Conceptual Framework for Economic Data Report Revisions

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1 Introduction

This paper is intended as a scoping analysis to support ongoing SSPT assessment and planning of a process for developing recommendations to the Council regarding EDR program revisions. At its May, 2019 meeting, the SSPT responded to Council tasking regarding the EDR program by reviewing the discussion paper 'Alaska Region Economic Data Reporting Programs'[1] and identifying broad issues to be addressed in future analyses, distinguishing between '1) issues that are straightforward and can be addressed in the short term; and 2) issues that require a data- collection framework and can only be addressed in the long term'. This paper provides an initial synthesis of the Council's previously stated purpose and needs regarding social and economic information, and its analytical processes and decision outcomes over the course of EDR program development. This initial synthesis reveals considerable confusion regarding fundamental conceptual issues, objectives, and decision variables. As such, the paper begins with an attempt to clarify conceptual issues, the multi-faceted problem the SSPT and Council are trying to solve, and outline a decision framework for developing and evaluating alternatives for social and economic data collections which address Council needs and priorities. The paper concludes with a brief outline of the scope of best practice considerations related to survey design, information management, and social and economic analyses, and a few examples of economic data collection efforts and analytical applications comparable to the EDR program that might serve as working models toward which the EDR program might be developed.

2 Council, SSC, and SSPT minutes

In response to its review of the discussion paper Alaska Region Economic Data Reporting Programs, the Council approved a motion[2] initiating work to address two sets of issues regarding revising elements of the current EDR program. Issue 1 of the motion initiates an analysis of alternatives for FMP and regulatory amendments to a) revise procedural requirements associated with EDR data verification and confidential data disclosure protection, and b) to revise or remove Gulf of Alaska Groundfish Trawl EDR requirements that the Council developed in 2013 as an initial part of the GOA trawl catch share program that was then in development (suspended in December, 2016). The following discussion paper does not address Issue 1 elements of the Council's motion, which are the subject of analyses in development by

[1] Item D5, April, 2019 meeting of the North Pacific Fishery Management Council. Available at: https://meetings.npfmc.org/CommentReview/DownloadFile?p=1f542e61-0dfc-465e-92eb-f7f00ab70edc.pdf&fileName=D5%20EDR%20Discussion%20Paper.pdf

[2] https://meetings.npfmc.org/CommentReview/DownloadFile?p=695c22f1-5139-4ea6-a7c4-7c92b5428cd2.pdf&fileName=D5%20MOTION.pdf

Council and NMFS staff. This document is focused on Issue 2 of the motion, which is concerned with assessing and potentially revising the analytical objectives of the current EDR program and the data content of the four management program-specific data collections that currently comprise the EDR program. Issue 2 of the motion states:

> *Issue 2 – Review Current EDR Programs*
>
> *The Council recommends that staff undertake a process to propose revisions to the current Economic Data Reporting (EDR) programs, including the GOA trawl EDR. Recommended revisions should consider:*
>
> *1) The Council's previously stated needs for economic and social science information and the utility of data for analysis of impacts of Council actions and for research that provides a better understanding of the impacts of future actions;*
>
> *2) Data that are also collected in other data collection programs (such as the Commercial Operators Annual Reports) which may be duplicative and unnecessary to collect as a part of the EDRs;*
>
> *3) Alternatives for creating more consistency across EDRs to increase the utility of economic and social information in analyses of Council actions and management program reviews and to support research that provides a better understanding of the impacts of future actions; and*
>
> *4) Tradeoffs between aggregation of elements used to reduce reporting burden by streamlining collection and the effects of the loss of detail from that aggregation on the accuracy of resulting analyses.*
>
> *Staff should consult the Social Science Planning Team, (SSPT) submitters, and data users of the various EDR programs in developing these recommendations. The recommendations should be developed to reduce burden and improve the practical utility of data collected through the elimination of duplicative data elements and elements of little analytical utility and the modification of specific data elements to achieve greater consistency across EDR programs. The recommendations should also consider the benefits and costs of implementing more standardized EDRs with appropriate variations to address different operation and gear types.*
>
> *Staff should address the SSC's April 2019 comments on the EDR discussion paper to the extent practicable.*
>
> *In addition, the Council requests the SSPT review the EDR discussion paper and provide recommendations to the Council at its June 2019 meeting about which aspects of review of the current EDRs are within the scope and capability of the SSPT to undertake. The Council requests the SSPT develop a plan for conducting this review. This plan should include opportunities for public input during the review, the work products that would be needed from staff to conduct the review, and a projected timeline for the review.*

The SSC's minutes from discussion of the EDR Discussion Paper during the April, 2019 meeting reflected similar concerns regarding minimizing reporting burden and improving the analytical utility of data and information produced by the EDR program. The SSC emphasized the importance of the EDR program in the context of National Standards (NS), including NS2 provisions regarding scientific information and application of best available science, as well as social and economic management objectives under National Standards 4, 5 and 8. The SSC also provided the following recommendations regarding issues that should be included in the development of EDR program revisions:

- NMFS should work to clarify the goals of the EDR programs so that industry perceives minimal disincentives to reveal management-relevant financial information to the federal government.
- Specifically stating lessons learned in the North Pacific historical review.
- Drawing on lessons learned from other regions, most of which have now eclipsed the North Pacific in gathering useful EDR data, especially on vessel and processing costs.
- Revisiting the quinquennial program reviews to identify questions that have been raised but were not adequately addressed by EDR information.

The Council motion and SSC recommendations encompass a broad scope of issues and potential revisions to the current EDR program. The motion identifies multiple objectives for developing recommendations for EDR revisions: reduce reporting burden, improve consistency, and improve analytical utility and alignment of information collected in the EDR with the Council's previously stated information needs.

At the most narrow in scope, potential EDR revisions would be limited to modification and/or elimination of a small number of discrete data elements reported in one or more of the 9 different EDR forms currently in use. Modification of individual data elements would be intended to improve their consistency and analytical utility, and/or reduce reporting burden. EDR data elements that are to some degree duplicative of information available from another source would be assessed regarding their analytical utility compared to the alternate source, and could be recommended for elimination if the gain in analytical utility does not justify the associated reporting burden.

At the other extreme, the motion calls for consideration of a much broader scope of potential revisions, up to a comprehensive redesign of the EDR program and development of a standardized framework of analytical objectives and metrics, EDR questionnaires and data elements, and appropriate data quality standards. The near-term goals of developing such a framework would be to improve the consistency of data collected in the EDR program and thereby improve the utility of the data to support analyses of Council and NMFS management decisions regarding the industry sectors and management programs currently subject to EDR requirements. A longer term goal would be to establish a common framework for considering expanded data collections (as part of the EDR program or separately) to provide a more consistent base of social and economic information available across all fisheries and sectors defined within the Council's FMPs. This would have the added benefit of increasing the utility of any existing data collections by improving the efficiency of staff analysts to create and interpret standardized performance metrics for the Council.

<u>SSPT recommendations</u>

At its May, 2019 meeting, the SSPT reviewed the EDR Discussion Paper. In its report to the Council (presented at the June, 2019 Council meeting), the SSPT identified a range of issues and concerns regarding limitations of EDR data, both in regard to the utility of data currently collected in the program as well as general information gaps that could potentially be addressed in future EDR program development. The SSPT acknowledged its role in supporting

the Council's development of the EDR program "particularly as an advisory body and for providing a framework for how proposed EDR revisions could be constructed and evaluated" and made the following recommendations for the next steps in the EDR revision process:

- The purpose and needs statements for each EDR program, and for any systematic economic and social data-collection program more generally, would need to be revised since the goals and needs of future economic data collections are not necessarily the same as when each EDR program was initiated. A clear purpose and needs statement will be critical moving forward to ensure that the EDRs are collecting the right information without imposing unnecessary burden on the industry.
- Issue 2 of the Council's motion regarding EDR revisions should be bifurcated into: 1) issues that are straightforward and can be addressed in the short term; and 2) issues that require a data- collection framework and can only be addressed in the long term.
    - Short-term issues include: consideration of data being collected by the current EDRs that are duplicative of data being collected in other data collection programs; identification of best practices for collecting economic data and providing examples from other Council regions (e.g., Economic Data Collection staff from the Northwest Fisheries Science Center) and other non-fisheries agencies (e.g., Bureau of Labor Statistics); consideration of the benefits and costs of standardizing EDRs; addressing SSC comments from the April 2019 meeting.
    - Long-term issues include developing a framework for a systematic economic and social data collection program that meets the purpose and needs of the Council (e.g., see the generic statistical business process model presented in Figure 1 of the EDR Discussion paper).
- The SSPT agreed that it should provide guidance in the development of a framework for future economic and social data collection; however, it was not possible to provide such guidance during the current meeting. The SSPT suggests conducting a workshop outside of the SSPT's regular meeting schedule in order to provide guidance on EDR revisions in a timely manner. The SSPT suggested a late-summer meeting could be possible for several of the SSPT members.

In distinguishing between short- and long-term issues, the SSPT identified the development of a data collection framework as a long-term issue, but proposed a workshop on the topic in the near-term and did not propose a specific timeline for addressing short-term issues. While the list of short-term issues identified includes the relatively discrete issue of duplicative reporting requirements, it also identifies examination of best-practices in economic data collection, including examples from U.S. statistical agencies "(e.g., Bureau of Labor Statistics)" as well as other NMFS regions that have implemented data collection systems comparable to the EDR program, and standardization of data collections within the EDR program as short-term issues.

It is not clear that the latter issues represent "short-term" projects. The scope of best-practice considerations relevant to economic data collection in the context of the EDR is as broad and complex as the set of subprocesses depicted in the Generic Statistical Business Process Model (GSBPM) figure referenced in the SSPT's minutes, and the task of identifying and applying a

relevant set of best-practices can likely only be accomplished in the near term for the most limited set of potential EDR revisions. On the other hand, the need for standardization and consistency within the EDR program is predicated on the fundamental lack a clear and consistent conceptual framework in the design and evolution of the program. **As such, proceeding with ad hoc revisions without the benefit of clearer analytical framework would likely result in further unintended fragmentation and discontinuities in the affected EDR data series, and lower utility of information for any cost and burden imposed on the industry and government.**

3 Conceptual decision framework for data collection design

As noted in the previous discussion paper, across the collective information system that NMFS, ADF&G, and the Council use to conduct fishery management functions and to inform decisions, the EDR program appears to be the only data collection designed exclusively by the Council (i.e., with analytical support from NMFS/AFSC, and with input from stakeholders), and solely as social and economic information for use in the Council process. Virtually every other regular, ongoing data collection sourced by Council or AKR staff analysts for quantitative social and economic data were developed for non-analytical (i.e., administrative) purposes. Statistics extracted from those sources for use in Council/AKR analyses are essentially no-cost by-products of data collections designed, operated, and funded for other purposes. For the most part, the Council has not needed to articulate a scale for evaluating social and economic data collections on the basis of the analytical utility of information in the Council process relative to cost and burden.

In contrast, the Council routinely encounters costly and complex scientific information systems that are designed almost entirely to inform Council decisions, particularly in the context of National Standard 1. Within the structure of harvest specifications as defined by NS1 and implemented through the Council process (e.g., plan teams, SSC, CIE reviews, etc.), the stock assessment "information availability" tier framework represents a mechanism for distilling a complex multi-dimensional evaluation of data quality, across all scientific information available for a given fishery stock, into a ranked hierarchy corresponding to risk-based decision rules. At the lowest tier (Tier 6), information considered reliable for assessment purposes is limited to a single static estimate (average annual catch during a fixed reference period) acting as a proxy measure of the entire dynamic state of the stock. The corresponding Tier 6 control rules are maximally risk averse and grant the Council the least discretion in determining annual OFL and ABC. At the highest tier (Tier 1), the assessment provides a detailed model of the stock as a dynamic system, with high resolution data series supporting statistical estimates of known quality across a standardized set of state variables and functional parameters. Correspondingly, control rules grant maximal management discretion, based on high confidence in the assessment's ability to forecast the disturbance-response effects of harvest specifications.

In short, the stock assessment tier framework represents a linkage between data quality and tangible outcomes, namely annual OFL and ABC determinations (and less directly, to sector TAC

allocations), such that the utility of discrete changes in data quality affecting a given stock assessment are at least conceptually well-defined. Thus, the universe of relevant data quality issues are organized into a conceptually coherent, hierarchical framework, and operationalized as an ordered set of data quality standards for each tier, describing "what should be measured" and "how well it should be measured". Given a stock with a Tier 6 assessment, for example, a research and data collection plan can be identified to improve the assessment to Tier 5, with identifiable costs and tangible implications for management options and outcomes. This allows the Council, over time, based on repeated iteration of deciding harvest specifications informed by a transparent scientific process, to discern the relative utility of research and data quality improvements directed to a given assessment, prioritize improvements with the largest immediate benefit relative to cost and other resource limitations, and to advance research plans for longer-term priorities.

