter in bins when they were conveniently located and when there was less litter already left in the park. This indicates that small environmental changes such as placing more bins in convenient locations in public areas will assist citizens to adopt positive social behaviours such as proper disposal of litter. Given emerging evidence indicating that program effectiveness can be enhanced when environmental change is added to a program aiming to motivate the desired behaviour (Carins et al., 2016), insights delivered in the current study suggest that bin locations and park beautification programs in addition to communication supporting extrinsic motivations such as a desire for a beautiful space for one's children to enjoy will deliver litter reduction in Saudi Arabian parks.

This study demonstrates the efficacy of the use of observation methods when examining anti-environmental behaviour such as littering where individuals may not report their true behaviour. Therefore, methodologically this study answers the call to extend beyond self-reported methods such as interviews and surveys, which have predominantly been used previously in social marketing studies. Thus, this research addressed the call to extend beyond self-reporting methods (Carins et al., 2016) by employing covert observations in addition to interviews in response to calls for use of multiple methods in formative research (Carins et al., 2016; Kubacki & Rundle-Thiele, 2017) to gain insights into social and structural factors in addition to individual factors.

Finally, this thesis contributes to the literature by offering a social marketing formative research study whose aim is to understand both the individual and environmental factors influencing littering in public spaces in Middle Eastern

countries and to gain actionable insights that can be used to develop an intervention to reduce littering in cultures beyond a Western context.

7.6. Limitations

This study is not without limitations, and acknowledging the limitations of the research is particularly important in order to improve the outcomes of future research. The limitations for each study have been presented in each study (Chapters 4 to 6). This section discusses the key limitations of the overall research design.

Due to the limitations of time and budget, the current study (Studies 2 and 3) was conducted based on a convenience sample. This thesis used a convenience sampling technique as it included participants who were accessible and willing to participate in the study. Convenience sampling is a non-probability sampling technique where subjects are selected because of their convenient availability to the researcher. Therefore, the results of this study are not generalisable to a larger population of Saudi Arabian adults.

This study (Study 2) is limited in that it only examines three parks in one Saudi Arabian city over a limited time period and many aspects of the built environment were not measured, such as whether the park has kiosks and the quality of the neighbourhood where the park is located. Future research is required to examine the wider role of the built environment and individual factors on an individual's littering behaviour. The lack of comparison across different sites makes it difficult to rule out other possible external influences on littering behaviour. Therefore, this research cannot be generalised beyond the sites examined.

This study used human observation. Alternatively, in future, mechanical observations (for example, video cameras or CCTV) might be used. The use of video cameras could offer safety, time efficiency and non-biased judgments (Stern, 2000; Takahashi, 2009). Finally, this thesis limited the use of segmentation in the formative research stage, which has limited the overall consumer insights. Application of segmentation offers an opportunity for future research.

This thesis focused on limited individual, social and environmental factors that surround the individual. Extending understanding beyond the factors examined in the current study is recommended to extend understanding on littering behaviour influences.

7.7. Future Research

Whilst acknowledging the limitations of this study, it is hoped the findings of the current study will be useful for social marketers, behaviour change intervention designers and policy makers as well as the wider community. The future research suggestions from each study have been presented in each study (Chapters 4 to 6). This section reviews the future research that result from the overall research design.

First of all, this thesis encourages and endorses the significant role that social marketing could play to change littering behaviour in Middle Eastern contexts such as Saudi Arabia. Due to the limited number of social marketing studies reported in peer-reviewed literature targeting littering behaviour, opportunities to extend social marketing's application to littering are called for. For some time, there has been a call to increase the use of social marketing strategies targeting environmental behaviour (Takahashi, 2009; Truong, 2014). The findings in this thesis could not only help maintain and sustain individual antilittering behaviour, but it might also extend to other anti-public environmental behaviour such as graffiti.

Opportunities to apply more of Andreasen's (2002) social marketing components are recommended given research demonstrating that behaviour change is more likely when more of the social marketing benchmark's are applied (Carins and Rundle-Thiele. 2014). For example, the limited use of social marketing criteria, namely segmentation and customer orientation, in the systematic review (Study 1) provide opportunities for future research.

This thesis provides insights into the role that social and environmental factors exert on individual littering behaviour. This supports the use of a multilevel focus in social marketing research, and advocates the usefulness of designing broader formative research to gain insights into factors that extend beyond the individual targeted for change. A broader understanding can be applied to design programs which may be more effective, a proposition that can be empirically tested in future research. The Behavioural Ecological (Brennan, Binney, Hall, & Hall, 2015) and MOAB frameworks (Parkinson et al., 2016) used in this thesis acknowledge social and environmental level factors that influence the individual. Future research could further extend this by also examining other individual influences e.g., type of residency (Arafat et al., 2007), social influences e.g., children (Weaver, 2015) or environmental influences e.g., the smell of the place (de Lange, Debets, Ruitenburg, & Holland, 2012).

