e-survey: Modernisation in data collection of short-term economic survey

Lee Chee You[1]; Ab Rahman Mohamad[2]; Rozita binti Misran[3]; Halina binti Abdul Hamid[4]

[1] Principal Assistant Director, Head of the Construction, Energy and Utilities Section, Industrial Production and Construction Statistics Division, Department of Statistics Malaysia, lcyou@dosm.gov.my

[2] Director, Industrial Production and Construction Statistics Division, Department of Statistics Malaysia, rahman.mohamad@dosm.gov.my

[3] Deputy Director, Industrial Production and Construction Statistics Division, Department of Statistics Malaysia, rozita@dosm.gov.my

[4] Principal Assistant Director, Head of the Annual Manufacturing and Mining Section, Industrial Production and Construction Statistics Division, Department of Statistics Malaysia, halina@dosm.gov.my

Abstract:
Response rates, data quality and data confidentiality were identified as the critical success factors in Malaysia's short-term economic survey. According to the facts, Department of statistics Malaysia (DOSM) has outlined a few initiatives in its strategic plan (2011-2015) and transformation plan (2016-2020) over the past ten years to improve and modernise the data collection, processing and dissemination methods. This paper presents the application of e-survey in raising response rate, enhance data quality and managing data confidentiality in DOSM short-term economic survey, i.e monthly manufacturing survey (MM) and quarterly construction survey (QCS). The advantages and limitations of MM and QCS e-survey in this content will be discussed. An empirical study shown the response rate of the both short-term surveys improved over the years and questionnaire submission through e-survey becoming more encouraging lately. Comparison of data received by various survey modes also indicated that e-survey provides the best prospects in reducing non-sampling error and protecting data against unintentional.

Keywords: e-survey, response, confidential, modernisation, establishment

1. Introduction:

The Department of Statistics Malaysia is the government agency responsible to collect, interpret and disseminate quality, user-oriented and timely statistics in monitoring the national economic performance and social development. Survey is the main technique in the Department to gather primary data from a targeted population. Face to face interview, postal, telephone, facsimile and email are the popular conventional method of data collection in Malaysia's short-term economic survey before 2010.

e-survey have become increasingly popular in the field of data collection years back because it can gain information faster, involve lower costs and better data quality than the conventional method (Schmidt 1997; Couper 2000; Sohn 2001). Realising that it could also benefit both the respondents and the Department, especially in handling the confidentiality of information provided by respondents, the Department has outlined a few initiatives in its strategic plan (2011-2015) and transformation plan (2016-2020) over the past ten years to improve and modernising its statistical system.

The number of broadband subscriptions in Malaysia registered 5.7 million in 2011. The number continues to grow to 30.8 million in 2015 and 39.4 million in 2018 (Malaysian Communications and Multimedia Commission, 2012, 2016 & 2019). In 2015, 67.7 per cent of the establishments in the

construction sector used internet in their business. The percentage increased to 85.6 per cent in 2017 (DOSM, 2017 & 2019). The rapid advances in computer and internet usage clearly offer a wealth of potential advantages for the Department to introduce QCS e-survey in 2013. The response rates of QCS and MM e-survey are expected to rise in the future as the establishments becoming more "digital natives".

1.1 Objective of Study

The purpose of this study is to present the strategies adopted and adapted from the literature to improve current practises in raising response rate, enhance data quality and managing data confidentiality of MM and QCS e-survey. Finally, the current performance of MM and QCS e-survey will be provided and discussed.

1.2 Literature Review

e-survey in DOSM's short-term economic survey is one alternative among many options provided for respondents to return the completed questionnaire because the Department takes time to promote this new method and respondents need time adapt themselves to the means of providing information to the Department. This will involve additional cost of replicating systems to accommodate both paper and electronic returns in the early stages but will reduce operating costs in the long run. Couper (2000) stated in his study that this approach is widely used in panel survey of establishment where the same respondent will be contacted for information over a long period of time. However, providing a simultaneous choice of return the completed questionnaire does not improve response rates (Millar & Dillman, 2011).

