INFORMATION QUALITY IN SOCIAL MEDIA: A CONCEPTUAL MODEL

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Abstract

Social Media (SM) is increasingly being integrated with business information in decision making. Unique characteristics of social media (e.g. wide accessibility, permanence, global audience, recentness, and ease of use) raise new issues with information quality (IQ); quite different from traditional considerations of IQ in information systems (IS) evaluation.

This paper presents a preliminary conceptual model of information quality in social media (IQnSM) derived through directed content analysis and employing characteristics of analytic theory in the study protocol. Based in the notion of 'fitness for use', IQnSM is highly use and user centric and is defined as "the degree to which information is suitable for doing a specified task by a specific user, in a certain context". IQnSM is operationalised as hierarchical, formed by the three dimensions (18 measures): intrinsic quality, contextual quality and representational quality. A research plan for empirically validating the model is proposed.

Keywords: Information quality, Social media, Information quality in social media, Analytic theory.

1   INTRODUCTION

Social media (SM) has become a significant phenomenon in recent years, impacting on individual, social and economic aspects of modern life. In combination, the various SM boast more than 1.5 billion users globally, with 70% of organisations using SM in their business, and 90% of these reporting related benefits (*Chui.M* et al., 2012).

Over the past several years, SM sites, such as LinkedIn, Facebook and Twitter, have drastically changed the social interaction landscape by creating new platforms for communication and information exchange. Organizations are striving to integrate information from various SM into their daily business practices in e.g. recruiting, sales and marketing (Sinclaire & Vogus, 2011). Yet, if organisations are to rely on data collected through SM sites, they need to understand the quality of information from these sites. Though there is concern with the quality of this information, understanding of relevant quality attributes and effective means of their assessment is limited. This has raised, for many researchers, the question of the quality of user generated content in SM (Baeza-Yates, 2009).

Given the unique characteristics of SM applications, such as: wide accessibility, permanence, global audience, recentness and ease of use (Agarwal & Yiliyasi, 2010; Baeza-Yates, 2009), information quality (IQ) in the context of SM is quite different from traditional IQ in information systems (IS) evaluation. While researchers have studied different IQ measurement and evaluation issues in SM (e.g. Baeza-Yates, 2009; Chai, Potdar, & Dillon, 2009; Yee Cheung, Ling, & Kuan, 2012), review of the literature (see below) indicates that the scope, perspectives and approach of these works is disparate, largely incomparable and lacking any common theoretical basis.

This paper reports on a preliminary work of a larger research study that aims to address the research question: "What is information quality in social media (IQnSM)?" We propose a new IQ conceptual model in the context of SM. The proposed IQ concept is multidimensional - with the three dimensions (i) intrinsic quality, (ii) representational quality and (iii) contextual quality, forming the overarching IQ construct.

The remainder of this paper will first present a brief literature review of prior research on social media and on information quality in social media. The research approach and methodology are presented in section three. Finally, the paper concludes in section four.

2   LITERATURE REVIEW

This section provides a very high level literature based introduction to Social media; definitions and its current trends. It then discusses the notion of Information Quality in social media; which becomes the basis for the proposed conceptual model presented in the next section.

2.1   Social Media

Social media have attracted both academics and practitioners, for their affordances and ease of reach. Kaplan and Haenlein (2010, p. 61) defined Social Media (SM) as a *"group of internet based applications that build on the ideological and technological foundation of web 2.0 and allow creation and exchange of user created contents"*. Chui (2012) classifies these different applications as: Blogs, Microblogs, Media sharing, Wikis, Social Network Sites, Social commerce, Social gaming, Shared work space, Q&A websites, Forum and Review websites. Each of these application groups has their own functionalities which make them appropriate for particular uses.

Many researchers have studied how organizations use SM applications and their associated benefits, including: enhancing government services (Bertot, Jaeger, & Hansen, 2012; Kavanaugh et al., 2011), marketing (Parent, Plangger, & Bal, 2011; Sinclaire & Vogus, 2011; Thackeray, Neiger, Hanson, &

McKenzie, 2008), customer relationships (Mangold & Faulds, 2009; Vuori, 2012) and health care services (Andersen, Medaglia, & Henriksen, 2012).