Littering behaviour is a complex public behaviour influenced by many internal and external factors. Examining these factors and how they interact with others in this context could deliver a holistic picture and, by doing so encourage positive littering practices. Other influences, such as conscious and automatic influences, have been used effectively to control other behaviours, such as eating behaviour, and could offer insights on influences that extend beyond the individual's volitional control (Carins et al., 2016).

Future research should aim to examine a number of cities in Saudi Arabia over a longer time period, as well as different public places, such as petrol stations and highways, to confirm the findings of this study. In addition, further research would start with segmentation of the targeted population. For example, factors influencing children or workers might be different from those who were targeted in this study, namely Saudi Arabian adults; therefore, different results might occur. Public places in Saudi Arabia are the location for diverse individuals in terms of age, gender and nationality to gather, and as such segments would be expected (Dietrich, Rundle-Thiele, et al., 2015). Dietrich, Rundle-Thiele, et al. (2015) argue that the use of segmentation might foster program effectiveness, a proposition that requires empirical testing.

7.8. Conclusion

The growing negative impact of behaviours such as littering on the natural environment threatens the balance of the world's ecosystem (Berger & Hevenstone, 2016; Milfont & Schultz, 2015). Notwithstanding raising awareness of environmental issues in the general public since the 1970s has not stopped environmental degradation. The damage and misuse of environmental resources continues, posing a serious threat to humanity and the planet (Mehmetoglu, 2010; Milfont & Schultz, 2015; Veiga et al., 2016; Weaver, 2015). Therefore, it is important to examine the broader system surrounding individuals to extend an understanding of approaches that could be used to reduce littering behaviour. This research applied a broader perspective to social marketing formative research to examine individual, social and environmental factors influencing littering behaviour in the Middle Eastern context. Thus, this research presents an important first step towards understanding how littering behaviour may be reduced and highlights several avenues for future research.

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Appendices

Appendix 1: Griffith University Ethics Approval (Interview)

GRIFFITH UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE

31-Oct-2014

Dear Mrs Almosa

I write further to the additional information provided in relation to the
provisional approval granted to your application for ethical clearance for
your project "NR: Applying social marketing to change littering behaviour in
the Middle East: The Riyadh experience" (GU Ref No: MKT/34/14/HREC).

The additional information was considered by Office for Research.

This is to confirm that this response has addressed the comments and
concerns of the HREC.

When initially approaching potential participants who have been identified
through snowballing it is important that the researcher explain who it was
that suggested that they might be a useful participant, that their
participation is completely voluntary, and the 'referring' participant will
not be informed of their decision.

Consequently, you are authorised to immediately commence this research on
this basis.

The standard conditions of approval attached to our previous correspondence
about this protocol continue to apply.

Regards

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Appendix 2: Griffith University Ethics Approval (Observation)

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         GRIFFITH UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE

                                                31-Oct-2014


    Dear Ms Almosa

    I write further to the additional information provided in relation to the
    conditional approval granted to your application for ethical clearance for
    your project "Applying social marketing to change littering behaviour in the
    Middle East: The Riyadh experience" (GU Ref No: MKT/32/14/HREC).

    This is to confirm receipt of the remaining required information, assurances
    or amendments to this protocol.



    Consequently, I reconfirm my earlier advice that you are authorised |to
    immediately commence this research on this basis.

    The standard conditions of approval attached to our previous correspondence
    about this protocol continue to apply.

    Regards



    Dr Gary Allen
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Litter Behavioral Understanding Guide, adopted from (Schultz et al., 2013)

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Part 1: Site Selection

General Litter Observation Sites

General litter observations will be conducted at Recreation areas. To the extent possible, the specific sites visited will be selected prior to the scheduled observation shift. Alternate (back-up) sites will also be selected. Alternate sites should be used if (a) the initial site does not fit the specified site criteria, (b) fewer than 4 data points are obtained in the first hour of observation, (c) observers are asked to leave the site, or (d) the observers must leave the site for any other reason (e.g., safety, inclement weather, etc.).

Recreation: Recreation sites are areas where people gather to spend time outdoors. Recreation sites include beaches, parks, ski/skating areas, outdoor events (e.g., fairs), and sporting events (e.g., basketball games). For the observations of general litter, events consisting primarily of families or children might also be included

Part 2: Defining the Observation Field

The observation field refers to the entire physical space that will be observed. The size and dimensions of the observation field will vary by location and will take into consideration physical layout, obstructions, natural boundaries, etc. All individuals who are observed and whose data is recorded must be located within the defined observation field. Individuals falling outside of the observation field will not be included in the data set. Additionally, if an individual exits the observation field before they have been observed littering or not littering, the observation of that individual is complete and their action is recorded as "left site." The details of this coding procedure will be detailed later in this document.