Existing literature reports that e-survey response rate is usually lower than conventional methods, especially compared with postal (Crawford et al., 2001; Fricker & Schonlau, 2002; Groves et al., 2009). However, Kiernan et al. (2005) found in her experimental study, e-survey can be as effective as postal survey in term of response rate and data quality. The contrary results may due to the different strategies in conducting e-survey. Therefore, understanding the reason people choosing e-survey increasingly important to boost e-survey response rate.

Keusch (2015) summarises an empirical finding on 23 factors influencing participation behaviour in e-survey (Table 1). The findings provide a guidance to the Department to increase participation in e-survey.

Table 1: Summary of empirical findings on factors influencing participation behaviour in e-survey

No	Factor & Finding
	Societal-level factors
1.	**Survey fatigue**: More e-survey invitations lead to lower participation
2.	**Culture**: Stronger orientation toward collectivism increases participation
	Sample person characteristics
3.	**Gender**: Females are more likely to participate than males
4.	**Race/ ethnicity**: Blacks are less likely to participate than non-blacks
5.	**Population**: Mixed findings for student vs. non-student populations
6.	**Personality**: Web survey respondents show more social engagement, investigative personality, openness to experience, need for cognition, curiosity, agreeableness, and Web innovativeness and less artistic personality, enterprise personality, and conscientiousness than non-respondents
7.	**Personal topic interest**: Personal interest in survey topic influences participation decision in cross sectional Web surveys
8.	**Attitudes towards survey research**: Positive attitudes toward surveys in general lead to higher Web survey participation
9.	**Previous participation behaviour**: Individuals show consistency in (non)participation behaviour across several waves of Web surveys and in online panels

	Survey design attributes
10.	**Contact mode**: Mixed results for invitations sent via mail vs. e-mail; samples drawn from online panels more likely to participate than samples drawn from other online sources
11.	**Prenotification**: Prenotification via offline media enhances response rates in Web surveys; mixed findings for effect of e-mail prenotifications
12.	**Timing of invitation**: Invitations sent on Wednesday morning yield highest response rates; invitations sent on weekend are not immediately returned; higher Web survey participation in winter
13.	**Sender/sponsor**: Relationship between invitation sender and recipient, familiarity of sponsor, trust in sponsor, reputation of sponsor and survey provider, and authority of sender influence participation decision; mixed findings for academic vs. non-academic sender/sponsor; female senders increase participation in male populations
14.	**Subject line**: Promoting incentives and references to survey have negative effect while appeals for help and referencing an authority figure have positive effect on participation
15.	**Invitation message**: Mixed findings for personalization of invitation, length of message, and whether deadline for participation is stated; having to type in password upon questionnaire access reduces willingness to participate
16.	**Reminder**: Sending e-mail reminders increases participation but reminders reach an early saturation point; postal reminders do not increase participation in Web surveys
	Incentives
17.	**Unconditional incentives**: Unconditional incentives increases participation; monetary incentives sent via PayPal do not affect participation
18.	**Conditional incentives**: Mixed findings for incentives conditional upon finishing Web survey
19.	**Survey results**: Offering survey results as incentives does not increase participation
	Questionnaire design
20.	**Paging vs. scrolling**: No difference in participation between paging and scrolling format
21.	**Progress indicator**: Static progress indicators have no or negative effect on survey completion; fast-to-slow progress indicators decrease & slow-to-fast progress indicators increase break-offs
22.	**Questionnaire layout**: Layout features of the Web questionnaire have no effect on survey completion; java applets and higher loading times lower likelihood of participation
23.	**Questionnaire length**: Actual length and announced length of Web questionnaire negatively correlated with participation behaviour

Jamaliah (2012) and Habsah (2014) have researched the advantages and limitations of DOSM's e-survey, described the development of MM's e-survey in 2009 and discussed the implementation performance until 2013. Their study shows that the number of establishments providing information through e-survey is encouraging. This indicates that the MM e-survey implementation strategy is effective and can serve as a benchmark for other short-term economic surveys in the Department. Among strategies have been introduced to increase e-survey participation:

(i) Communicating (call, email or visit) with all existing respondents to promote and follow up with the invitation to participate in e-survey;
(ii) Organising session with respondents to inform them the usage of e-survey and hands-on;
(iii) Sending pamphlets and brochures on e-survey to establishments with e-mail address;
(iv) Determine target responds;
(v) Assist respondents in registration as portal user; and
(vi) Sharing of findings on industries related to respondents.