Kietzmann et al. (2011) proposed seven functional blocks to define functional traits of different SM activities. These functional blocks include: identity, conversations, sharing, presence, relationships, reputation, and groups. SM sites can be categorized according to their focus on certain of these blocks. Thus, enterprises can choose which SM to use based on the relevance of each block to their business. While researchers have tried to classify SM according to kind of applications and different features (Heidemann, Klier, & Probst, 2012; Kietzmann, et al., 2011), there is no commonly accepted consensus on how to classify them, given the wide variety of SM applications and their diverse uses[1].

2.2   Information Quality in Social Media

Information quality (IQ) in the context of SM is different compared to traditional IQ in information systems (IS) evaluation, given the distinctive characteristics of SM, such as: wide accessibility, permanence, global audience, recentness and ease of use (Agarwal & Yiliyasi, 2010; Baeza-Yates, 2009). Social media has extended knowledge creation boarders across organizational boundaries, therefore unlike traditional information systems, managers have no control to influence quality of the information obtained (Kane & Ransbotham, 2012)

Generally, IQ has been defined from both user (subjective) and data (objective) perspectives. From the users' point of view (Ge & Helfert, 2007), IQ is the extent to which the information fits for the intended use of the consumer (Chai, et al., 2009; Strong, Lee, & Wang, 1997). From the data view, data quality refers to technical issues (Madnick, Wang, Lee, & Zhu, 2009), such as meeting predefined and well-established requirements and specifications that ensure the information is free from deficiencies that may interfere with its use (Kahn, Strong, & Wang, 2002). In the SM context, Chai, Potdar and Dillon (2009) refer to IQ as content quality (CQ), which allows for identification and distinction of high quality content over poor quality content. Table 1 categorized IQ studies according to their goals to investigate to what extent these studies cover various applications of SM information. The Table presents a brief synthesis of IQ in SM research, classified around four main goals discerned from the set of studies, and comparing across study goals, contexts, dimensions and methods.

Goals	Context	Dimensions	Methods	Adopted from
Learning and education	Q&A websites, forum	Informativeness, Politeness, Completeness, Readability, Relevance, Conciseness, Truthfulness Level of Detail, Originality, Objectivity, Novelty, Usefulness, expertise, semantic content, amount of data	User survey, experts, developing automated NLP, automated text categorization, neural networks, text mining, information retrieval, natural language processing	(Kim, Shaw, Feng, Beal, & Hovy, 2006; Lui, Li, & Choy, 2007; McKlin, Harmon, Evans, & Jones, 2002; Z. Zhu, Bernhard, & Gurevych, 2009)
Information retrieval services and search engines	Q&A websites, forum, media sharing, Social media websites	Amount of data, description, discrimination, information diversity, semantic content , user relationships, usage statistic Accuracy, Believability, Objectivity, Reputation, Value-added, Relevancy, Timeliness, Completeness, Amount of data, Interpretability, Ease of understanding, Manipulability,	Using web crawlers to analyse data, stochastic gradient boosted trees Total data quality management methodology	(Agarwal & Yiliyasi, 2010; Agichtein, Castillo, Donato, Gionis, & Mishne, 2008; Figueiredo et al., 2013),(Chen & Tseng, 2011)

		Conciseness, Accessibility, Security		
Evaluating the knowledge	Q&A websites, customer review website	Accuracy, completeness, verifiability, content accuracy, suitability, accessibility, legal compliance, argument quality, source credibility, review consistency, review sidedness,	Content analysis, distortion analysis (Wu, Greene, Smyth, & Cunningham, 2010), survey analysis	(Fichman, 2011; Olsina, Sassano, & Mich, 2008; Yee Cheung, et al., 2012)
User contribution and ranking	Forum	User feedback, amount of data	Quality ratings by other users, developing prototype	(Chai, et al., 2009; Klamma et al., 2007)

Table 1.   Analysis of IQ in different SM applications

In summary, the scope, perspectives and approach to evaluating IQnSM studies, have varied. While prior literature offers several avenues to IQ measurement in SM, we observe the scope, perspectives and approach of these works is disparate, largely incomparable and lacking any common theoretical basis.