Very little in the way of equivalent structure is in evidence in the domain of social and economic information that bears on Council decision making. Council deliberations and decisions on matters related to social and economic objectives are complex, non-routine, and often involve tradeoffs across objectives. In a general sense, Council and AKR analyses apply a consistent analytical framework for assessing social and economic effects of management measures, but the initial steps of developing an analysis involve identifying the relatively unique scope of social and economic dimensions and potential effects of a given management measure, identifying the best available data to inform the analysis, and metrics that can be calculated or estimated to portray the potential magnitude of effects. But there is no consistent framework of social and economic indicators in FMPs. The meaning of 'data quality' is ambiguous in the broad context of data or performance metrics related to social and economic objectives under MSA provisions. In the relatively few occasions that the Council has attempted to apply a working definition, as demonstrated by the EDR design process to date, it has not benefited adequately from conceptual clarity or scientific rigor. Before further consideration of any significant revisions to the EDR program, a generalizable conceptual framework is needed to clarify the relevant decision variables and information objectives that should be examined in the process. **This paper attempts to create that framework for the SSPT to use as a starting point in their discussions toward achieving an operational framework that can be applied to the 4 existing EDR Programs and 9 EDR forms which will then provide actionable advice to the Council about a suite of potential revisions to achieve their EDR revision goals of** reducing reporting burden, improving consistency, and improving analytical utility.

The core task of the EDR review as identified in the Council motion is to identify and recommend a set of near-term and long-term design revisions to achieve the competing goals of reducing cost and reporting burden while increasing the utility of data produced. Consistency will improve the information utility from any given level of information collected or cost and burden because analysts will have more readily accessible and similar performance metrics across EDR fisheries. This process is conceptualized in Figure 1, where administrative cost and industry burden (cost+burden) on the y-axis and data quality on the x-axis are both inputs into

the data collection process that creates an output of a certain level of utility of information (such as point A).[3]

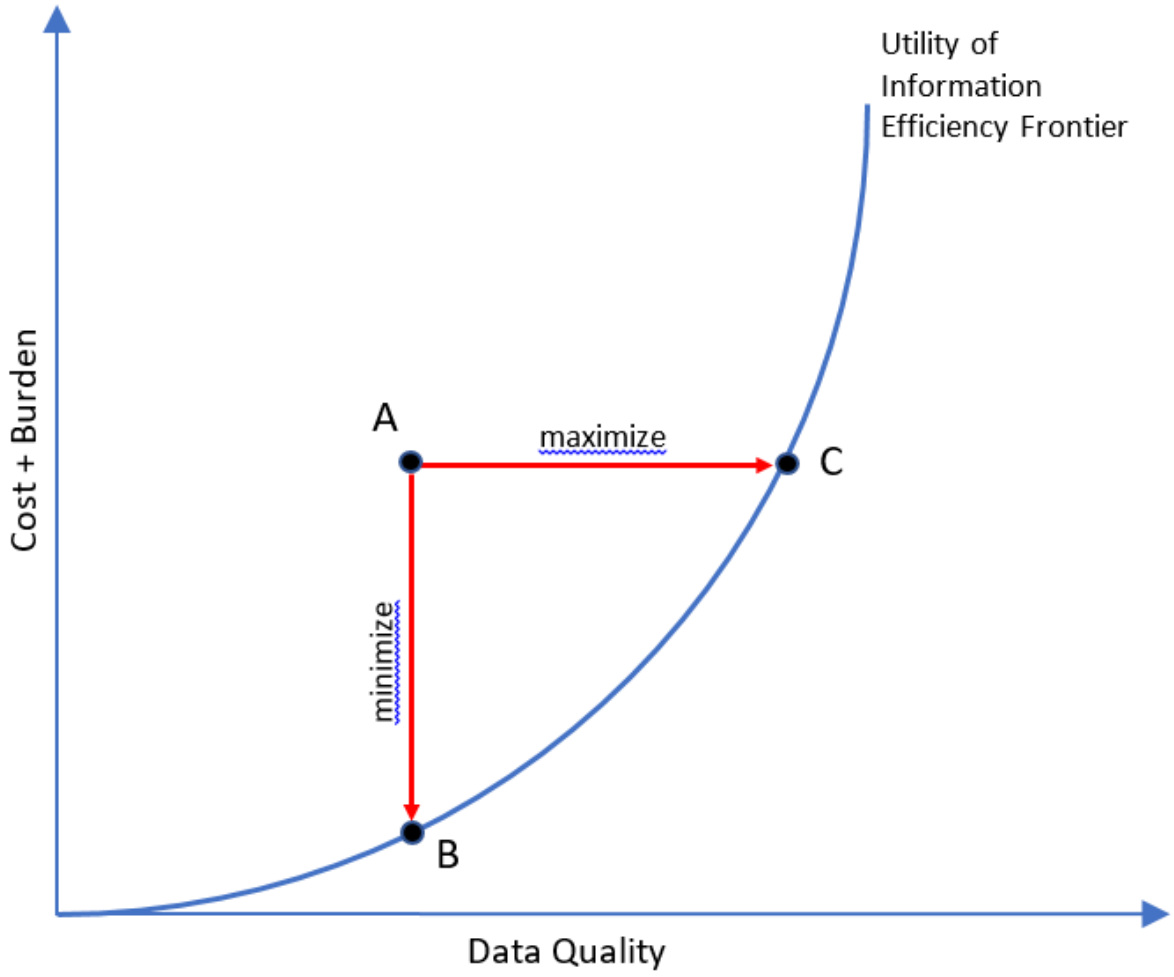


Figure 1: Graphical representation of the tradeoffs between cost+burden and data quality to achieve a level of information utility.

The curve represents the efficient frontier by which best practices are used in the data collection process to minimize the feasible cost+burden and data quality inputs to achieve any given level of data utility. The efficiency frontier is drawn as an upward bending curve (i.e., with increasing slope) to illustrate two aspects of efficiency that may be relevant. Generally, information utility increases with each incremental increase in data quality, but at the efficient

[3] The point of the figure, in the tradition of economic thought, is to depict a complex decision scenario as a simple efficiency relation between two ambiguously defined variables by abstracting from all other multidimensional decision criteria which are assumed to satisfy "ideal conditions". Starting from this simplified framework, the rest of this paper will attempt to expand on conceptual details most salient at this stage of the EDR analysis, and to deconstruct "ideal conditions" as the matter of attaining best practices in specific aspects of EDR survey design and implementation.

margin, the relation is likely nonlinear over at least some range of the curve. That is, the marginal utility of data quality is likely quite large at the low end of the cost/utility spectrum, and small at the upper end. The area above the curve represents the infinite set of possible data collection designs (of which the EDR is one), each of which incur a level of cost and burden and data quality to produce a data product that attains a given level of information utility. In a general sense, data quality combines both the amount of data produced, i.e., the number of observations (individual datums), and the aggregate of other quality attributes that apply to potential applications of the data for relevant purposes. For the sake of illustration, consider an increase of data quality to be achieved by producing more data, better data, or both.

Figure 1 also illustrates that from an interior point not on the efficiency frontier, it is unambiguously better to move down and to the right of the figure. Moving vertically down from A, there is no reduction in data quality but significant decreases in cost+burden as one moves toward point B, and at every point along that line connecting A and B is an improvement in the utility of information (data) collected as one moves closer to the frontier. The simplest example of a move from A to B would be the removal of duplicative data elements. Moving horizontally from A to C, for the same cost+burden, the data collection process can achieve improvements in data quality and would result in a higher utility of information at all points along the line from A to C. There are not too many real world examples with no changes in cost+burden with large increases in data quality, but one hypothetical example may be moving from censuses of a population with a small number of data elements collected to a sufficiently large sample with additional data elements that allows the creation of additional performance metrics or more fully capture the distribution of a performance metric. Thus, any movement in the pie shaped area A-B-C would be an unambiguous reduction in cost+burden and increase in data quality leading to a higher utility of information from the data collection process. This figure also illustrates the difficulty in assessing tradeoffs between minimizing cost+burden while maximizing the utility of information from the EDR Program, and that Council preferences over data quality and cost+burden are essential to determine an "optimal" EDR data collection Program for the North Pacific.

Figure 1 suggests two additional aspects of data collection design that are important to note before moving to developing the outlines of a more detained conceptual framework and discussion of relevant best practices. First, a clear and specific definition of at least one analytical objective is necessary in order to operationalize the concepts of data quality and utility of information and enable application the model described in Figure 1 to the evaluation one or more potential EDR revisions. Data quality is a composite of multiple dimensions and attributes, and the expression of data quality is fundamentally context-dependent; distinct quality attributes of a given body of data may have different bearing on an assessment of data quality according to the analytical use to which the data are applied and the decision the analysis is intended to inform.

Figure 2 adds the concept of Council preferences for different levels cost+burden and data quality through the introduction of an indifference curve which along its length represents a constant level of Council Utility (CU), such that the Council is "indifferent" between any

combination of cost+burden and data quality along the curve. Council Utility is increasing as one moves downward and to the right, such that the Council Utility for data collection process A (CU^0) is strictly lower level of utility than the data collection process at D (CU^1) such that $CU^0<CU^1$. Thus in this hypothetical scenario, point D would be the "optimal" data collection program in the North Pacific given the cost+burden and data quality inputs into the data collection process that achieves an efficient (best practices) frontier of utility of information according to the preferences of the Council over cost+burden and data quality. However, the issue facing the SSPT and Council is that we do not know the exact shape of Council preferences to solve this problem graphically or analytically. For example, it is entirely reasonable to consider the Council having preferences like CU^2 or CU^3 (which cannot be ranked) that may lead to an "optimal" solution at points B or C or even outside the A-B-C pie shaped area (Figure 3).

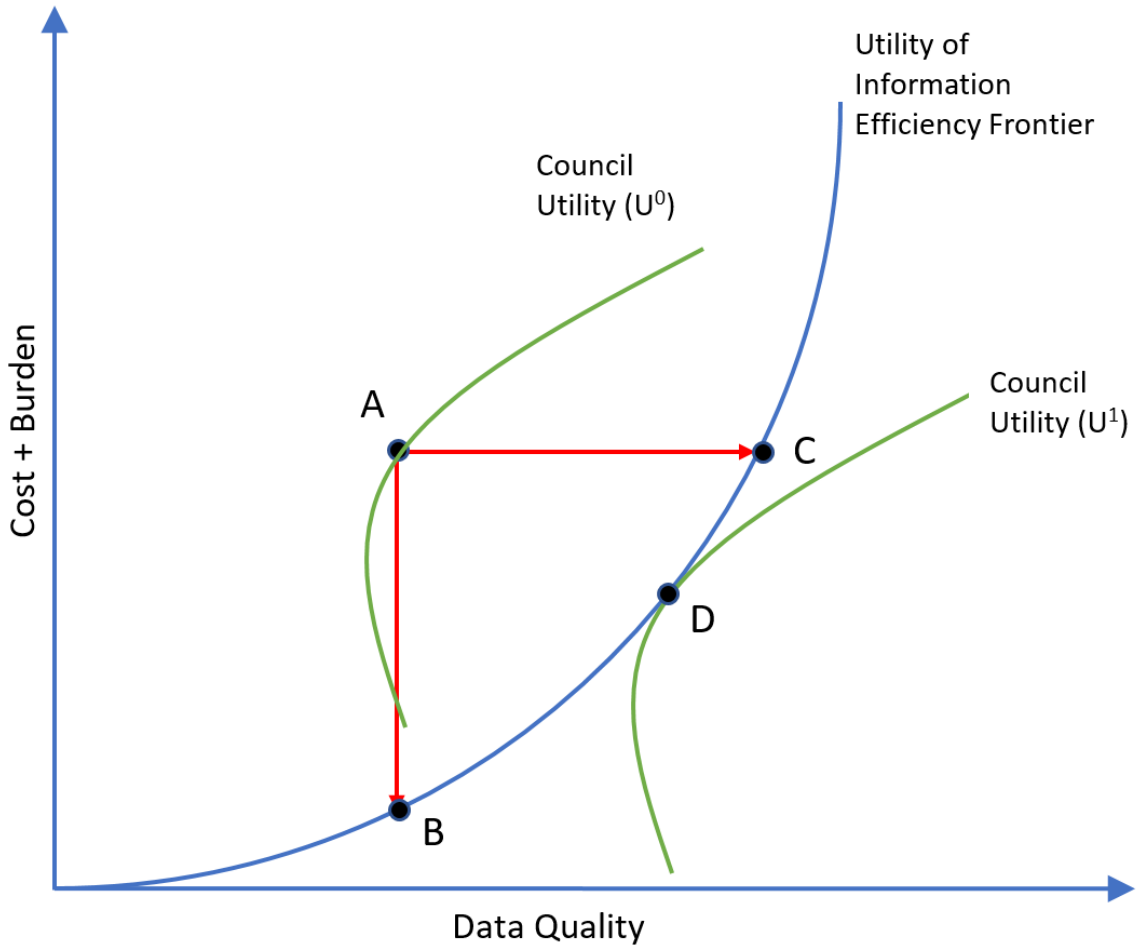


Figure 2: Theoretical representation of how to incorporate Council preferences for cost+burden and data quality to achieve a level of Council utility.

In the case of Figure 3, there could be "optimal" data collection process solutions at point B for Council utility CU^3 and point C for Council Utility CU^2, where the preferences represented by CU^2 reflect preferences where the Council is willing to trade a lot of cost+burden for a small

increase in data quality, while CU^3 represents a Council is willing to exchange a large amount of data quality if it reduces cost+burden a small amount. As we do not know the shape of the Councils indifference curve in this space, the goal of this framework is to present the Council with a means of comparing differences in cost+burden and data quality to achieve different levels of information utility and Council Utility.