There are three basic layouts for the observation field: open field layout, restricted field layout, and variable field layout. The following definitions and guidelines shall be used to select the most appropriate layout for each site:

Open Field Layout: The open field layout should be selected in areas that have wide expanses of land with people scattered throughout. The boundary of the observation field is defined as the edge of the observer's visual field. The visual field boundary is the maximum distance by which a person's activities can be clearly observed (by the plain eye). The visual field boundary should be defined by mutual consent prior to the observation session.
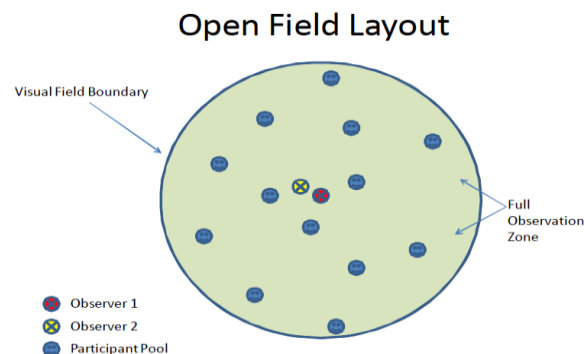
For this research Open Field Layou will be used, which found to be more appropriate observation field technic to be used.

Restricted Field Layout: The restricted field layout should be selected in areas that have clearly defined boundaries beyond which access is either limited or not available. The boundary of the observation field is defined by naturally occurring or built structure boundary lines including streets, buildings, private property lines, trees, fences, waterways, etc. While the defined boundary should be obvious, in these circumstances, the defined boundary should be discussed and agreed upon by both observers prior to the observation session.

## Restricted Field Layout

Variable Field Layout
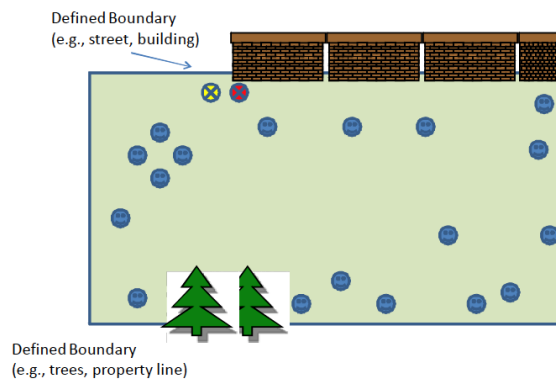
Variable Field Layout: The variable field layout should be selected in areas that have a combination of clearly defined boundaries and large open expanses. The observation field boundary should be extended from the naturally occurring boundaries to other open areas by extending an imaginary line in a rectangular fashion. As with the other field layouts, the boundaries should be determined prior to beginning the observation session.
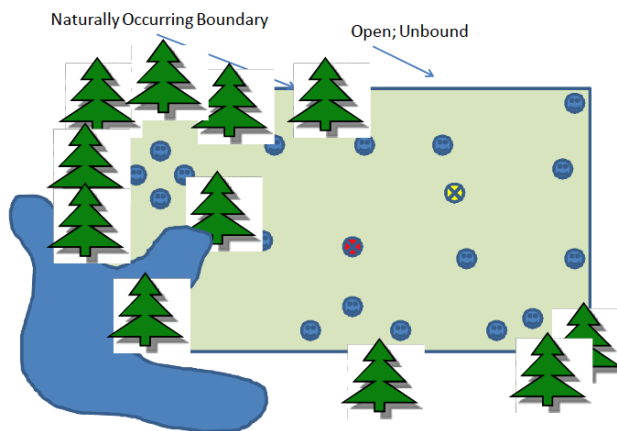
Observing from a Car: In many cases (e.g., at gas stations) it may be necessary to observe from a vehicle in order to remain unobtrusive while making the observations. In these cases, the field will be defined using the same criteria as above.

Observation from Car
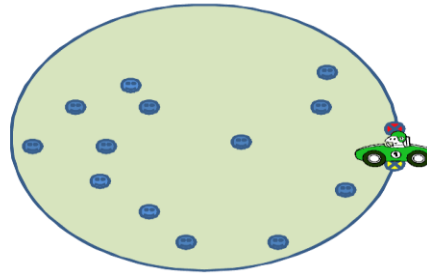
Observing from Inside: In some cases (e.g., at city center areas), it may be necessary to observe from inside a private establishment such as a restaurant or coffee shop in order to make the observations. In these cases, the field will be defined using the same criteria as above and only outdoor areas will be observed. That is, you will observe the people who are outside while sitting at an inside vantage point.