3   APPROACH AND METHODOLOGY

3.1   The Conceptual Model

Early research in SM mostly referred to IQ as content quality, cursorily treating user perceptions of quality as secondary (Chai, et al., 2009). (Knight & Bum, 2005) suggest however, that in the World Wide Web context, the quality of information cannot be assessed independent from its users. A widely cited definition of IQ in having this emphasis is *"fitness for use"* (Ge & Helfert, 2007; Strong, et al., 1997), which considers three main factors: user characteristics, task and environment (Knight & Bum, 2005; Price & Shanks, 2005). Consistent with this thinking, in this study IQ is defined as *the degree to which information is suitable for doing a specified task by a specific user, in a certain context*.

Also, consistent with prior work, (e.g. Knight & Bum, 2005; Strong, et al., 1997; Wand & Wang, 1996; Wang, Storey, & Firth, 1995), this study proceeds from the assumption that IQnSM is a multidimensional construct[2]. Wang and Strong (1997; 1996), discuss IQ in terms of usefulness and usability for consumers, and based on an inductive empirical study, propose a hierarchical framework for IQ consisting of four dimensions: Intrinsic, accessibility, contextual and representational. These dimensions have been used widely in IQ research and they are the most cited dimensions in IQ literature (Agarwal & Yiliyasi, 2010; Alkhattabi, Neagu, & Cullen, 2011; Chen & Tseng, 2011; Lee, Strong, Kahn, & Wang, 2002; Strong, et al., 1997; Stvilia, Gasser, Twidale, & Smith, 2007).

Lee, Strong et al.,(2002) have empirically demonstrated that these dimensions provide comprehensive coverage of a multidimensional IQ construct. On this basis, the current study commences with these dimensions, to study IQnSM. However, Agarwal and Yiliyasiv (2010) found in their study that social media IQ problems don't map to any accessibility measures[3]. Moreover, the bottom-up approach used in this study to derive measures from previous IQ in SM studies (as described below), further evidences the lesser relevance of accessibility in the SM context. As a result, three dimensions are defined for IQ in this study: intrinsic quality, representational quality and contextual quality; these three forming the overarching IQ construct. Figure 1 depicts the study's IQnSM conceptual model (see greyed rows of Table 2 for definitions of the model's dimensions).

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[2] More details on the applications of multidimensional constructs can be found in Rabaa'i and Gable (2012).

[3] Accessibility measures are accessibility and access security (Wang & Strong, 1996) and public accessibility is defined as a social media characteristic (Agarwal & Yiliyasi, 2010), therefore accessibility is not considered as an IQ problem and dimension in social media. However, Wang and Strong (1996) declared that there is little difference between treating accessibility as a an IQ dimension or as a separate construct.

The proposed IQnSM conceptual model is an example of what Gregor (2006) might describe as Analytic (or Type 1) theory, the most basic type of theory, necessary for the development of all of the other types of theory. In building a classification model, framework or taxonomy, the analytic theory is an important initial step towards building theory and deriving deeper understanding of a phenomena interest. *"Analytic theories describe or classify specific dimensions or characteristics of individuals, groups, situations, or events by summarizing the commonalities found in discrete observations"* (Gregor, 2006: 623)[4].
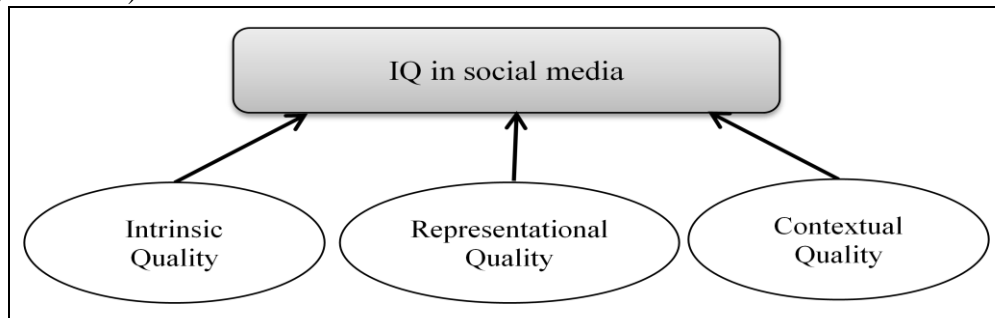

Figure 1.   IQnSM Conceptual Model.