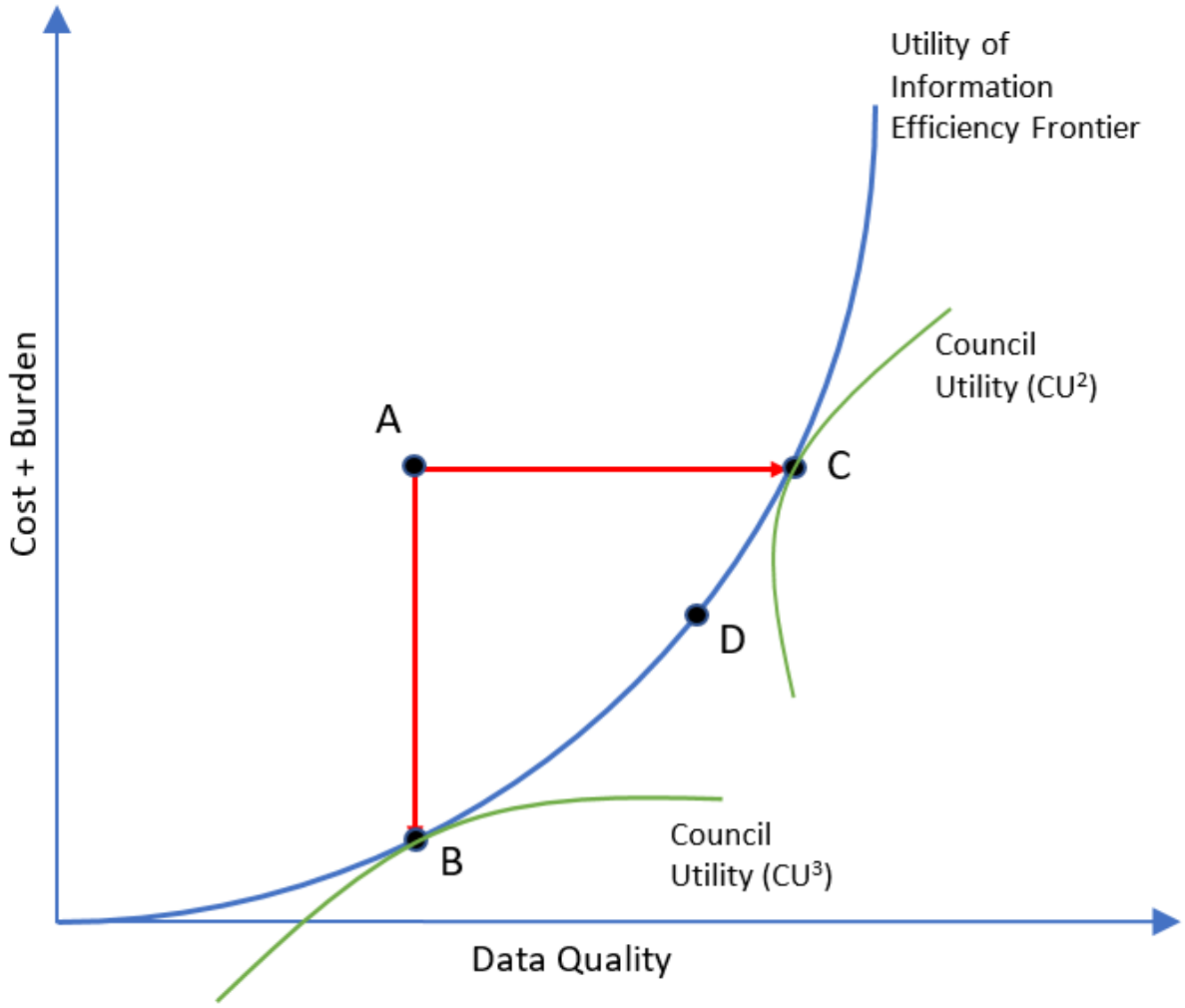


Figure 3: Illustration of two different hypothetical sets of Council preferences for cost+burden and data quality to achieve a level of Council Utility.

2012 Crab EDR Revision Example

In an attempt to make this conceptual framework more tangible and to more clearly define the problem facing the SSPT and Council, we will provide an illustrative example of one potential representation of the changes from the original design of the Crab EDR data collection process ($Crab^{2005}$) through the implementation of the Crab EDR data collection process in reality ($Crab^{2005'}$) to the current Crab EDR data collection process that was modified in 2012 ($Crab^{2012}$). The original design of the Crab EDR data collection process can be summarized by Figure 4, which shows a particular relationship between cost+burden and data quality inputs required to

produce a given level of utility of information at point Crab^{2005}. The point is defined in the interior of the frontier (U^{2005}) as there were likely some design elements that could have been improved and results in cost+burden of C+B^{2005} and data quality DQ^{2005}.[4] The intent of this example is not to reevaluate the changes that occurred but to demonstrate the changes that did occur in cost+burden, data quality, and information utility space and to use this to understand the tradeoffs implicit in any future changes to the EDR Program.

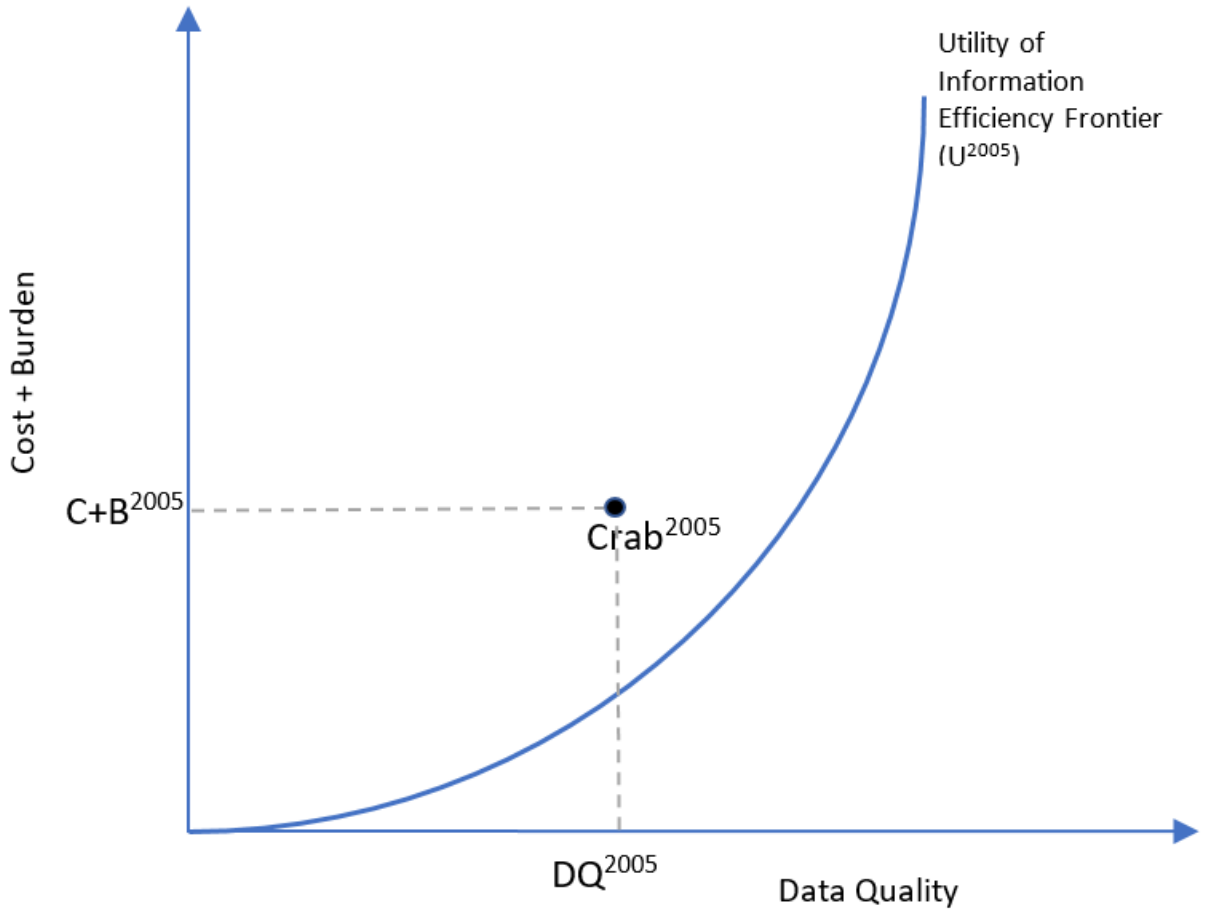


Figure 4: Illustration of the original design of the Crab EDR data collection process in cost+burden, data quality, and information utility space.

[4] As a general point, given the current EDR program design, there are likely numerous feasible alternatives for improving adherence toward best practices that would achieve one or both of the Councils stated objectives of increasing information utility and reducing cost and burden.

However, what has now been realized (but was not fully recognized at the time) is that the relationship between cost+burden and data quality to produce information utility is actually far steeper (more cost+burden for any given improvement in data quality) than anticipated. This is reflected by the shift up in Utility of Information Efficiency Frontier to $U^{2005'}$ in Figure 5. The point $Crab^{2005}$ is now also outside of the feasible set of possible data collection programs and the reality was that implementing this type of data collection program was far costlier to administer and more burdensome for industry members to fill out, and the data collection process that was implemented is better represented by point $Crab^{2005'}$, with associated cost+burden of $C+B^{2005'}$.

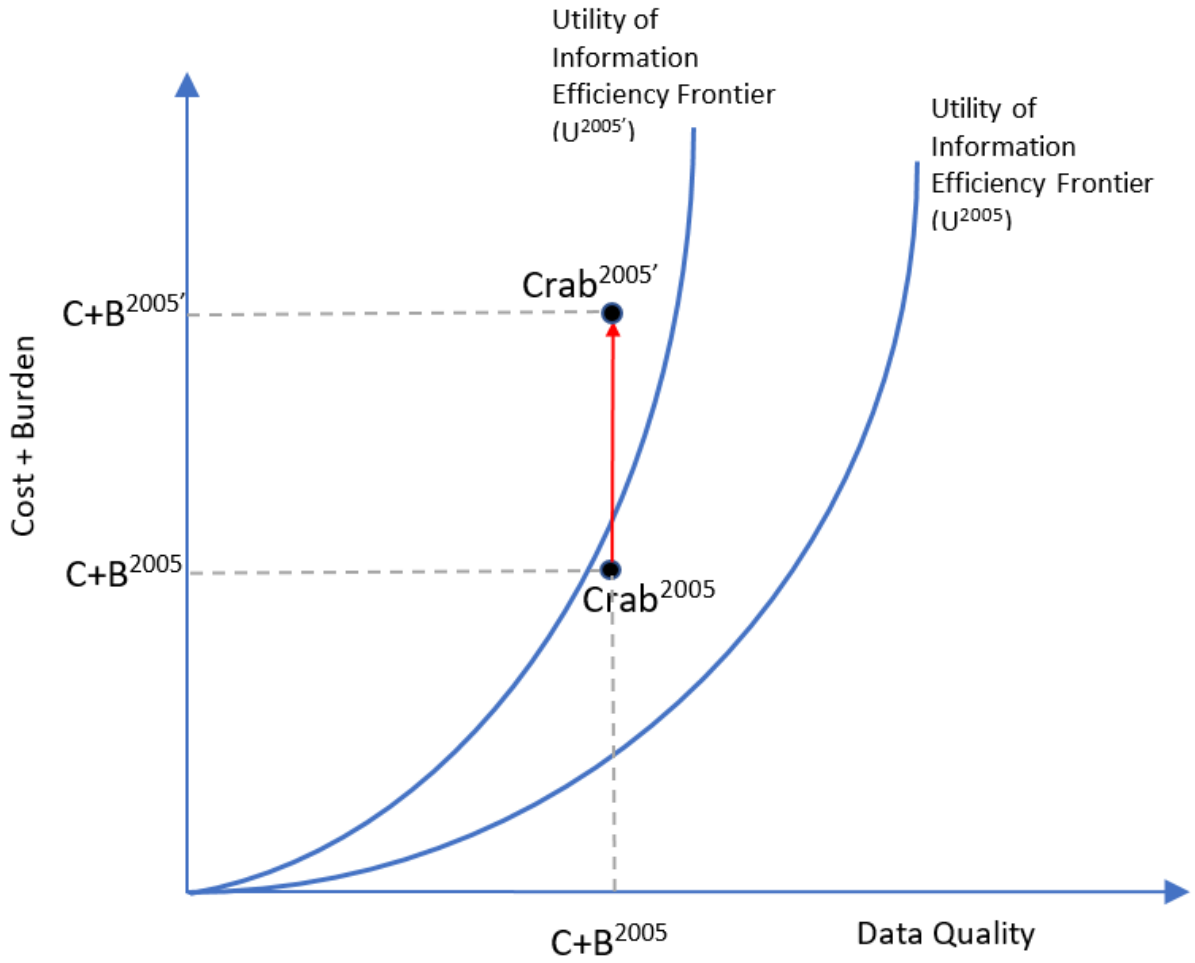


Figure 5: Illustration of the difference between the expected design of the Crab EDR data collection process ($Crab^{2005}$) and the realized implementation of the Crab EDR data collection process ($Crab^{2005'}$).

There were many revisions to the Crab EDRs that both increased and decreased different aspects of data quality, but for the purposes of this example we will assume that there was a

net decrease in overall data quality from the revisions as not all data elements that were removed had zero information content. But there was clearly a large reduction in cost+burden as a result, which is illustrated in Figure 6, moving from point $Crab^{2005'}$ to $Crab^{2012}$, with a reduction in data quality from DQ^{2005} to DQ^{2012}. It is also assumed that the Council achieved its original designed cost+burden estimate $C+B^{2012}=C+B^{2005}$, which is not necessary but done for ease of exposition. The question now is whether that move was welfare improving, decreasing, or ambiguous, which will be explored in Figure 7 using the Council Utility indifference curves introduced in Figure 2.