The higher response in e-survey means more questions answered and fewer information omission, leading to a better survey quality (Hoonakker & Carayon, 2009). A smaller number of questions that respondents did not answer would also reduce the non-sampling error in a survey. Likewise, e-survey design can prevent respondents from not answering desirable questions in a questionnaire and warm on illogical information (Jansen et al., 2007). Previous studies have shown that the quality of e-survey data

can be achieved with good design in the early stages and deliver higher response rates. Dillman (2000) suggested that with careful attention to design, response rates of 70 per cent could be produced consistently.

Comparing the advantages and disadvantages of e-survey prepared by Hoonakker & Carayon (2009), Kalantari et al. (2011) and Bakla et al. (2013), data security is the common limitations of e-survey. If respondents do not feel secure about their data, they might partially respond to the survey by skipping sensitive questions or might choose not to respond by e-survey. It is the National Statistical Office (NSO) responsibility to protect individual/establishments data which are collected for statistical purposes only. It is certainly not ethical to use these data for purposes other than statistics. Data protection can be achieved through data encryption and protect the data collected in a secure medium which is not connected to the internet to avoid data theft.

2. Methodology:

MM and QCS surveys in Malaysia were conducted through National Enterprise Web Statistical System (NEWSS). The system was developed in 2008 to integrate the sampling frame, data collection, processing, analysis, dissemination and provide on demand report. The system also provides a platform for the Department to implement MM e-survey starting in 2009 and QCS e-survey in 2013.

The process flow of e-survey in NEWSS is as described by Habsah (2014) and the steps in the implementation of the MM e-survey are clearly explained by Jamaliah (2012). The implementation of QCS e-survey shares the same platform and implementation steps with MM e-survey. In addition, the first 16 factors listed in table one was adapted and applied during 2014-2019.

3. Result and Discussion:

The initiative to offer MM e-survey in 2009 received great response from the establishments and contributed to the increase in survey response. The average number of completed questionnaire received increased to 88.7 per cent compared to 73.2 per cent in 2009 (Chart 1). The average of e-survey response rates has increased tremendously from 21.5 per cent in 2015 to 41.5 per cent in 2019. The slower response rate in 2014 and 2015 was contributed by the changing concept of sampling method in selection of companies which some of the e-survey's companies whom had responded previously were not selected in the sample.

Chart 1: Average Response Rate and Contribution of MM e-survey, 2009-2109

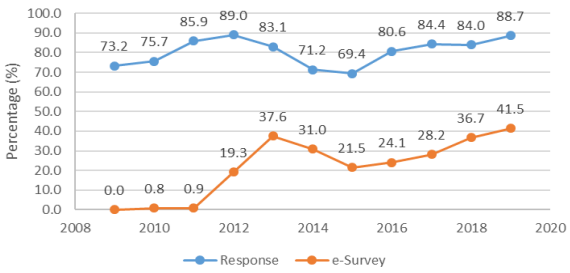
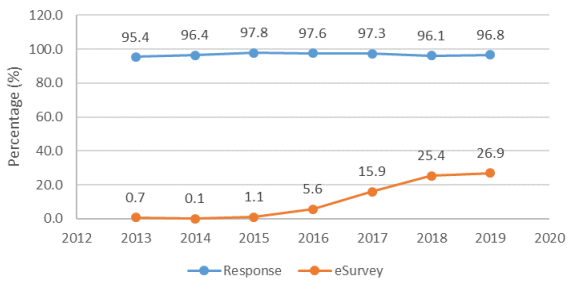


Chart 2: Average Response Rate and Contribution of QCS e-survey, 2013-2019



Applying the same strategies, QCS gained encouraging response in e-survey. By 2019, more than one-fourth of QCS questionnaire received via e-survey (Chart 2). QCS e-survey is increasingly popular to construction companies because it is given a longer period than other methods to qualify for CCD points in returns. Contractor Continuous Development (CCD) is a program designed to ensure contractors registered with Construction Industry Development Board (CIDB) are continually well-informed and knowledgeable. CCD point is acquired for contractors to renew their registration. Therefore, there has been no significant improvement in QCS response rate by introducing e-survey in construction industries. However, e-survey offer a more convenient and secure way for respondents to return the completed questionnaire to the Department and data received is better in quality.