At this stage, the conceptual model is operationalized based on the primarily review of relevant literature. Operationalization entails a bottom-up, inductive review of the relevant literature for salient dimension and measures which collectively represent all the relevant aspects of the construct of interest (G. G. Gable & D. Sedera, 2009; G. G. Gable, D. Sedera, & T. Chan, 2008). The first measures' list was derived from previous studies on data quality and information quality in SM. To ensure elimination of redundant measures, mutual exclusivity and the parsimony of the measures, the guideline proposed by Gable et al.,(2008) was adopted in the synthesisation process. Table 2 presents selected measures and dimensions and relevant citations.

Intrinsic IQ: Conformance between data and real world view (Strong, et al., 1997; Wand & Wang, 1996).		
Measure	**Description**	**Adopted in social media context by**
Completeness	Extent to which the information is not missing and is of sufficient breadth and depth.	(Chai, et al., 2009; Fichman, 2011; Olsina, et al., 2008; Z. Zhu, et al., 2009)
Originality	How much information are not copied from other sources.	(Z. Zhu, et al., 2009)
Objectivity	Extent to which information is unbiased, unprejudiced.	(Chai, et al., 2009; McKlin, et al., 2002; Olsina, et al., 2008; Yee Cheung, et al., 2012; Z. Zhu, et al., 2009)
Novelty	If the information is innovative.	(Z. Zhu, et al., 2009)
Accuracy	The degree to which data are correct, reliable and free of errors and is current.	(Chai, et al., 2009; Fichman, 2011; Yee Cheung, et al., 2012)
Intrinsic content quality	It includes semantic, syntactic, grammar, punctuation and other attributes of the text.	(Agichtein, et al., 2008; Fichman, 2011; Figueiredo, et al., 2013; Olsina, et al., 2008)
Verifiability	The degree to which information can be checked for correctness.	(Fichman, 2011; Naumann & Rolker, 2000; Olsina, et al., 2008)
Reliability	Extent to which information is correct and reliable.	(Chai, et al., 2009; McKlin, et al., 2002)
Contextual Information Quality: The degree to which data is suitable and worthwhile in a given context (Price & Shanks, 2005; Strong, et al., 1997).		
Measure	**Description**	**Adopted from**
Amount of data	Extent to which the quality or amount of data is appropriate.	(Agichtein, et al., 2008; Chai, et al., 2009; Figueiredo, et al., 2013; Kim, et al., 2006; Klamma, et al., 2007; Lui, et al., 2007)

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[4] Analytic theory seeks to answer the "What is" question as opposed to explaining causality or attempting predictive generalisations is the essence of the approach (Gregor, 2006).

Relevancy	Extent to which information is applicable for task in hand.	(Chai, et al., 2009; Olsina, et al., 2008; Z. Zhu, et al., 2009)
Credibility	Believability or the characteristic that makes people believe and trust someone or something.	(Agichtein, et al., 2008; Chai, et al., 2009; Naumann & Rolker, 2000; Nussbaum, Hartley, Sinatra, Reynolds, & Bendixen, 2002; Olsina, et al., 2008; Yee Cheung, et al., 2012; X. Zhu & Gauch, 2000)
User feedback	Users provides either an implicit (e.g. dwell time reading content) or explicit (e.g. provides a rating) quality evaluation of the content. Their quality evaluation may include the assessment of any or combination of any CQ dimensions.	(Agichtein, et al., 2008; Chai, Hayati, Potdar, Wu, & Talevski, 2010; Chai, et al., 2009; Kim, et al., 2006; Klamma, et al., 2007)
Timeliness	Extent to which information is sufficiently up-to-date for the task in hand.	(Chai, et al., 2009; Naumann & Rolker, 2000)
Understand ability	Extent to which data is clear without ambiguity and easily comprehended.	(Chai, et al., 2009)
Value added	Extent to which information is beneficial and provides advantages from its use.	(Chai, et al., 2009; McKlin, et al., 2002; Naumann & Rolker, 2000; Olsina, et al., 2008)
Representational IQ: Information presentation that is suitable for all users (with or without disabilities) taking into account both technical and representational aspects (Olsina, et al., 2008).		
Measure	**Description**	**Adopted from**
Conciseness	Extent that information presentation matches with information and is compact represented without being overwhelming, granularity, appropriateness	(Naumann & Rolker, 2000; Olsina, et al., 2008; Z. Zhu, et al., 2009)
Consistency	The same format and compatible with previous data	(Olsina, et al., 2008; Yee Cheung, et al., 2012)
Accessibility	Extent to which information is available or easily and quickly retrievable	(Olsina, et al., 2008)