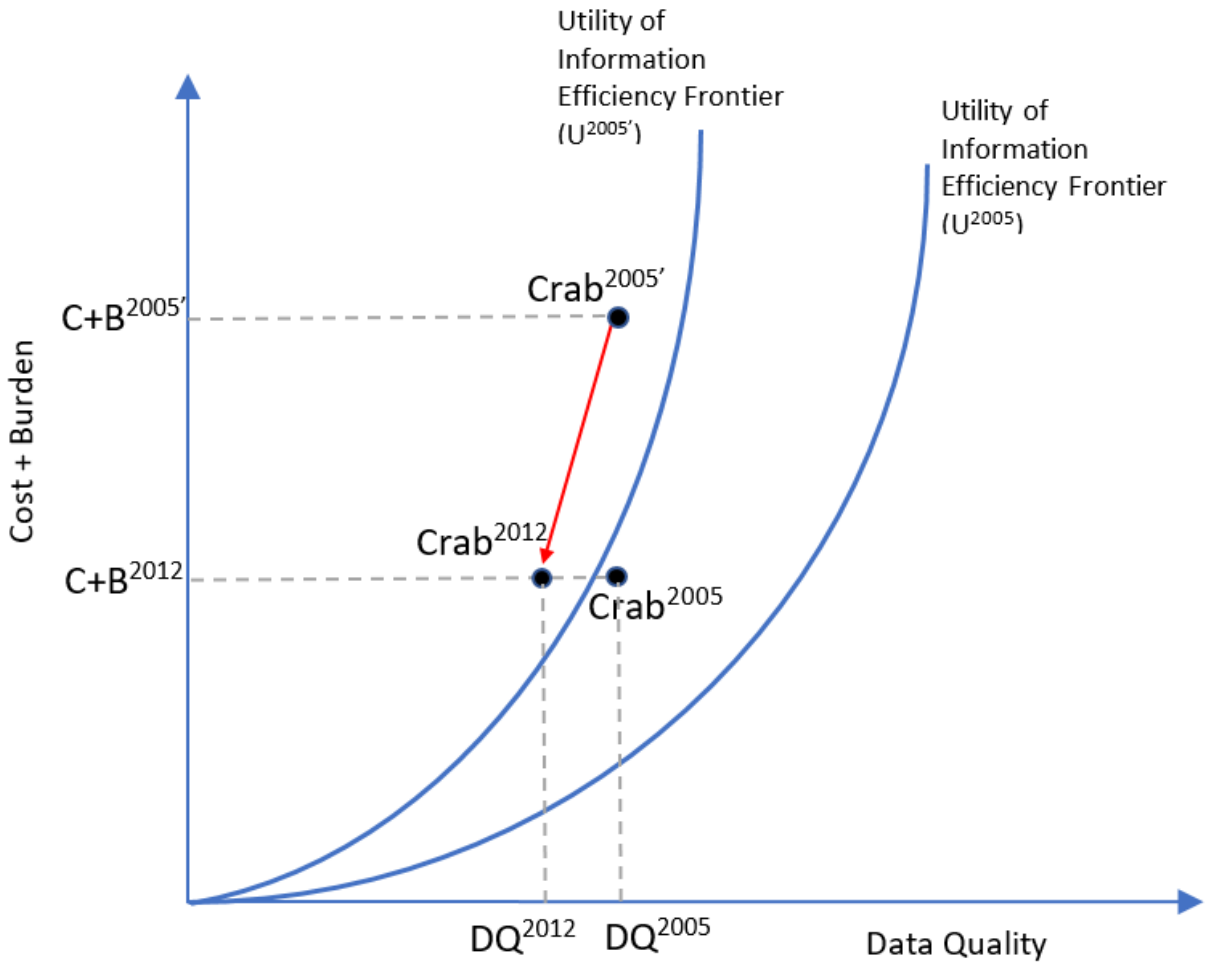


Figure 6: Illustration of the hypothesized difference between realized implementation of the Crab EDR data collection process ($Crab^{2005'}$) and the 2012 Crab EDR revisions ($Crab^{2012}$).

Figure 7 shows that since the original 2005 design of the Crab EDRs was beyond what was feasible (as defined by the upper left area above the Utility of Information Efficiency Frontier), but this would have achieved the highest level of Council Utility (CU^{2005}). However, what was implemented and they received was a level of Council Utility at $CU^{2005'}$, which was a substantial reduction in Council Utility from the data collection process ($CU^{2005'}<C^{2005}$). Given the Council

preferences over cost+burden and data quality represented by these indifference curves, it is relatively easy to show that Council Utility increased as a result of the 2012 Crab EDR revisions, such that $CU^{2012}>CU^{2005'}$.

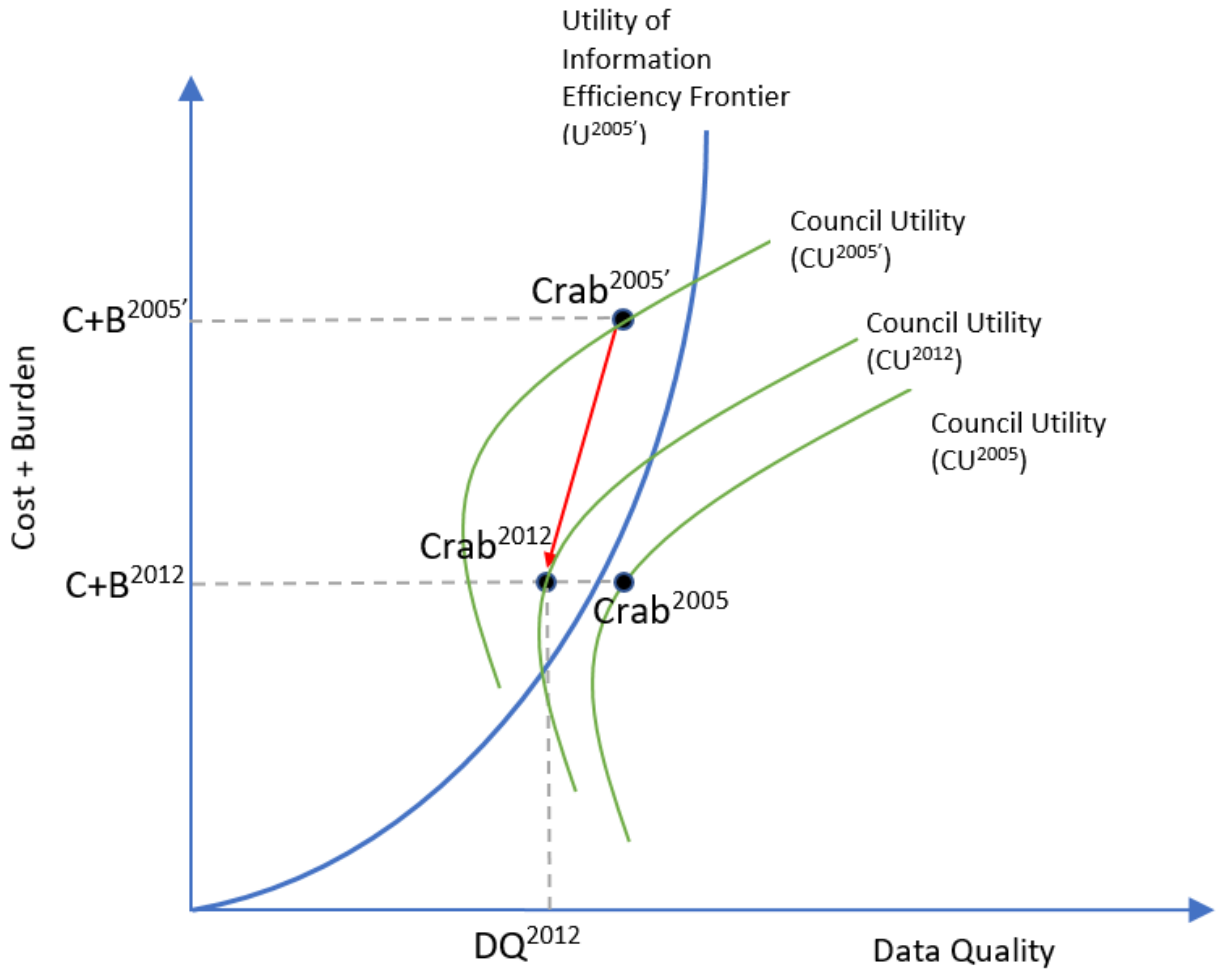


Figure 7: Illustration of the changes in hypothetical Council Utility indifference curves from the original Crab EDR program (CU^{2005}), the realized implemented Crab EDR Program ($CU^{2005'}$), and the result of the 2012 Crab EDR revisions (CU^{2012}).

The fundamental problem facing the SSPT in regards to improving the EDR data collection process is to determine in which direction to move from Crab^{2012} (and across the multiple EDRs). Obviously moves downward and to the right are unambiguously better, but the preferences of the Council for cost+burden and data quality (the shape of the Council Utility indifference curves) will determine the "optimal" direction to move. This is illustrated in Figure 8 using the three hypothetical EDR revisions. The point EDR^1 represents a pared down version of the EDRs with little cost+burden ($C+B^{EDR1}$) and reduced data quality (DQ^{EDR1}) that would achieve Council Utility CU^{EDR1} if the Council had strong preferences away from imposing cost and burden on the government and industry. If the Council had moderate preferences for

cost+burden relative to data quality, their preferences could be drawn similar to CU^{EDR2}, resulting in an "optimal" combination of $C+B^{EDR2}$ and DQ^{EDR2}. If the Council had strong data quality preferences, such as those shown by CU^{EDR3}, the "optimal" choice would be to implement a data collection process that achieves $C+B^{EDR3}$ and DQ^{EDR3}. Note that these three sets of Council preferences represent three different states of nature and are not comparable to one another in terms of ranking outcomes across these different preference relations, and we do not know the exact shape of the Council's Utility indifference curves. Additionally, we do not know the shape of the entire Utility of Information Efficiency Frontier as there is a nearly infinite number of combinations of the different components of data quality that may achieve the same overall level of data quality. As we don't know the shape of any of these curves or necessarily where the current EDR Program is in cost+burden, data quality and information utility space, what is the point of this illustration and how does this impact the task before the SSPT?

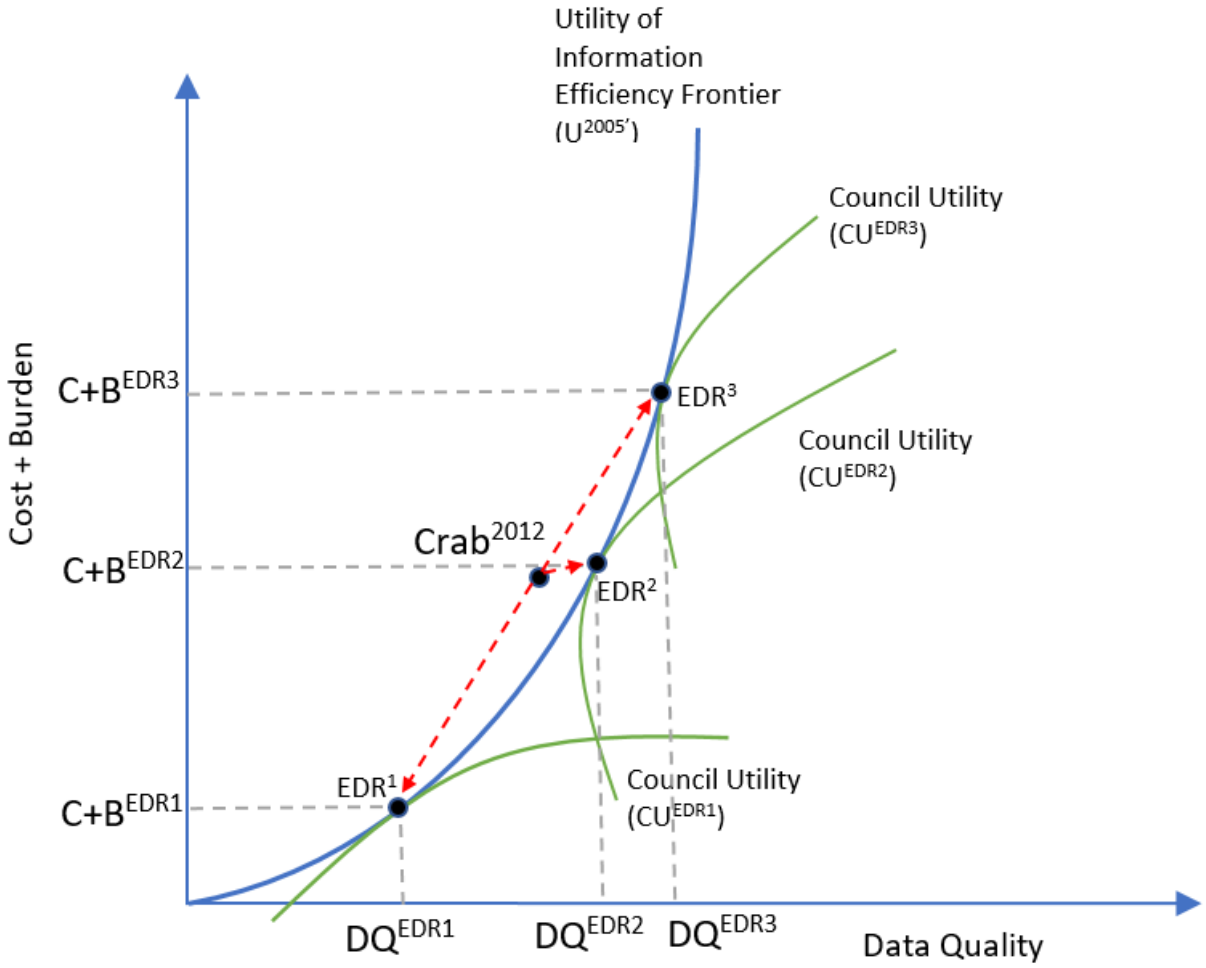


Figure 8: Graphical representation of the challenge in revising the EDR Program from the existing EDR Program (represented here by $Crab^{2012}$), compared with a suite of potential revision options including a pared down version (EDR^1), a moderately revised version EDR^2, and an expanded version EDR^3.