Part 3: Location Description Worksheet

Once the field has been defined, researchers should complete the location description worksheet. The Location Description Worksheet includes the background information about the site (e.g., weather, temperature, and litter present) as well as features that remain stable throughout the observation session (e.g., number of receptacles, beautification, etc.). A walk through of the site is necessary to complete this worksheet. The walk through should take place prior to the initiation of the observations. In some cases, one observer may begin making observations while the second observer completes the location description worksheet. However, both observers should walk through and become familiar with the field (i.e., placement of trash cans, location of ashtrays, etc.) prior to making any observations. Depending on the size and detail of the site, the location description sheet should take approximately 50 – 60 minutes to complete.

The Location Description Worksheet includes the following information:

Location ID: The location ID allows for matching of site and observation data and is comprised of abbreviations of the state, city, and site. For instance, the location ID for a Recreation in R, CA would be CA _R_REC.

Location Type: Indicate the appropriate location category for the site. The categories are: City Center (CC), Gas Stations (GAS), Fast Food (FF), Recreation (REC), and Rest Areas (RST).

Location Name and Address: Fill in the name, address and city where the observation site is located. In most cases, this information will be known prior to visiting the site.

Intercept Site: Record whether the site was selected for intercept surveys (Yes or No).

Observers: Fill in the names and ID numbers of the observers on site.

Start Time: Enter the time that the field was defined and the completion of the location description worksheet began.

Weather: Choose the picture that best describes the weather at the observation site at the time of completing the location description worksheet. Pictures include full sun, various states of cloudiness,

and types of storms.

Temperature: Estimate the current temperature at the location. The temperature should be written in numeric form and should be in degrees Fahrenheit (F). When possible, the temperature can be confirmed following the observation period through actual weather reports available online.

Trash Receptacles: Trash receptacles include any containers placed in the location that are intended for the disposal of trash, cigarettes, or recyclables.

- Indicate the presence (Y/N) and number of trash receptacles including trashcans, ashtrays, dumpsters, recycling bins, etc.
- Indicate how many of each type of trash receptacles are full (no room left for proper disposal within receptacle), partially full (trash in receptacle, but still room left for proper disposal of trash) and empty (no trash in receptacle). If the level of trash cannot be determined indicate this as "unknown."
- Describe the location of the receptacles (e.g., scattered, clustered, widely spread out).
- Indicate also the approximate distance between receptacles.

Existing Litter: Using a scale from 0 (not at all littered) to 10 (extremely littered), rate the amount of litter in the location.

- Indicate the type of litter that is present (check all that apply)
- Indicate the primary locations of the litter (check all that apply)
- Indicate the type of litter in the planters (check all that apply).

Cleanliness: "Cleanliness" refers to the absence of dirt (not physical dirt, but being dirty). Areas high in cleanliness would be free from bad smells, litter, unkempt infrastructure (e.g., peeling paint, poorly maintained walkways, etc.), and objects that do not belong in the location. Areas low in cleanliness would include bad smells, litter, deteriorating infrastructure, and objects that do not belong in the location. Using a scale from 0 (not at all clean) to 10 (extremely clean), rate the cleanliness of the location.

Walkability: "Walkability" refers to the overall walking conditions within the location. Areas high in walkability would be locations with quality sidewalks, safety and buffers to moving traffic (planter strips, on-street parking, or bike lanes), easy access to mass transit, availability of pedestrian crossing, and aesthetically pleasing to the eye. Areas low in walkability would be locations without sidewalks or where sidewalks are not in useable condition, unsafe and with a lack in buffers to moving traffic, lack access to mass transit, do not have pedestrian crossing and are not aesthetically pleasing to the eye. Using a scale from 0 (not at all walkable) to 10 (extremely walkable), rate the walkability of the location.

Anti-Litter Signage: Indicate the presence of anti-litter signage and record the wording and location(s) of the signage. Also take a picture of any anti-litter signage in the area.

Other Enforcements: "Other enforcements" refers to such things as: police officers, security guards, surveillance cameras, or any other item that would enforce anti-littering. Indicate the presence of other enforcement regarding litter in location and

describe the other enforcement, taking pictures if possible. Note that only stable enforcements should be recorded (those enforcements that remain during the entire observation period).