Table 2.   IQnSM Model's proposed dimensions and indicators

3.2   Specifying the IQ Model

Petter, Straub and Rai (2007) cast doubt on the validity of many mainstream constructs employed in IS research over the past three decades. Petter et al. (2007) criticise the almost universal conceptualisation and validation of these constructs as *reflective* when in many studies the measures appear to have been implicitly operationalised as *formative*. Other authors, like Diamantopoulos and Winklhofer (2001) and Jarvis, MacKenzie, & Podsakoff (2003), support this view[5]. Petter et al. (2007) suggest that there is a significant threat of miss-specifying and validating constructs as "reflective" that, on closer scrutiny, are, in fact, "formative". Misspecification of constructs as formative or reflective results in measurement error, which impacts the structural model, thereby increasing the potential for type I and type II errors (G. Gable & D. Sedera, 2009; G. Gable, D. Sedera, & T. Chan, 2008).

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[5] There has been an ongoing debate on the characteristics of both model types and particularly on the limitations of formative indicators (e.g. Ali, Tate, Rabaa'i, & Zhang, 2012; Bagozzi, 2007; Bollen, 2007; Edwards, 2011; Hardin, Chang, Fuller, & Torkzadeh, 2011; Howell, Breivik, & Wilcox, 2007a, 2007b; Wilcox, Howell, & Breivik, 2008). A comprehensive overview of the application of formative measurement models has been provided by Diamantopoulos, Riefler, and Roth (2008).

How a multidimensional construct is operationalized may influence analytical results of research models (e.g. G. Gable & D. Sedera, 2009; Jarvis, et al., 2003; Petter, et al., 2007; Polites, Roberts, & Thatcher, 2011; Vlachos & Theotokis, 2009). Therefore, it is essential to carefully conceptualise the relationship from the first-order dimensions and their indicators and from lower-order dimensions to the higher-order construct (Polites, et al., 2011). The IQ construct in SM proposed in this study is conceptualised as a formative first-order, formative second-order model (i.e. Type IV in Jarvis et al. (2003) specification of multidimensional constructs).

3.3   The Research Design

Consistent with MacKenzie and House (1979), McGrath (1979) and Burton-Jones and Straub (2006), this study follows the same guidelines followed by Gable et al. (2008) to hypothesise and validate a measurement model. These guidelines suggest a definition phase followed by a research cycle that involves two main phases: an exploratory phase and a confirmatory phase. The exploratory phase assists in hypothesising a measurement model, while the confirmatory phase assists in validating the hypothesised measurement model against newly gathered data. The overall research design is depicted in Figure 2. This study is to be conducted in three phases, including: the Definition Phase, the Exploratory Phase, and the Confirmatory Phase.
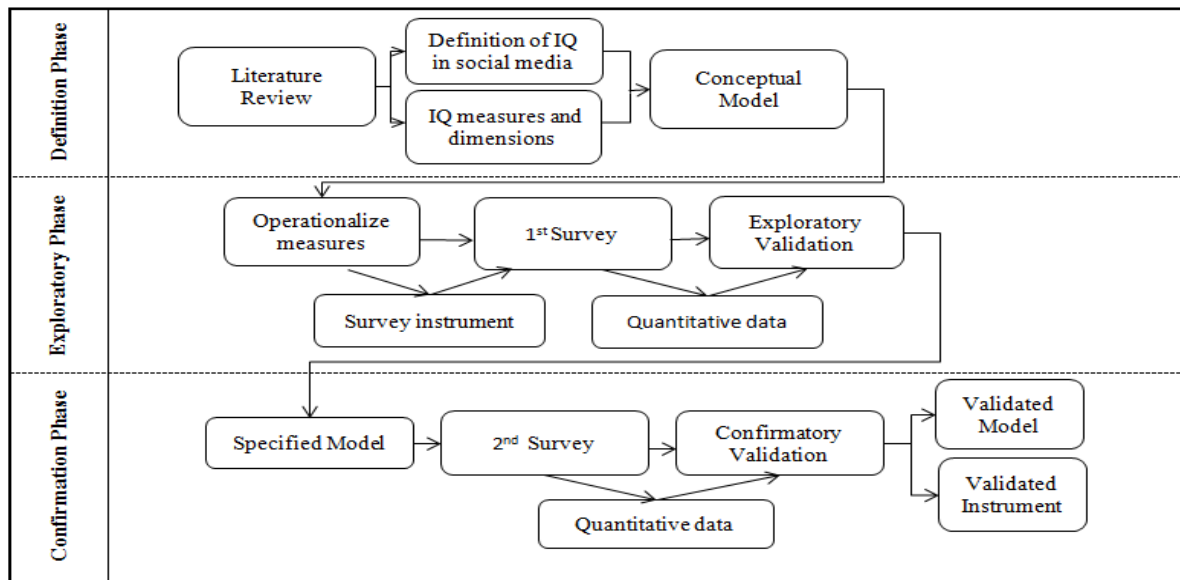