In the early stages of implementing e-survey, the Department spent about three years to promote and educate respondents to use the system. At the same time, the respondents have provided suggestions for improvement and any identified system weaknesses were redesigned. This results the number of e-survey return increased after that period and respondents' complaints decreased significantly after 3 years (Chart 3 & Chart 4). The total number of system bugs identified for QCS e-survey was significantly higher than MM e-survey at the development stage and decreased significantly as both e-survey sharing the same platform and experienced IT personnel.

Chart 3: MM e-survey Response Rate and System Bug & Change Request, 2009-2019

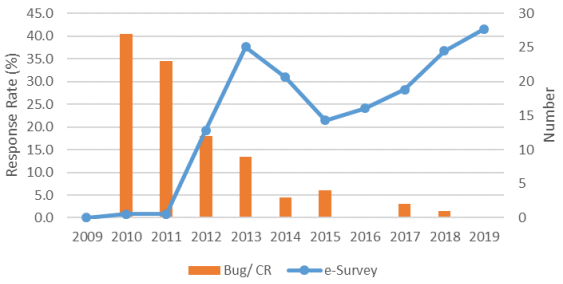
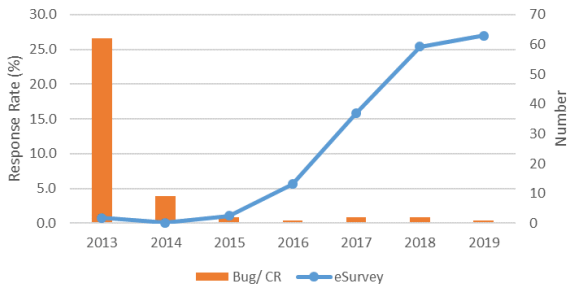


Chart 4: QCS e-survey Response Rate and System Bug & Change Request, 2013-2019



The contribution of completed questionnaire return by facsimile and postal decreased significantly since the implementation of e-survey for MM survey and QCS. In MM Survey, the facsimile returns declined 50.5 percentage points from 2009 to 6.2 per cent in 2019. Meanwhile, the postal returns contracted 5.7 percentage points to record 0.6 percent in the same period (Chart 5). The QCS returns via facsimile and postal only contributed 3.0 per cent and 1.3 percent respectively in 2019, compared with 24.8 per cent and 5.5 per cent in the last 6 years (Chart 6).

The main reasons of reduction of the use of facsimile and postal services by respondent were uncertainties, data quality and confidentiality issues. Postal service may be delayed and misplaced during the delivery. Meanwhile, the quality of the facsimile machine print can lead to poor readability and received follow up calls from the Department. The additional cost to resend questionnaire and ongoing inquiries are not favourable to respondents. This made respondents more likely to provide information electronically lately and contributing to the increase in receiving questionnaires by email and e-survey.

Receiving information over the phone, especially smartphones are increasingly important as data is needed before the survey deadline and respondents are working in the field. Telephone contributed to 16.0 per cent and 32.3 per cent respectively of the total responses for MM survey and QCS in 2019.

Chart 5: Contribution of MM Survey Response by Mode, 2009-2019

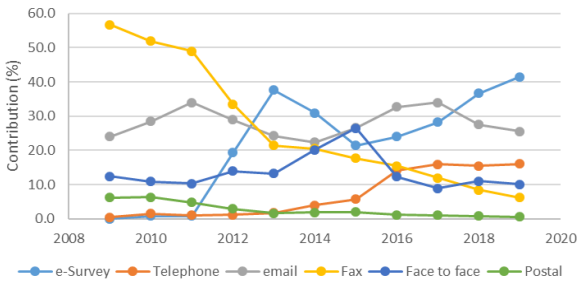
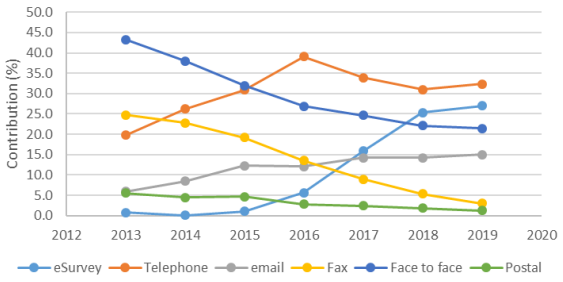