Picture File Names and Descriptions: Pictures should be taken both before and after the observation session. A minimum of six photographs should be taken per site and should include the full observation field as well as any observed litter. If people are included in the picture, that is okay. However, do not take pictures of specific individuals. Record the picture number/filename and description of the picture on the worksheet. Take as many pictures as necessary to fully capture the site. Do not limit yourself to the six-picture minimum. Use additional pages as needed to describe the pictures

At the end of the observation period, the following items should be completed:

Number of people at location: Record the lowest and highest number of people in this location during the observation period. For each item, estimate a whole number and do not use ranges or decimals.

Crowdedness: Rate the minimum and maximum levels of crowdedness during the observation period using a scale from 1 (not at all crowded) to 10 (extremely crowded). Crowdedness is a subjective rating of the perceptions and feelings of being crowded (e.g., ability to move freely). Crowdedness is a combination of the number of people in the location and the features of the location. For example, a beach area with 50 people would be rated as less crowded than a fast food restaurant with 50 people.

End Time: Record the time that the observation session was ended.

Notes: Record any notes about unusual circumstances that happened during the observation period that may have changed the features of the location. For example: the trashcans were emptied, a windstorm blew litter into the location, etc.

Part 4: Making and Recording the Observations

General Litter Observations

Individuals will be sampled at the point that they are passing through or leaving the zone. All observation details for non-disposers and disposers will be recorded in the General Litter Observation Log Book. If an individual is observed disposing, additional information will be recorded in the General Litter Disposer Observation Book.

Information recorded in the General Litter Observation Log Book includes the following:

Observation Number	Record observations consecutively (i.e., 1, 2, 3…). The goal is 30-50 total observations per site.
Time of Observation	Record the time that the observation of the individual began.

	Indicate if the time was am or pm.
Sunset	Record whether the observation took place "before sunset" or "after sunset." The purpose of this item is to differentiate between observations made during daylight hours and those made at night.
Gender	Record the individual's gender (male or female). If gender cannot be determined, check "unknown."
Age	Estimate the age of the individual and record. Estimate a whole number. Ranges (e.g., 25-30) or general estimates (20's) are not acceptable entries.
Group	Was the subject in a group? Yes or No.
Observed Behaviour	All individuals will be sampled at the point they are leaving and coded as follows: ☐ Left Site with no Visible Object ☐ Left Site with an Object ☐ Disposer

For Disposers, the following information will be recorded in the General Litter Disposer

Observations Booklet:

Observation Number: This number should correspond to the number recorded in the "General Litter Observations Log Book."

Object Disposed: If an object was littered or disposed, what was the object? Below are the categories:

- Beverage Bottle: Plastic
- Beverage Bottle: Glass
- Beverage Can
- Beverage Cup
- Food Wrapper
- Food Container
- Food Remnants
- Cigarette Butt (age 21 and over only)
- Paper
- Napkin/Tissue
- Plastic Bag
- Combo/Mixed Trash
- Other (e.g., dog waste left behind, gum)

Disposal Method

Check the box corresponding to the disposal method that was observed. Below are the categories and associated descriptions:

Pocketed	The individual placed the object in his/her pocket, handbag, or otherwise took it with them.
Trash Can	The individual placed the object inside a receptacle intended for trash.
Recycle Bin: Correct:	The individual placed a recyclable object(s) in a designated recycling bin.

Recycle Bin: Incorrect	The individual placed non-recyclable objects in a recycling bin
Ashtray	The individual placed the object in an ashtray.
Separated	The individual placed some items in the trashcan and others in a recycle bin.
Ground	The individual placed, threw, dropped, buried, or otherwise left on the object on the ground
Planter	The individual placed, threw, dropped, buried, or otherwise placed the object in a planter.
Bushes/Shrubbery	The individual placed, threw, dropped, buried, or otherwise placed the object in an area with bushes or other shrubbery
On or Around Receptacle	The individual placed or threw the object on top of or immediately next to a trash or cigarette receptacle.
Other	Disposed of in a manner not specified above. Please specify what happened to the object in this situation.

Littering Strategy

If an object was littered (not placed in a trash can, receptacle, pocket, or other appropriate location), please indicate the littering strategy used by the subject. Below are the categories and associated descriptions:

N/A	No strategy was used. The individual properly disposed of the item, pocketed it, left the observation zone with the item, or had no object.
Wedge	Litter was stuffed into a gap in a wall, sidewalk, light fixture, etc
Flick or Fling	The litter was thrown into the air without intent to reach a receptacle.
Shoot and Miss	The litter was thrown toward an appropriate receptacle but ignored when it missed the intended destination.
Bury	The litter was buried in dirt or leaves.
Drop-Intent	The object was simply dropped (not thrown) and the drop appeared to be intentional.
Drop-No Intent	The object was simply dropped (not thrown) and the drop appeared to the observer to be unintentional.
Inch Away	The individual slowly inches away from the litter.
Sweep	The individual sweeps others' waste onto the ground before settling at a location
90%:	Most objects are binned, but some left behind.
Other	The individual used some other strategy for littering that was not specified above. Please detail the strategy used.