Figure 2.   The Overall Research Design.

3.3.1   Definition Phase

The definition phase, similar to the definition stage of Burton-Jones (2006), aims to define the unique characteristics of IQnSM and derive the conceptual model of this study by identifying measures and dimensions of IQ from previous studies. To gain a holistic view of IQ in SM context, this study critically examined prior approaches for evaluating IQnSM. It also investigated other IQ measurement models and frameworks and the distinguishing characteristics and applications of SM.

3.3.2   Exploratory Phase

Based on the IQ definition of this study, an empirical approach will be used to identify IQ attributes, in the SM context, by analysing user perceptions and how they assess whether the information fits their use or not.

This phase includes a quantitative exploratory survey. The conceptual model derived from the definition phase will be operationalized in a survey instrument. This phase is akin to the selection

stage of Burton-Jones (2006) approach, which aims to ensure the appropriate selection of measures and dimensions and the model completeness. This phase will ensure that measures and dimensions derived from the definition phase are not only conceptually but empirically relevant in the SM context. According to Gable et al. (2008), specifying the model at this stage involves eliminating and consolidating measures and the introduction of new measures. Jarvis et al. (2003) procedures, for achieving identification of formative indicators, will also be followed.

3.3.3   Confirmatory Phase

To complete the research cycle proposed by MacKenzie and House (1979), McGrath (1979) and extended by Gable et al. (2008), the confirmatory phase aims to further validate the model and instrument deriving from the exploratory phase, and to further illustrate the mutual exclusivity and additive of the dimensions and measures in the model using confirmatory data analysis techniques and new data. A close-ended quantitative survey will be employed in this phase to validate the measurement model. In order to establish internal validity for a "formative construct", this study will follow formative construct validation guidelines as identified in the literature (e.g. Andreev, Heart, Maoz, & Pliskin, 2009; Götz, Liehr-Gobbers, & Krafft, 2010; Henseler, Ringle, & Sinkovics, 2009; Petter, et al., 2007; Urbach & Ahlemann, 2010).

4   SUMMARY AND RESEARCH OUTLOOK

This research in progress aims to use systematic methods to conceptualize IQ as a multi-dimensional formative construct in SM context. The model is intended to have the characteristics of analytic theory and the development procedure of a formative construct. An extensive literature review of SM and IQ was conducted. The aim of this review was to identify (1) the gaps in prior social media and information quality studies and (2) a theoretical approach for conceptualizing IQ. The approach for conceptualizing IQnSM, in this study, is based on the Burton-Jones and Straub (2006) re-conceptualization approach extended by Gable et al. (2008). This approach tries to derive most appropriate metrics for IQ measurement based on the context and users' perception.

At present, the definition phase of this study has been completed, where the purpose was to expose underlying measures and dimensions. Previous studies have been reviewed and a comprehensive list of IQ measures in SM was derived. The suggested IQnSM conceptual model consists of three main dimensions: intrinsic quality, content quality and representational quality.

As shown in the study design (Figure 2), the study will be extended through a series of planned techniques to overcome limitations of prior research. The dimensions and measures identified here will be further tested through the exploratory survey to investigate the applicability and the completeness of the dimensions and measures and specifying new measures or dimensions which are not identified but possibly significant in the environment. The confirmation survey will further validate the model and instrument deriving from the exploratory phase.

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