Our view is that what the SSPT can and should do is to implement best practices for data collection processes applied to the EDR Program to move the program toward/on the Utility of Information Efficiency Frontier, and provide a suite of options, such as EDR[1], EDR[2], and EDR[3] for the Council to consider and reveal their preferences (i.e. the general shape of their indifference curves) by choosing their preferred alternative. However, as mentioned in the prior EDR discussion paper, this may require an updating of the Council's stated purpose and needs for the existing EDR data collections as changes in those preferences will partially dictate the direction each EDR should move from its current position toward the frontier. Now that the basic problem and potential levers to effect change available to the SSPT have been defined, the remainder of this paper will describe key elements of data collection design, including information utility, data quality, and cost and burden that builds toward an operational framework that can be applied to the EDR Program as a whole, each individual EDR, and finally to each element of each EDR form to assess information utility and data quality and the impact of potential revisions.

4 Key elements of data collection design

Evaluation of the current EDR data collections and alternatives at either end of the scale of revisions within the scope defined by the Council motion requires a set of working definitions for, at minimum, the three principal evaluation scales referenced in the motion: utility of information, data quality, and cost and burden. Consideration of any specific change in EDR design makes it readily obvious that these terms merely reference a set of quite general concepts, and that manifesting these concepts for any specific recommendation requires expanding them into a more detailed set of working definitions appropriate to the application.

Consider for example the (arguably) most tangible of terms referenced in the Council motion: burden. Notwithstanding the OMB definition of burden, obtaining information from a survey subject involves taxing them in more ways than merely the amount of time they are occupied with responding to questions. Cognitive burden is distinct from, but is correlated with time burden. Disclosure, as another aspect of burden, is not closely associated with time burden, but has arguably been the most salient issue regarding industry willingness to provide proprietary economic information to NMFS.[5] In any of these aspects, the amount of burden that a survey instrument imposes on respondents has an effect on quality of response; individual respondents' tolerance for burden can reach a point of exhaustion, after which, quality of response to successive questions degrades. As such, for a given level of overall burden, it may

[5] This is a key point, and is related to the first bullet from the SSC minutes cited above regarding clarification of EDR goals so that "industry perceives minimal disincentives to reveal management-relevant financial information". That there remains a strong interest among industry in eliminating individual EDR variables rather than other alternatives that would more substantially reduce or displace burden hours is evidence that disclosure burden is an important aversive factor that a redesign of the EDR program should seek to minimize.

be more efficient to distribute reporting burden over a larger number of respondents, for example, by obtaining different data elements from different populations, e.g. quota lease value as a general operating cost item from vessel operators, and more detailed transaction-level quota lease information from QS holders, or a sub-segment thereof. There are a variety of methodological best practices to employ in designing a data collection to reduce submitter burden, but they depend on understanding that there are different forms of response burden that have distinct effects on the survey response process. Similarly, "cost" is inadequate as a representation of agency resources that must be organized and expended in the process of implementing an information system, and the terms "data quality" and "information utility" invoke more questions than answers.

Information utility, in particular, links to another set of concepts for which the lack of an agreed upon set of reference definitions has been a barrier to improving the Council's ability to harness social science information toward accomplishing fishery management mandates. Efficiency, equity, and stability all represent normative, aspirational scales in the descriptions of social and economic objectives under MSA and FMPs. As such, it may not be possible, or even desirable, to identify definitive standards for these management objectives equivalent to OFL and ABC under National Standard 1. The normative aspects of OY explain why definitive control rules associated with stock assessment tiers only apply to MSY, and it would be untenable to propose constraining Council management discretion according to hypothetical information quality tiers in the domain of social science information. Nonetheless, better definition of terms, graduating to a comprehensive framework of quantifiable, comparable performance metrics for social and economic management goals is a fundamental prerequisite to designing an efficient data collection system that meets more than ad hoc objectives.

The following examines the most immediately relevant documentary source material, e.g., the Council record and related references, for key semantic terms under the three general headings identified in the Council motion.

4.1 Information utility

It is probably best to set aside the formalism of the economic formulation of utility and focus on a more practical, intuitive conception of information usefulness, and relatedly, uses of information. Both loosely encompass the issue of jointness from economic theory, i.e., that information is used in defined bundles, and the relative usefulness of a given new element of information depends on the information environment into which it is combined. It will also be necessary to account for the social utility aspect of the formal economic framework, i.e., that the Council isn't an individual consumer expressing preferences regarding the content and amount of information it obtains for EDRs, but represents the interests of multiple distinct stakeholders, and the public at large, in seeking to obtain information.

The general domain of management issues and analytical applications most germane to design of the EDRs is described in the SSPT's ongoing Data Gap Analysis document, which provides a

comprehensive discussion and analysis of the social and economic goals and objectives of fishery management as specified in MSA, the Council's FMPs, and other related mandates. For the sake of context, those objectives and dimensions are broadly captured under the following five headings:

- Maximize net benefits and economic efficiency
- Achieve equitable distribution of benefits
- Maintain economic and social stability within and across sectors and communities
- Avoid disruption of existing social and economic structures
- Provide for sustained participation and opportunity of access

As the Data Gap Analysis describes, data analysis serves three basic functions in support of social and economic goals of fishery management:

1. Monitor the level and distribution of net benefits from Council fisheries,
2. Explore the factors that explain changes in the level and distribution of those net benefits over time, and
3. Predict the likely effects on the level and distribution of those net benefits for alternative fishery management actions.

In statistical terms, or more generally, as information functions, these represent 1) description, 2) inference, and 3) prediction. Logically, these functions are arranged in order of precedence and generality, and arguably, importance. That is, inferential analysis involves using cross-sectional and temporal variation in factors that have first been described and measured to identify systematic variation, and thereby describe functional relationships between factors, and explain systematic patterns and changes observed in the system over time. Prediction involves use of inferential results to anticipate changes in the described system as a result of internal or external disturbances in the future.

National Standard 2 Guidelines define the purpose and social and economic content of the Stock Assessment and Fishery Evaluation (SAFE) Report as including both the descriptive/monitoring function with regard to social and economic conditions, and inferential and predictive functions with regard to retrospective and prospective analyses of the effects of management measures:

> *"provid[ing] the Secretary and the Councils with a summary of scientific information concerning … the social and economic condition of the recreational and commercial fishing interests, fishing communities, and the fish processing industries. …*
> *(3) Each SAFE report should contain the following scientific information when it exists: …*
> *(v) Pertinent economic, social, community, and ecological information for assessing the success and impacts of management measures or the achievement of objectives of each FMP. "*
> 50 CFR 600.315(d)

The logical order of these functions is reflected in the stock assessment tier system: improving the ability to monitor biomass is the first step up in the tier system, whereas improving inferential analysis and predictive reliability are the focus at higher tiers. The stock assessment system has developed over time, with trawl surveys and other field data collections optimized for specific purposes, and sustained research making incremental improvements in analytical techniques. Data quality requirements are likely to be quite different for these distinct analytical functions in a given setting, and it is unlikely that the most efficient design of a given survey instrument can be optimized for all analytical functions.

4.1.1 General purpose statistics for monitoring and descriptive reporting

Monitoring and descriptive reporting serves several purposes, including, among others: transparency regarding the magnitude and distribution of economic and social benefits flowing from a public trust resource, and changes and trends in both over time; capturing baseline levels and ranges of variability against which effects of management measures can be assessed; and supporting risk management by identifying adverse trends or indicating points where fishery-dependent economic and social systems are approaching critical failure thresholds.

Given the broad range of social and economic factors and management units for which basic monitoring data remain unavailable, and the lack of success in achieving Tier 1 level objectives in EDR implementation, some repurposing of the EDR system to achieve basic social and economic monitoring functions may produce the greatest information utility over time.

The utility of general purpose descriptive statistical reporting and monitoring lies in the value describing and reporting relevant characteristics of a population and salient conditions affecting them over time, independent of other statistical or analytical applications that that may be made of the raw data, or any specific decisions that may either be informed a priori, or evaluated ex post, by applied analysis. Data quality requirements for general purpose statistics are defined by minimum differences in measured values that are meaningful in the context of cross-sectional and temporal divisions relevant to the characteristics and conditions of interest. Quality requirements and design criteria in data collection for such purposes are to some degree independent of those relevant to other uses of the data. For example, sufficiently accurate and reliable estimates for descriptive monitoring and reporting necessitate long-term, continuous maintenance but may not require the level of detail needed for inferential analysis. In contrast, inferential models used to test causal hypotheses require detailed panel data, but unless there is a need to continuously maintain the model and monitor causal mechanisms, a limited time series would be sufficient and the specific data collection needed for model testing could be conducted on a periodic basis, with less frequency than critical monitoring functions.

The Economic SAFE documents (with the recent additions of ESPs, EPR, etc.) may represent the only public reports of general statistical social and economic information published under Council auspices, and as noted above, most of the descriptive results reported therein are derived from administrative data sources not principally designed for statistical applications.

NOAA Information Quality guidelines are mainly relevant in the context of disseminating general purpose statistics, but provide little by way of useful quality reporting guidance beyond requiring that publicly disseminated data should be of "known quality" and supported by documentation. Neither the NOAA guidelines nor any other official guidance document provides specific metrics for evaluating the content or appropriate minimum data quality standards for publicly disseminated general purpose statistics.

4.1.2 Inferential analyses

The utility of inferential analyses, broadly speaking, is the ability to identify statistical or functional associations between components of a system using various statistical tools (analysis of variance, regression models), and to test the size and significance of systematic effects of external or endogenous shocks to the system. In the context of the EDR program, this has primarily been invoked in design of the original Crab and A80 EDRs, which were substantially motivated by the Council's stated purpose and needs for post-implementation retrospective program reviews. The analytical objectives included both general monitoring objectives, as well as statistical testing the independent effects of the combined management measures comprising the respective management programs. This included capacity utilization, productivity, technical and allocative production efficiency, and changes in sector-level changes in the net value of production and quasi-rent. The Crab EDR also included analysis of aggregate indicators in terms of spatial and between/within sectoral distributional effects of rationalization.

Inferential analysis, as a class, is a broad topic, and further dissection isn't the point of this discussion. The essential point in this context, is that systematic application of inferential analyses based on social and economic data, and EDR data in particular, has not generally been achieved. Individual applications have been successful and provided useful information to the Council, but the original ambitions of the crab and Amendment 80 EDRs to support a series of econometric models to provide powerful diagnostic analyses of effects of rationalization has not been realized. This is not principally because the data are not sufficiently accurate. It is because we do not yet have a sufficiently complete description of the social and economic systems that are affected by fishery management measures to begin an orderly approach to explaining those effects.

4.1.3 EDR Purpose and needs, measurement objectives

A review of the Council's purpose and needs statements (Figure 9) and analytical metrics and indicators (Table 1)[6] for the EDRs reveals a general progression toward minimizing both burden

[6] Figure 10 provides a summary of analytical metrics described in RIR documents for the respective EDRs. The metrics and indicators shown represent the measurement objectives supported by the specification of variables, population frames, and other design elements described as the Council's preferred alternative for the respective EDR forms. The table is presented for the purpose of summarizing the set of intended metrics and indicators encompassed in EDR program overall, and comparison of distinctions across EDRs. Table 4 from the April, 2019

and analytical objectives. Each of the EDRs were developed to address one or more aspects of the general social and economic management objectives outlined above, but over time, the analytical scope of EDRs have shifted from broadly encompassing all five, to narrower aspects and only one or two general management goals, and from encompassing both monitoring and inferential functions, to limited scope of one or the other. These shifts reflect a narrowing conception of information utility, relative to cost and burden, from formalized economic or financial metrics to the consideration of individual information units (variables) that are accurate and informative, relevant and reliable as standalone metrics. The most recent motion reflects this narrowed perspective to a degree, but also recognizes that a broader consideration of information utility is appropriate at this time, and that a reconsideration of priorities in EDR data collection is in order.