Receptacles

Record the approximate distance (in metric) from the observed individual to the nearest trash can, recycling bin, and ashtray. This distance should be recorded both at the beginning of the observation period and at the point of disposal.

Receptacles: At Start – How far was the individual from the trash can, recycle bin, or ashtray when the observation began? If no receptacles exist, record N/A (not 0). Use a "0" only if the person is less than one foot from the receptacle.
Receptacles: At Disposal – How far was the individual from the trashcan, recycle bin, or ashtray when they disposed of the object? If no receptacles exist, record N/A (not 0). Use a "0" only if the person is less than one foot from the receptacle.
Activity Before Disposal

Record the activity that the individual was engaging in prior to disposing of the object (i.e., reading, standing, talking on the phone, etc.).

Activity After Disposal

Record the activity that the individual is engaging in immediately following disposal (i.e., getting on a bus, entering a store, eating a meal, etc.).

Group Setting at Disposal

Record whether or not the individual is alone, in a group, or if there is a group of people nearby (within 10 feet) at the point of disposal. If the individual is either part of a group or within 10 feet of a group, record the number of people in that group. Do not count the individual as part of the number in the group.

Randomization Sheet

Record which randomization procedure was used: 1's 2's 3's. etc. This is a subjective measure of traffic at the time of the observation.

Notes

Provide a description if anything unusual happened in the situation or if there was anything you were uncertain about. This may not need to be completed for every observation. Be sure to also include any "other enforcements" that may have been in place during the observation of the individual. Such other enforcements might include police officers, city workers, security guards, security camera etc.

Part 5: Concluding the Session

The observation session is complete when 30 – 50 observations of disposers have been made. Following the observation session:

Check all materials for completeness

Take any additional pictures

Complete the post-observation variables on the Location Description Worksheet (end time, crowdedness, etc,)

Complete observation totals for each booklet

Complete the site summary sheet

Place all completed materials inside a large envelope

Once the observation session has been closed, call your supervisor to report that you are safely leaving the site. Report the number of completed observations.s

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SITE SUMMARY SHEET

LOCATION ID:………….
Observer 1 =_____
SESSION END CHECKLIST:
Observation book total # enclosed =_____
Location description worksheet
Photo taken pre and post
Total diposers observed
Observer 1 =_____
Total = _____

Part 6: Special Issues

Other Behaviours Not Classified as Litter

There are some behaviours that involve individuals throwing objects onto the ground, but that are not considered to be litter. These behaviours include:

- Feeding of animals such as ducks or birds
- Throwing coins into fountains
- Spitting of saliva

Observations of this type are not counted towards the total number of disposer observations.

Other Behaviours Classified as Litter

- Throwing food onto the ground where there are no animals
- Throwing objects other than coins into fountains
- Spitting of chewing tobacco (not saliva, but actual tobacco) onto the ground
- Spitting of gum

Part 7: Fallback Statements

While conducting observations in the field, it is possible that you will be approached regarding your activities. The following are standardized responses to the most frequent questions you might receive while working in the field.

While Conducting Observations Only
Who are you?
- I'm a researcher AT Griffith University; I'm doing a study on littering issues in Saudi Arabia. I am out observing to see what people do with their trash in various places. I am not singling out any particular business or location.
- Here is a letter from Griffith University that describes a little more about what we are doing. (Provide letter.)
- If you asked to leave the location even after explaining your activities, kindly comply.

Why are you taking pictures?
- I'm a researcher AT Griffith University; I'm doing a study on littering issues in Saudi Arabia. I am out observing to see what people do with their trash in various places. I am not singling out any particular business or location. As part of my study, my supervisor asked me to take pictures of the different environments that I visit and the trash receptacles in those environments. I am not taking any pictures of your business or anything that includes your logo and the pictures won't be used in any advertising or marketing campaigns.

If you have any queries including the summary of results you can contact the research team identified above.