Chart 6: Contribution of QCS Response by Mode, 2013-2019



High response rates in MM and QCS provide limited space for e-survey to further improving response rates. The further increase in the e-survey must contribute to the better quality and security of the data received. However, facsimile and postal responses have been minimal and telephone is needed for respondents who are not always in the office. Therefore, face-to-face cases is the best to emphasize in

using the e-survey because field enumerator are able meet with them regularly. Respondents using email may also be considered because they are known to have the email required to register e-survey. According to the latest QCS and MM e-survey user profiles, establishments in the Residential sub-sector (39.2%) and the Manufacture of crude palm oil sub-sector (36.3%) used the most e-survey (Chart 7 & Chart 8). Establishments in these two sub-sectors need to be emphasized to use e-survey, especially those newly selected in the sample. In QCS, females are more likely to participate e-survey than male but races did not show any effect on e-survey participation rates.

Chart 7: Contribution of QCS e-survey by Sub-sector

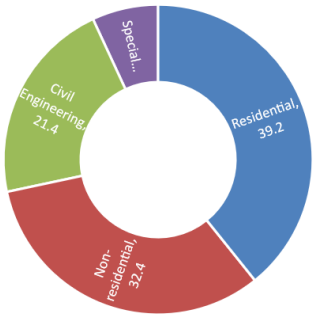
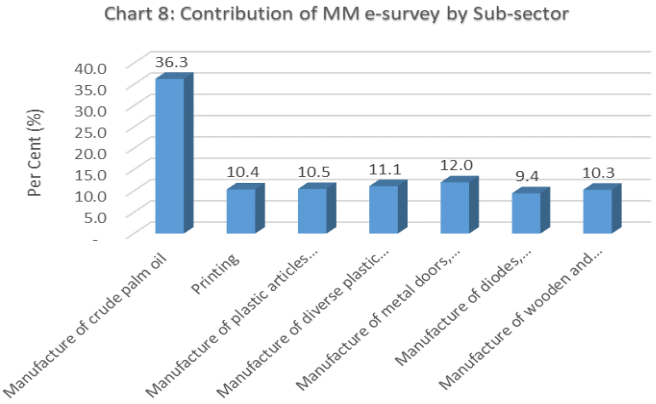


Chart 8: Contribution of MM e-survey by Sub-sector



MM and QCS e-survey design has required all the important fields to be filled. information and logic checks are performed before being transmitted through the system. Respondents will be informed of any detected outliers and asked to provide justification. Therefore, the percentage of completeness is higher than other methods.

Department apply hypertext transfer protocol secure (HTTPS) to protect respondent's connection to e-survey portal. Data sent using HTTPS is encrypted and not able to be modified or corrupted during transfer. Since 2009, there is no any information return by e-survey was lost or unreadable.

4. Conclusion and Recommendations:

Increased computer ownership and access to internet networks by establishment has opened opportunities for the Departments to collect information quickly, effectively and securely from e-survey. This innovative method benefits both the department and the respondents. The implementation strategies/ SOP of e-survey prepared and used (Jamaliah, 2012) are still relevant today. The system and strategies are mostly match with the research review and taken care of the factors influencing participation behaviour in e-survey.

However, measures to identify potential users are still unclear and increasingly important. Analyse of big data based on existing e-survey user profiles are expected to be helpful in increasing the possibility of e-survey cases for establishment new to the Department survey.

As at end of 2017, the usage of computer and internet by establishment in Malaysia is 78.9 per cent and 73.3 per cent respectively. it is opening the opportunity for e-survey to be available in next economic Census.

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