The original crab EDR employed a combination of variables and composite metrics intended to provide meaningful performance metrics for monitoring conditions across the full scope of FMP social and economic objectives (i.e., efficiency, equity, and stability), and highly complete panels of variables to enable inferential analyses to model vessel and plant-level operational and production responses to CR program implementation, controlling for the effects of exogenous price variation in input and product markets and other factors. The A80 EDR was designed with both monitoring and inferential objectives, but did not attempt to optimize the survey instrument for all dimensions of both functions and emphasized inferential analysis of the efficiency effects of Amendment 80 within the fleet. Subsequent EDR development seems to have discarded the monitoring function of data collection with respect to broad FMP objectives. Concurrent with initiating development of the A80 EDR, the Council also created the Comprehensive Data Collection Committee which was tasked with developing social and economic data collections, which would likely have prioritized general descriptive metrics and applications relative to intensive inferential analyses. Crab EDR and subsequent challenges diverted the Council's attention and narrowed focus to data/metrics of very limited scope and focused on assessing the effect of specific management measures, either using a set of variables to construct an inferential model to detect changes in fuel costs attributable to PSC avoidance as in the A91 EDR, or general monitoring of select variables that are premised to change in response to rationalization (fuel consumption and cost, excluder gear expenditures, crew labor input, employment and wages), without supporting information to enable statistical control for contemporaneous exogenous factors which would enable the Council to understand the causal impacts of the program rather than just compare changes in variables before and after program implementation.

EDR Discussion paper provides a comparable summary of categories of variables across EDR forms and is attached for reference as Appendix B to this paper.

Figure 9: Analytical functions in EDR Purpose and Needs statements

Crab EDR (2002)

...Cost, revenue, ownership and employment data will be collected... to ***study the impacts*** *of the crab rationalization program*
*...**analyze the economic and social impacts of future FMP amendments** on industry, regions, and localities.*
...to ***monitor*** *the "...economic stability for harvesters, processors and coastal communities". ...*

A80 (2006)

*...**fully understand** the socio-economic impacts of the action,*
*...**inform future** management actions,*
*...**monitoring of the community impacts** of this program.*
*...**identify/estimate the costs** associated with bycatch reduction*
*...**estimate the revenues generated** to the sector*
*...**monitor the program benefits** to present generations of fishermen, associated fishing sectors, including the CDQ sector, communities, and the nation as a whole*

A91 (2009)

....A data collection program ... to ***understand the effects*** *and impact of the IPAs.*
*...**evaluating the effectiveness** of the IPA incentives*
*...**evaluating** how the Council's action affects where, when, and how*
*...**study and verify conclusions drawn by industry**...*

Crab Revision (2010)

...the Council developed a comprehensive economic data collection ("EDR") program to provide information to analysts ***to assess the effects*** *of the CR program and* ***identify problems*** *that may require future amendments to the EDR program.*
...identification of substantial portions of the EDR data that are inaccurate.
*...**amend the EDR process** so that the data collected is **accurate, informative** to the Council*
...limit the EDR to the collection of data that have been demonstrated... to be ***sufficiently accurate****.*
...providing the ***greatest information value*** *to the management decision making process.*

GOA Trawl (2013)

... relevant baseline information that can be used to ***assess the impacts*** *of a catch share program*
...implemented quickly, efficiently, and with minimal burden on participating stakeholders,
*...**information that is relevant, reliable**,*

Table 1: Analytical metrics specified in EDR development

	Economic metric	EDR data required	Crab (2005)	Crab (2012)	A80	A91	GOA
Capacity utilization and efficiency	Capitalized value of vessel/plant and equipment	Assessed and insured value of vessel/plant and equipment	By sector	By sector	Yes		By sector
	Capacity and capacity utilization	Complete variable input costs and quantities, capital investment, inputs and value, salaries and overhead expenses	By sector, by fishery - limited to crab fisheries		Yes		
	Profit (total revenue - total cost)	Capital investment, itemized fixed and variable production factor quantities and prices, itemized output quantities and prices			Yes		
	Quasi-rent (total revenue - total variable cost)	Itemized variable production factor quantities and prices, itemized output quantities and prices	By sector, by fishery - limited to crab fisheries		Yes		
	Productivity and efficiency (technical, allocative)	Physical capital input/value, itemized fixed and variable production factor quantities and prices, itemized output quantities and prices	By sector, by fishery - limited to crab fisheries		Yes		
	Fuel consumption	Fuel consumed (gallons), purchase gallons and cost	By sector, by fishery	By fishery (vessel gallons used only); vessel annual volume and cost	Vessel annual volume and cost; vessel; By operating mode - hourly rate	Vessel annual volume and cost; vessel; By operating mode - hourly rate	Vessel annual volume and cost

	Economic metric	EDR data required	Crab (2005)	Crab (2012)	A80	A91	GOA
Stability and equity	Distribution of harvest volume and revenue	None – data already available	By sector, by cohort, by port of landing, by location of residence	By sector, by cohort, by location of landing, by location of residence	By cohort		
	Distribution of profits and quasi rents within and between the harvesting and processing sectors	Ownership of vessel, processor, QS assets	Within and between harvesting and processing sectors				
	Distributions of harvester and processor use rights	Ownership of vessel, processor, QS assets	By sector, by owner cohort, by location of residence	By sector, by owner cohort, by location of residence	By owner cohort, by location of residence		
	Value of privileges	QS sales, IFQ lease value	By sector, by fishery, by QS type	By sector, by fishery, by QS type	By QS type	By transaction - compensated PSC transfers only	
	Vertical integration	Ownership of vessel, processor, QS assets	Processor ownership interest in BSAI crab catcher vessels and harvester QS/catch history				

	Economic metric	EDR data required	Crab (2005)	Crab (2012)	A80	A91	GOA
	Concentration of ownership, vessels/plants, QS, by sector, domestic/foreign	Ownership of vessel, processor, QS assets					
	Degree of involvement of harvesters/processors in non-program AK fisheries	None – data already available					
	Regional economic impacts - Wages and purchasing	Location of purchases, employee residence	By sector				
	Seasonality of catch and ex-vessel revenue by vessel class, port of landing, and residence	None – data already available					
	Harvesting employment and payments to harvesting crews	Number of crew and wages/settlement payments	By fishery	By fishery; annual total	Annual total		Annual total
	Processing employment and payments to processing crews	Number of payroll employees, hours, and wages	By fishery	By fishery	Annual total		By month, by housing status
Program-specific	Individual non-labor operating inputs, quantity and cost			Vessel fuel, bait and provision costs			
	Capitalized purchases						Annual total expenditure – trawl gear, excluder gear

Note: The above metrics are compiled from the analyses prepared for the Council for each of the EDR programs. Additional detail and context are available in the associated RIR documents.

A principal source of inconsistency in the specification of metrics and individual variables across EDR forms may be attributable to the distinction between descriptive/monitoring and inferential objectives not being consistently made clear. Several variables are specified similarly in multiple EDR forms but are intended to serve different functional purposes. For example, crew employment and wages as collected in the A80 EDR (specified with other variable factor inputs) appear to be optimized for inferential analysis of changes in production efficiency attributable to rationalization. The content of the GOA Trawl CV and revised Crab CV forms don't support inferential analysis in that context (due to a lack of other variable inputs and capital investment), but are coupled with crew residence variables and appear to be optimized to enable aggregate and spatially distributed descriptive reporting of employment and wages.

Generally, though not exclusively, in questionnaire design, disaggregation of individual variables by category (e.g., by species, quota type, etc.) is intended to enable descriptive subdivision in reporting aggregate statistics, whereas detailed divisions within categories of variables (e.g. itemized variable costs) is intended to support inferential analysis of composite performance metrics. In evaluating potential revisions to current EDR forms, options for reducing burden by aggregating or eliminating itemized variables should consider the potential change in information value (considering research applications as well as ongoing monitoring and program review) relative to the relative burden reduction likely to be achieved.

4.2 Data quality

A fundamental premise of the data quality literature is that there are multiple attributes or dimensions of data quality, including qualitative or subjective dimensions, as well as objective, measurable attributes (Wang and Strong 1996) that together determine whether a given item or body of data are considered 'fit for use" in a particular application. Table 2 displays one commonly cited version of the data quality framework.

Table 2: Data Quality Dimensions and Objectives in Survey Data

Accuracy	Total survey error is minimized
Credibility	Data are considered trustworthy by the survey community
Comparability	Demographic, spatial, and temporal comparisons are valid
Usability/Interpretability	Documentation is clear and metadata are well-managed
Relevance	Data satisfy users needs
Accessibility	Access to the data is user friendly
Timeliness/Punctuality	Data deliveries adhere to schedules
Completeness	Data are rich enough to satisfy the analysis objectives without undue burden on respondents
Coherence	Estimates from different sources can be reliably combined

From (Biemer 2010)

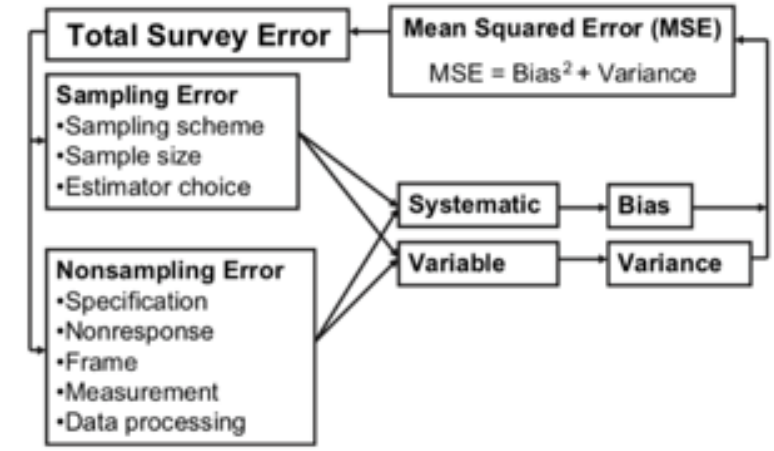
Each of the nine quality dimensions described in Table 2 has manifested as a critical limitation of the fitness-for-use of EDR data, either currently or in the past. Utility of information requires meeting minimum thresholds in each data quality dimension, such that failure to meet any one threshold, despite attaining all but one, may have disproportionately large negative effects on utility. Consider timeliness: data may meet high thresholds for completeness and accuracy, but if the primary intended use is time-critical, then failure to deliver timely results may render the data produced essentially useless from the perspective of the primary user. A different user who wishes to make the same use as the primary user but is not as concerned with timing may assess fitness-for-use as satisfactory and utility quite high. Thus, fitness-for-use is not an intrinsic quality of a given collection of data, but is assessed by the user in the context of a particular application of the data. User access to supporting information on which to assess fitness-for-use is likewise essential, and lacking it can critically limit overall quality despite meeting high standards in other quality dimensions.

As these examples suggest, an assessment of data quality from a fitness-for-use perspective is comprised of a series of tests with yes or no answers rather than an overall score. Also, while quality improvement in each of the nine dimensions is advanced by adherence to best practice standards, not all dimensions are directly related to the content of survey instruments or involve balancing quality against submitter burden.

Accuracy is clearly a central quality attribute, but is particularly difficult to pin down conceptually, and the vernacular usage of the term tends to be misleading in this context. **A key point is that the object that is assessed for accuracy is not individual observations or data points, but the estimated value derived from individual data values collected by the survey.** A statistical survey is designed for the purpose of producing statistical estimates of the objects of measurement and, although individual data points will always be captured with some degree of error, it is only the cumulative effect of error across all data points used in an estimate that determine the fitness-for-use. The primacy of estimates over individual data records is the central distinction between administrative data collections and statistical surveys. As noted in the preceding EDR discussion paper, the resemblance of EDR surveys to more familiar administrative reporting requirements from the submitters' (and some data users') perspective has been a fundamental source of semantic conflict in the EDR process to date, particularly regarding the meaning and relative importance of accuracy.

It is generally the case that for a given measurement objective, (say, total fuel expenditures by GOA trawl CVs during a calendar year, or crab CV quasi-rents in the Bering Sea snow crab fishery), there is no reference level measure of "true value" available against which accuracy can be assessed. In most cases, the object of measurement is to some degree an abstraction rather than an observable physical quantity, such that "true value" is a purely hypothetical construct. As such, in all but simple cases accuracy is itself a hypothetical construct. Thus, rather than observing accuracy or inaccuracy in survey data and estimates directly, the Total Survey Error (TSE; Figure 11) approach (Biemer 2010) depends on controlling potential sources of error in the production of survey estimates.

Figure 11: Total Survey Error – Sources and Mean Squared Error



From Biemer (2010); Table 1

In designing the data collection, total error is produced by the combination of sampling and non-sampling errors, both of which have systematic components, which produce bias in survey estimates, and random components, which increase variance in survey estimates. As shown in Figure 11, Mean Squared Error (MSE) is represented as a quantitative formula, but in practical implementation, quantitative estimates of the size of bias and variable error components are not produced. Rather, the survey designers qualitatively assesses the relative magnitude of potential error sources, and focuses available time and effort on employing methodological best practices on minimizing the degree of potential error. The largest potential sources are generally considered to be specification and measurement error, which are controlled by careful conceptualization of measurement objectives, followed by design of survey questions and of the survey instrument (e.g., questionnaire or interview script). Nonsampling error sources in survey data include the following:

> **Specification error:** error that occurs at the planning stage of a survey because data specification is inadequate and/or inconsistent with respect to the objectives of the survey. Specification error can result simply from poorly worded questionnaires and survey instructions, such that subjects interpret the survey question as eliciting a qualitatively different value than the intended object of measurement. Alternately, specification error may reflect the difficulty of measuring an abstract concept or counterfactual, such that the intended object of measurement may be unobservable to the subject. In both cases, it may not be possible to define a statistical relationship between the intended object of measurement and the data reported by survey subjects. In an economic survey, it is often the difference between the quantity intended to be measured, such as the price or quantity of an input or output in a complex production process, and the survey subject's ability to report this measure as specified in the questionnaire design (Federal Committee on Statistical Methodology (FCSM) 1988).