Griffith University conducts research in accordance with the *National Statement on Ethical Conduct in Human Research*. If you have any concerns or complaints about the ethical conduct of the research project they should contact the Manager, Research Ethics on 3735 54375 or **research-ethics@griffith.edu.au (for non English speaker please call Mrs/ Yara ALmosa on +996554449089)**

General litter observation

Logbook

Researcher:_____ date:_____

Location:_____

Total observed
Total left with no visible object
Total left site with object
Total disposers

Comments/ concerns / problems encountered

ID #	Notes Indicate the observation # associated with the additional notes

ID	Time	Sunset	M/F	Age	Grp.	Left Site No	Left Site With	Disp.
	☐AM ☐PM	☐Before ☐After	☐M ☐F		☐Y ☐N	☐	☐	☐
	☐AM ☐PM	☐Before ☐After	☐M ☐F		☐Y ☐N	☐	☐	☐
	☐AM ☐PM	☐Before ☐After	☐M ☐F		☐Y ☐N	☐	☐	☐
	☐AM ☐PM	☐Before ☐After	☐M ☐F		☐Y ☐N	☐	☐	☐
	☐AM ☐PM	☐Before ☐After	☐M ☐F		☐Y ☐N	☐	☐	☐
	☐AM ☐PM	☐Before ☐After	☐M ☐F		☐Y ☐N	☐	☐	☐
	☐AM ☐PM	☐Before ☐After	☐M ☐F		☐Y ☐N	☐	☐	☐
	☐AM ☐PM	☐Before ☐After	☐M ☐F		☐Y ☐N	☐	☐	☐
	☐AM ☐PM	☐Before ☐After	☐M ☐F		☐Y ☐N	☐	☐	☐

General litter <u>Disposer</u> observation

Book_____ of_____

Researcher_____ date_____

Location_____

Post observation summary (pre booklet)

Comments/ concerns / problems encountered

Observation # _____ (from log book)

Object Disposed	Disposal Method	Litter Strategy
1 Beverage Bottle: Plastic	1 Pocketed	
2 Beverage Bottle: Glass	2 Trash Can	
3 Beverage Can	3 Recycling Bin: Correct	0 N/A
4 Beverage Cup	4 Recycling Bin: Incorrect	
5 Food Wrapper	5 Ashtray	1 Wedge
6 Food Container	6 Separated	2 Flick/Fling
7 Food Remnants		3 Shoot & Miss
8 Cigarette Butt (21+ only)		4 Bury
9 Paper	7 Ground	5 Drop: Intent
10 Napkin/Tissue	8 Planter	6 Drop: No Intent
11 Plastic Bag	9 Bushes/Shrubbery	7 Inch Away
12 Combo/Mixed Trash	10 On/Around Receptacle	8 Sweep
13 Other:_____	11 Other:_____	9 90%
		10 Other:_____

Receptacles: At Start	Receptacles: At Disposal
Nearest Trash Can: ___meter Nearest Recycling Bin: _____meter Nearest Ashtray: _____feet	Nearest Trash Can: ___meter Nearest Recycling Bin: _____meter Nearest Ashtray: _____feet

Activity Before Disposal	Activity After Disposal
Describe:	Describe:

Group Setting at Disposal	Randomization Sheet
0 Alone 1 In Group # = __ 2 Nearby # = ___	1 2 3 4 5 6

Notes	
Anything unusual? Other Enforcements?	

CONSENT FORM

I (print name)…………………………………………………………….. give my consent to participate in this study and for my voice to be recorded and used for research purposes only.

Title of the study: "Changing littering behaviour in the Saudi Arabian community: A social marketing approach"

Conducted by

Mrs Yara ALmosa	**Prof. Sharyn Rundle- Thiele**	**Dr. Joy Parkinson**
PhD Candidate	Principal Supervisor	A/Supervisor
Griffith University	Griffith University	Griffith University
0737356446	0737356446	0737356446

yara.almosa@griffithuni.edu.au

By signing below, I confirm that I have read and understood the information package and in particular have noted that:

- I understand that my involvement in this research will include between 60 and 90 minutes of my time,
- I have had any questions answered to my satisfaction;
- I understand the risks involved;
- I understand that there will be no direct benefit to me from my participation in this research;
- I understand that my participation in this research is voluntary;
- I understand that if I have any additional questions I can contact the research team;
- I understand that I am free to withdraw at any time, without explanation or penalty;
- I understand that I can contact the Manager, Research Ethics, at Griffith University Human Research Ethics Committee on 3735 4375 (or research-ethics@griffith.edu.au) if I have any concerns about the ethical conduct of the project; and
- I agree to participate in the project where my voice will be recorded

Sign……………………………………………………………

Name……………………………………………………………

Date…………………………………………………………..

INFORMATION SHEET

Research team   Mrs Yara Almosa
                                                     Griffith University Business School, Department of
                                                     Marketing- Social Marketing@Griffith
                                                     0737356446
                                                     yara.almosa@griffithuni.edu.au

                                                     Prof. Sharyn Rundle-Thiele
                                                     Griffith University Business School, Department of
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                                                     Dr. Joy Parkinson
                                                     Griffith University Business School, Department of
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                                                     0737356446
                                                     J.parkinson@griffith.edu.au

Litter in public places is a serious problem in many countries. There is a need to understand your opinions about litter and to explore ways that you think littering could be prevented.