Nonresponse error: error of nonobservation reflecting an unsuccessful attempt to obtain the desired information from a subject. Nonresponse can be at the level of the survey subject (unit nonresponse) or a subject's nonresponse to an individual question (item nonresponse). In census data collections such as the EDR, unit nonresponse is generally identifiable and may be controlled through enforcement. Item nonresponse is more difficult to detect as it may be difficult to determine if is the measurement object applies to the subject, but has the effect of increasing variance and potentially introducing bias in the survey estimates.

Coverage error: the error associated with the failure to include some population units in the frame used for sample selection or census population identification (undercoverage) or the failure to identify units represented on the frame more than once (overcoverage).

Measurement error: the difference between the observed or reported value of a variable and the true, but unobserved, value of that variable. Measurement error comes from four primary sources in survey data collection: the questionnaire; the data collection method, as the way in which the request for information is made; the interviewer, as the deliverer of the questions; and the respondent, as the recipient of the request for information. Each of these sources can introduce error into the measurement process. Respondent effects include misunderstanding the meaning of the question, failing to recall the information accurately or maintain accurate records, and failing to construct the response correctly (e.g., by summing the components of an amount incorrectly). Measurement errors are difficult to quantify, and require some method of acquiring additional quantitative information on which to base an assessment of the data collected in the primary survey.

Processing error: errors occurring after the survey data are reported, during the processes that convert reported data into an electronic database and convey individual or aggregated observations to data users. Each processing step, from data collection to the publication of the final survey results, can generate errors in the data or in the published statistics. These errors range from transcribing or transmission error, to more complex errors arising from poorly specified editing procedures, database corruption, or aggregation and estimation methods in disseminated results.

As the EDRs employ a full census of the respective populations, error-based data quality concerns are focused on non-sampling error sources. All of the above error sources have been the cause of significant data quality concerns in the EDR program. The design of the original crab EDR questionnaires included both specification errors related to disaggregations that could not be supported with available records, and question phrasing that was subject to misinterpretation and generated measurement error. The complexity and scope of the information that was elicited in the questionnaires was fundamentally problematic, and exceeded practical reporting burden limits. There were significant concerns about the questionnaire designs raised by staff and external reviewers, and further design and development work to pretest questions and survey forms, and to reduce and/or better

distribute reporting burden likely would have prevented most of the problems encountered in the initial implementation of the crab EDR. Coverage error resulted from initially excluding crab processors that did not operate an active processing facility (custom-only buyers) from EDR submission requirements. Crab EDR implementation was tied to CR program implementation, however, and other constraints imposed on the design of the data collection program by the Council and the severely limited staff resources prevented the design and implementation of the crab EDR to identify and adhere to the full scope of relevant best-practice considerations.

A fuller diagnostic review of EDR survey instrument and other system components using the data quality frameworks described above can be produced for the SSPT's review, and would be responsive to the SSCs recommendation regarding description of "lessons learned". This would be a significant addition to this paper, however, and will be developed with additional guidance from the SSPT as the EDR review moves forward.

5 Toward a Social and Economic Management Information Tier Framework

One of many challenges to making greater progress on integrating social and economic analysis into the Council's general information process is the general lack of discernible structure in several key dimensions. In contrast to NS1 management objectives, and in particular, the structure of MSY implementation, social and economic management objectives under MSA and the Council's FMPs are multivariate and qualitative, and generally lack definitive performance metrics. Similarly, discussions regarding social science and economic data and information tend to lack a framework for classifying the quality attributes required of data and analytical results required to meaningfully inform management effects and decisions.

Social and economic data collection has been a perennial element on the Council's agenda for some 25 years, but has seen halting progress over that time. The SSPT has a mandate to address this problem, and it would benefit from an examination of working models that have enabled the Council's other standing plan teams and advisory bodies to make substantive progress on advancing the state of scientific practice in the Council process.

> *"While the analytical rigor and quality of information applied to stock assessments has evolved from crude back-of-the-envelope estimates employed at the onset of Council management, to the sophisticated state- of-the-art assessments that characterize our current stock assessments, the rigor of economic and social analyses has not evolved in a similar fashion. This is not a fault of the analysts or an expression of the inherent analytic limitations of the disciplines. The fault lies with a failure to collect basic information, information that is typically available for other industry sectors such as agriculture." (SSC, October, 2007)*

As noted previously in this paper, the tier system plays a role in the progress that the stock assessment process has made by providing a hierarchical organization of information quality

aligned with management-relevant performance metrics. This has provided a structure for prioritizing data acquisition and research across management units. A similar organization structure for social science and economic information and analyses could have similar benefits in that it would allow the SSPT and analysts to begin shaping the information environment rather than continuing to react to it.

The stock assessment tier system is clearly not directly applicable to the domain of information relevant to the SSPT, but the principal organizational function can be adapted. Key elements of an SSPT tier system could be:

1. Identify generally measurable dimensions of social and economic management objectives, each with a set of performance metrics ordered by increasing information content.
2. Arrangement of information tiers comprised of one or more metrics for each of the respective management objectives that attain a relatively consistent degree of "informativeness".
3. Identify the relevant management units to which the system applies, that would be analogous to fishery stock management units.

Across the social and economic FMP management goals, the three core principles are, arguably, *efficiency, equity, and stability*. Assuming that these represent the "generally measurable dimensions" of item 1, then a set of metrics could be defined for each of the three, scaled by information content. For example, a low-tier[7] efficiency metric would be *aggregate gross revenue,* and a high tier metric would be *vessel-level net operating profit,* with the latter represented as a statistical distribution or structured quartiles with a sufficiently long time series to enable analysis of changes in the distribution of the performance metric (efficiency) over relevant entities and communities (equity) and over time (stability). Low information tiers would support descriptive analysis, whereas high level tiers would support inferential analysis and statistical projections as well as simple descriptive statistics.

As a rough example to illustrate the principle, consider Table 3 below. A Social and Economic (SE) Management Information Tier Framework could be populated for a fishery, fleet, management program, an entire FMP, or some other division of management focus. The hypothetical SE framework shown is intended as a simple illustration of the sort of information gradation that would be captured by improving metrics associated with a single indicator for each SE dimension. In the stock assessment tier system, the description of "information available" for each tier doesn't immediately capture the dimensionality of the information difference between, say, Tier 1: *reliable point estimates of B and BMSY and reliable pdf of FMSY*, and Tier 6: *reliable catch history from 1978 through 1995*; there are three metrics for Tier 1, and only one for Tier 6, but there isn't a 3 to 1 information difference. Likewise, because the dimensionality of information increases (maybe exponentially), the number and breadth of

[7] "Low-tier" meaning low information; notwithstanding the stock assessment tier convention of Tier 1 = highest information.

metrics and indicators available for each "Social and Economic Management Dimension" would increase as information tiers increase (which isn't captured in Table 3). One function of having a framework, however, is to condense information, so it will be important to find an appropriate way in the framework to condense the description of information as the complexity of information increases. Greater distinction between social and economic domains may likely be one aspect of this.

Assume, for example, that the framework has been developed to apply to management and information at the fishery-level, and is ready for use. A first round assessment by the SSPT would assign each fishery a tier level for each of the three columns (according to current baseline information available). A second-round assessment would compare differences across fisheries. A third round would identify critical information gaps across fisheries, and a fourth round would identify near-term priorities for data collection and research to address information gaps.[8]

Table 3: Social and Economic (SE) Management Information Tier Framework

	Social and Economic Management Dimension		
Tier	Efficiency	Equity	Stability
	Point value and IQR of change in current-year annual net profit in all primary sectors can be estimated for all changes in allocations and management measures affecting spatial/operational conditions; five-year projections can be estimated with known confidence	Point estimate and IQR of resource rent ratio (% of total resource rent generated) can be estimated for all primary asset sectors, labor sectors, and communities	- Critical threshold levels of financial operating return (OR) are estimated for all primary sectors; Point estimate and IQR of OR are available and risk of insolvency can be estimated by quartile
	Point value and IQR of current-year R_{75} in all primary sectors can be estimated (R_{75} = gross revenue – 75% of total variable operating cost)	Point value of current-year gross income ratio (% of total gross income) can be estimated for all primary asset sectors, labor sectors, and communities	Point estimate and IQR of OR is monitored for all primary sectors; normal range of interannual volatility can be estimated for all primary sectors
	Production volume and value are known; point estimates with can be inferred or projected with unknown confidence	Current distribution of revenue within and between harvesting and processing sectors can be estimated	Council is informed of impending crises by stakeholder testimony

Note: IQR refers to the interquartile range, defined as the 75th percentile value of a metric minus the 25th percentile value.

[8] In many ways this SE framework is equally applicable to the SSPT's Data Gap Analysis as the EDR revision process.

A key function of the stock assessment tiers is that each tier is associated with an OFL and ABC control rule that is calibrated to the risk/uncertainty profile associated with the information level of the tier. The control rules relate to management discretion in TAC setting. There is no obvious analogue of this function in the case of social and economic management and information. For a tier framework to have utility for the SSPTs purpose, it isn't necessary to incorporate this function, but one option to consider would be linkage of social and economic tiers to the Council's analytical template. This could take the form of specifying tier-based modules in the analytical template that correspond to analytical metrics identified for each management dimension in the tier framework. Through the course of successively completing analyses of Council actions using the analytical template, a record of performance for analyses could identify critical information gaps and priorities for improving the tier-status of one or more management units or domains would emerge.

This proposal is intended as a thought experiment for the SSPT's consideration. It is hoped that the reader doesn't fix on any particular of the working example or the dimensions and elements described above. Rather, we hope to convey the general utility of a tier system for organized thinking about information (or even organized thinking about thinking-about-information). If the purported utility is worth investigating, the tier-system framework could be the subject of a future SSPT workshop for development of working principles and initial identification of metrics and quality attributes.

5.1 Best practices

As noted above, a comprehensive review of relevant best practices is not feasible within the scope of this paper. As the review of the EDR program develops, some approach may be needed for cataloguing the most useful source materials for reference on relevant best practices in the areas of survey methodology and design, management program review, and other fields of practice. A set of exemplars of successful projects comparable to the design and analysis tasks associated with production and use of EDR data would be more directly useful than, e.g., a comprehensive bibliography. The following is a brief list of citations along those lines.

5.1.1 Survey design

Office of Information and regulatory Affairs, Office of Management and Budget (OMB). 2006. Questions and Answers When Designing Surveys for Information Collections. Revised December, 2009. Washington. p. 87; Appendices.
https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/pmc_survey_guidance_2006.pdf

Office of Management and Budget (OMB). 2006. Standards and guidelines for statistical surveys. September, 2006. Washington. p. 41. https://georgewbush-whitehouse.archives.gov/omb/inforeg/statpolicy/standards_stat_surveys.pdf

Snijkers G, Heraldsen G, Jones J, Willimack DK. Designing and conducting business surveys Hoboken, New Jersey: John Wiley & Sons, Inc.,; 2013. https://onlinelibrary.wiley.com/doi/pdf/10.1002/9781118447895

Tuttle AD, Morrison RL, Willimack DK. 2010. From start to pilot: A multi-method approach to the comprehensive redesign of an Economic Survey Questionnaire. 26(1):87.

5.1.2 Management program review

Morrison WE, Scott TL. 2014. Review of Laws, Guidance, Technical Memorandums and Case Studies Related to Fisheries Allocation. US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. https://repository.library.noaa.gov/view/noaa/4813

Pacific Fishery Management Council, National Marine Fisheries Service. 2017. West Coast Groundfish Trawl Catch Share Program Five-year Review. ver 2 ed. https://www.pcouncil.org/wp-content/uploads/2018/12/Trawl_CSR_2017_MainDoc_Final.pdf https://www.pcouncil.org/wp-content/uploads/2018/09/Trawl_CSR_2017_Appendices_Final.pdf

5.1.3 Data collection and analytical framework

Moura C. 2016. Quality Guidelines for the DCF (Draft). Scientific, Technical and Economic Committee for Fisheries (STECF). Joint Research Centre, Directorate General - Maritime Affairs and Fisheries, European Commission. https://datacollection.jrc.ec.europa.eu/documents/10213/994708/Quality+of+socio+economic+variables+described+in+EU+MAP.pdf

Carmen SE. 2016. Methodologies for the socio-economic data described in EU MAP. PGECON. https://datacollection.jrc.ec.europa.eu/docs-links/socio-eco-var

Dörner H, Casey J, Carvalho N, Damalas D, Graham N, Guillen J, Holmes SJ, Natale F, Osio GC, Rätz H-J. 2018. Collection and dissemination of fisheries data in support of the EU Common Fisheries Policy. Ethics in Science and Environmental Politics 18:15-25.

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Biemer, PP. 2010. Total Survey Error: Design, Implementation, and Evaluation. *Public Opinion Quarterly*, 74(5): 817-848.

Federal Committee on Statistical Methodology (FCSM). 1988. Measurement of Quality in Establishment Surveys. Washington, D.C.: Subcommittee on Measuring and Reporting the Quality of Survey Data, Federal Committee on Statistical Methodology, Office of Management and Budget. Statistical Policy Working Paper No. 15.

Wang RY, Strong DM. 1996. Beyond accuracy: What data quality means to data consumers. *Journal of management information systems*, 12(4):5-33.

7 Appendix A: EDR Purpose and Needs Statements

Crab EDR (June, 2002)

> T*he North Pacific Fishery Management Council and the National Marine Fisheries Service shall have the authority to implement a mandatory data collection program of cost, revenue, ownership and employment data upon members of the BSAI crab fishing industry harvesting or processing fish under the Council's authority. Data collected under this authority will be maintained in a confidential manner and may not be released to any party other than staffs of federal and state agencies directly involved in the management of the fisheries under the Council's authority and their contractors.*
>
> *A mandatory data collection program shall be developed and implemented as part of the crab rationalization program and continued through the life of the program. Cost, revenue, ownership and employment data will be collected on a periodic basis (based on scientific requirements) to provide the information necessary to study the impacts of the crab rationalization program as well as collecting data that could be used to analyze the economic and social impacts of future FMP amendments on industry, regions, and localities. This data collection effort is also required to fulfill the Council problem statement requiring a crab rationalization program that would achieve "equity between the harvesting and processing sectors" and to monitor the "…economic stability for harvesters, processors and coastal communities". Both statutory and regulatory language shall be developed to ensure the confidentiality of these data.*
>
> *Any mandatory data collection program shall include: A comprehensive discussion of the enforcement of such a program, including enforcement actions that would be taken if inaccuracies in the data are found. The intent of this action would be to ensure that accurate data are collected without being overly burdensome on industry for unintended errors.*

Amendment 80 EDR (April, 2006)

> *A socioeconomic data collection program will be implemented under the Non-AFA Trawl CP Cooperative Program. The program will collect cost, revenue, ownership, and employment data on a periodic basis. The purpose of the data collection is to fully understand the socio-economic impacts of the action, to inform future management actions, and to assure that this action serves its intended purpose and meets the goals set forth in the problem statement. Data will be used by Council and agency staff, recognizing that confidentiality is of extreme importance.*
>
> *The ownership data will be collected by vessel for enforcement of the ownership cap regulations; ownership data collection is essential to ensure that ownership caps are not exceeded. Employment data will be collected for monitoring of the community impacts of this program. Revenue and cost data by vessel and sector are essential to identify/estimate the costs associated with bycatch reduction and estimate the revenues generated to the sector, as an objective of this program is to offer sector participants the opportunity to mitigate, to some degree, the costs associated with bycatch reduction. Revenue, cost and employment data will be used to monitor the program benefits to present generations of fishermen, associated fishing sectors, including the CDQ sector, communities, and the nation as a whole.*

Amendment 91 Chinook Salmon EDR (October, 2009)

In April 2009 the Council approved Amendment 91 to the BSAI groundfish fishery FMP to reduce Chinook salmon bycatch in the Bering Sea pollock fleet. Under Amendment 91, the pollock fishery has the option of participating in a NMFS-approved Incentive Plan Agreement (IPA) to access a higher hard cap than is available in the absence of an IPA. The IPAs provide a new and innovative method of bycatch management. A data collection program is needed in conjunction with Amendment 91 to understand the effects and impact of the IPAs. The data collection program will focus on: (1) evaluating the effectiveness of the IPA incentives in times of high and low levels of salmon bycatch abundance, the hard cap, and the performance standard in terms of reducing salmon bycatch, and (2) evaluating how the Council's action affects where, when, and how pollock fishing and salmon bycatch occur. The data collection program will also provide data for the agency to study and verify conclusions drawn by industry in the IPA annual reports. To ensure that a full assessment of the program is possible, the data collection program should be implemented at the time Amendment 91 is implemented or as soon as practicable.

To ensure that a full assessment of the program is possible from the start of the program, the data collection program should be separated into two phases, with a suite of data collection measures implemented at the time Amendment 91 goes into effect and sent to the Comprehensive Economic Data Collection Committee after IPAs have been fully developed and submitted to NMFS.

Crab EDR Revision (October, 2010)

As a part of its Bering Sea and Aleutian Island crab rationalization (CR) program, the Council developed a comprehensive economic data collection ("EDR") program to provide information to analysts to assess the effects of the CR program and identify problems that may require future amendments to the EDR program.

Council review of the EDR program, development of the EDR metadata through PNCIAC and testimony from the industry has resulted in the identification of substantial portions of the EDR data that are inaccurate. In addition, several elements are wholly or partially redundant with other existing data collection requirements, and some components may not further the Council's objectives. The cost to industry, both directly through data submission, and indirectly through cost recovery funding of program administration, outweigh the benefits of the resultant data and greatly exceed estimates provided in the initial analysis of the EDR program and in the accompanying regulatory analyses.

To address these problems, the Council intends to amend the EDR process so that the data collected is accurate, informative to the Council, not redundant with existing reporting requirements, and can be reported by industry and administered at a reasonable cost.

The Council expressly wants to limit the EDR to the collection of data that have been demonstrated, through the development of the EDR metadata, and other reviews of the data, to be sufficiently accurate. Data collection should be structured and specific elements identified, to minimize costs while maintaining accuracy and providing the greatest information value to the management decision making process.

As analysts develop, refine, and verify methods for accurately collecting additional informative data elements the Council will consider expansion of the data collection program to include those

elements. This process can also inform the future Council action regarding other existing and future EDR programs.

The Council requests staff to prepare a discussion paper developing the following alternatives for Council consideration: 1) critical operational components by individual crab fishery, 2) critical operational components from all crab fisheries (aggregated across all crab fisheries), 3) critical operational components from all fisheries (aggregated across all fisheries), and 4) all operational components by individual crab fishery (similar to current data collection program).

GOA Trawl (February, 2013)

The Council is interested in developing a data collection program that can be established prior to the implementation of a trawl catch share program in the GOA. This fast-tracked data collection would provide the Council and analysts with relevant baseline information that can be used to assess the impacts of a catch share program on affected harvesters, processors, and communities in the GOA.

In developing a data collection program that can be implemented quickly, efficiently, and with minimal burden on participating stakeholders, the Council intends to prioritize the collection of information that is relevant, reliable, and for which existing data sources do not exist. Given the potential for implementation of catch shares in both the Central and Western GOA, the scope of the analysis should include participants in both management areas.

8 Appendix B: Table 4 of 'Alaska Region Economic Data Reporting Programs' discussion paper[9]

Comparative overview of EDR variables across EDR forms

EDR Variables, by general group	BSAI crab			GOA trawl / Amendment 80			Amendment 91	
	Catcher vessel	**Catcher Processor**	**Shoreside & floating processor**	**Catcher vessel**	**Catcher processor**	**Shoreside & floating processor**	**Vessel Fuel Survey**	**Compensated Transfer Report**
Vessel / plant characteristics								
Name of Cooperative	Annual	Annual			Annual			
General vessel characteristics (1)					Annual			
Value of Vessel (Plant) and equipment Note: Assessed value reported for Shoreside processors only; Replacement value reported for CVs and floating processors only	Estimated market value; replacement value	Estimated market value; replacement value	Estimated market value; Borough assessed value or Replacement value	Estimated market value; replacement value	Survey value (survey date and inclusions)	Estimated market value; Borough assessed value or Replacement value		
Fuel consumption rate, average (gal/hour)					By activity (fishing/processing; steaming loaded; steaming empty); Annual		By activity (fishing; transiting); Pollock fishery	
Freezer capacity - storage capacity (pounds) and maximum product throughput (pounds per hour)					Annual			
Processing capacity - number of processing lines and maximum throughput (pounds per hour)					By species and product; A80 and GOA Groundfish			

[9] Item D5, April, 2019 meeting of the North Pacific Fishery Management Council. Available at: https://meetings.npfmc.org/CommentReview/DownloadFile?p=1f542e61-0dfc-465e-92eb-f7f00ab70edc.pdf&fileName=D5%20EDR%20Discussion%20Paper.pdf

EDR Variables, by general group	BSAI crab			GOA trawl / Amendment 80			Amendment 91	
	Catcher vessel	**Catcher Processor**	**Shoreside & floating processor**	**Catcher vessel**	**Catcher processor**	**Shoreside & floating processor**	**Vessel Fuel Survey**	**Compensated Transfer Report**
Revenue								
Ex-vessel	Revenue and pounds, by CR fishery and quota type							
1st Wholesale		Revenue and pounds, by affiliated (y/n), crab species, product, process, and box size	Revenue and pounds, by affiliated (y/n), crab species, product, process, and box size		Revenue and pounds (includes custom processing); Annual			
Custom processing provided		Revenue, raw pounds, and finished pounds, by CR fishery, product, and process	Revenue, raw pounds, and finished pounds, by CR fishery, product, and process					
Other vessel operation income					Revenue; Annual			
LLP sale revenue					By LLP sold			
Quota royalty revenue					Shares (mt) and royalty revenue; by A80 quota species			
Capital expenditures								
Fishing gear(3)				Capitalized plus expensed value; by type (halibut/salmon excluder), Trawl gear	Annual			
Processing equipment					Annual			
Other equipment					Annual			
Other capital expenditures					Annual			
LLP purchase cost					Annual			

EDR Variables, by general group	BSAI crab			GOA trawl / Amendment 80			Amendment 91	
	Catcher vessel	**Catcher Processor**	**Shoreside & floating processor**	**Catcher vessel**	**Catcher processor**	**Shoreside & floating processor**	**Vessel Fuel Survey**	**Compensated Transfer Report**
Operating costs, non-labor (annual expenses)								
Fuel and lubrication	1) Fuel cost and gallons; Annual 2) Fuel gallons, by CR Fishery	1) Fuel cost and gallons; Annual 2) Fuel gallons, by CR Fishery		Fuel and lubrication cost and fuel gallons; Annual	1) Fuel cost, lubrication cost; Annual 2) Fuel gallons, by activity (fishing/processing; steaming loaded; steaming empty); Annual		Fuel cost and gallons; Annual	
Food and provisions	By CR fishery	By CR fishery			Annual			
Bait cost	By CR fishery	By CR fishery						
Vessel and equipment - repair and maintenance costs					Annual			
Vessel and equipment - lease costs					Annual			
Fishing gear - purchases, lease, repair costs (excluding finance costs)					Annual			
Freight, storage, other sales costs for non-FOB sales					Annual			
Freight and storage other than for products					Annual			
Product and packaging materials					Annual			
Observer / monitoring fees					Annual			
Cooperative fees					Annual			
General Administrative Cost					Annual			
Insurance					Annual			
Fisheries landing taxes					Annual			
Raw fish purchases from other vessels, quantity and cost		By CR fishery and quota type	By CR fishery and quota type		Annual			
QS/PQS lease amounts and cost	By CR fishery and quota type	By CR fishery and quota type	By CR fishery and quota type		By A80 quota species			Chinook PSC; by compensated transfer

EDR Variables, by general group	BSAI crab			GOA trawl / Amendment 80			Amendment 91	
	Catcher vessel	**Catcher Processor**	**Shoreside & floating processor**	**Catcher vessel**	**Catcher processor**	**Shoreside & floating processor**	**Vessel Fuel Survey**	**Compensated Transfer Report**
Custom processing purchased - quantity and revenue		By CR fishery, product, process	By CR fishery, product, process					
Utilities (municipal) - water quantity and cost						Gallons and cost, by month; Kodiak plants only		
Utilities (municipal) - electricity quantity and cost						kWh and cost, by month; Kodiak plants only		
Labor cost and employment								
Labor cost - harvesting (4)	Final settlement paid, total by crew-type (fishing crew; captains) and CR fishery	Final settlement paid, total by crew-type (fishing/processing crew; captains) and CR fishery		Final settlement paid, total by crew-type (fishing crew, captains); GOA trawl	Gross wages, total by crew-type (deck crew; other non-processing crew); Annual			
Labor cost - processing (5)		Combined with harvesting labor cost	Gross wages and hours; by CR fishery		Gross wages; Annual	Gross wages and hours, by month and housing-status (housed, non-housed); Groundfish only		
Labor cost - Other personnel(6)			Total wages and salaries, non-processing personnel; Annual			Total wages and salaries, non-processing personnel; Annual		
Labor cost - total vessel labor	Total direct payment to crew (inclusive of settlements); Annual	Total direct payment to crew (inclusive of settlements); Annual						
Labor cost - non-wage expenses	Benefits provided (Y/N), by crew-type (fishing crew; captains); CR Crab	Benefits provided (Y/N), by crew-type (fishing crew; captains); CR Crab			Total benefits, recruitment, travel, and non-wage employment costs; Annual			
Employment - harvesting				Count of paid crew (excluding captains); GOA trawl	Employee count and average positions, by crew-type (deck crew; other non-			

EDR Variables, by general group	BSAI crab			GOA trawl / Amendment 80			Amendment 91	
	Catcher vessel	**Catcher Processor**	**Shoreside & floating processor**	**Catcher vessel**	**Catcher processor**	**Shoreside & floating processor**	**Vessel Fuel Survey**	**Compensated Transfer Report**
					processing crew); Annual			
Employment - processing			Employee count, by location of residence; CR Crab and Annual		Employee count, average positions, and average hours per employee-day; Annual	Employee count, by month; Groundfish fisheries		
Employment - other non-processing			Employee count; Annual			Employee count; Annual		
Employment - Crew licenses and permits	License/permit number, by crew member; CR Crab	License/permit number, by crew member; CR Crab		License/permit number, by crew member; GOA groundfish	License/permit number, by crew member; Annual			
Crew share system in use					Y/N, by some/all, processing/non-processing; Annual			
Other operational data								
Active days - fishing/processing					By activity (fishing; processing) and fishery (A80, GOA groundfish, other)			
Inactive days					Annual			
Travel/offload days					Annual			
Did vessel perform tendering?	Y/N; Annual							