This is a student research project aims to understand littering behaviour.

This interview will take between 60 and 90 minutes.

The expected benefits of the research include developing an effective strategy to reduce littering on public places.

Your participation in this interview is not likely to pose risks beyond your normal day-to-day living.

All your comments and responses are anonymous and confidential. All reporting of the data will be de-identified. All data will be stored securely and will only be accessible to the research team.

Your participation in the study is entirely voluntary and you can withdraw from the study anytime without any explanation. Withdrawals will not affect your relationship with Griffith University in any way.

If you have any queries including the summary of results you can contact the research team identified above.

Griffith University conducts research in accordance with the *National Statement on Ethical Conduct in Human Research*. If you have any concerns or complaints about the ethical conduct of the research project they should contact the Manager, Research Ethics on 3735 54375 or **research-ethics@griffith.edu.au**.

Demographics

Gender F/M

Age…..

Marital status

- Single, never married
- Widowed
- Divorced
- Separated but not divorced
- Married (including de facto or living with life partner)

Education

- No schooling completed
- Nursery school to 8th grade
- Some high school, no diploma
- High school graduate, diploma or the equivalent (for example: GED)
- Some college credit, no degree
- Trade/technical/vocational training
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate degree

Employment Status: Are you currently…?

- Employed for wages
- Self-employed
- Out of work and looking for work
- Out of work but not currently looking for work
- A homemaker
- A student
- Military
- Retired
- Unable to work
- Income level

What is the annual income of your household?

- $10 000   - less than $20 000
- $20 000   - less than $40 000
- $40 000   - less than $60 000
- $60 000   - less than $80 000
- $80 000   - more
- No answer

Depth Interview Litter Behaviour Understanding Guide

Hello, my name is Yara Almosa and I'm a researcher. I am doing a study on littering? Can you help me by answering a few questions? I am not selling or promoting anything.

AFTER YES…

We will not ask for your name or any other personal information that can identify you. The interview will be voice recorded and will take between 30 and 60 minutes. The answers you give will be kept strictly confidential. You do not have to answer any questions you do not want to and you may stop the interview at any time. After that, the voice recordings will be destroyed.

Are you at least 21 years of age?   Yes   No

I will start asking questions:

Understand the littering environment

1. Do you think that your city is 'better', 'worse' or 'about the same' in terms of litter than other cities?
2. Why do people litter?
3. How does seeing litter make you feel?
4. What do people put in bins?
5. What do they litter?
6. Where do people litter?
7. Where do they use bins?
8. When do people litter?
9. When do they use bins?
10. What objects do you consider as a litter?
11. Think of circumstances in which it would be okay to litter?
12. Can you give me any example of ways that littering harms the environment?
13. What do you feel when you litter?
14. Do consider leaving objects on the ground next to an overflowing bin as littering?
15. Some people say, "It is someone else job to pick up litter" Do you agree? Why or why not?
16. Some people say, "It is council's responsibility to pick up litter" Do you agree? Why or why not?
17. Some litterers say, "The space is already dirty"? What do you think about this statement? Do you agree? Why or why not?

Motivation and Barriers
1. How important is religion to you? Can religious places help you to not litter?
2. Think of the most important factors that would help you to dispose your rubbish in bins? What are they?
3. In the past month, have you littered?
4. Under which circumstances does your littering increase?
5. Under which circumstances do you litter less?
6. What would you say is the reason that you littered?
7. Do you think the packaging design and fast food outlet leads to littering?

Features of littering prevention programs

1. In the past year, have you seen or heard any messages about litter prevention?

2. What was the subject of the information you saw or heard?
3. Where did you see or hear it?
4. How likely would those campaigns be to increase your awareness and education against littering?
5. Did the ads teach you something new about the consequences of littering? Did those ads increase your concern about littering? Do you think there are barriers that prevent you from interacting with any of these programs?
6. What are the strong aspects and drawbacks of these programs?
7. How do you think that current-littering campaigns could be improved?
8. What media do you prefer? Television, Radio, Smartphone? And what social network do you spend most of your time on?

Would you prefer it to be held in a physical location or online?

Programs to help you stop littering
What are the ways to prevent littering?
What would stop people from littering?
If you setting a new agenda for litter prevention what would be your agenda?
At what physical location should activities be conducted?
How frequently?
How long should activities last?
Who should organize these programs?
Do you think incentives are a good idea to prevent littering? What type of incentives would you suggest?
What might be some other prizes that would get people's attention?
What should be the value of the gift certificates?

Do you have anything to add?
Thank you for your cooperation. Our hope is that this conversation will help us to better understand how we can design a campaign to prevent littering.