Lessons Learned on Preparing and Managing Mixed Mode Surveys

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Abstract

Preparing for and managing the collection of surveys using multiple modes and ensuring the resulting dataset is of appropriate quality is the challenge faced by all survey organizations. Often the goal is to program one instrument that works both for interviewer-administered and self-administered survey procedures. However, developing one instrument for multi-modes poses nontrivial challenges for questionnaire design (i.e., how the question is asked), instrument design (i.e., visual layout) and programming (i.e., complexity of programming and data processing). In addition there are many challenges related to the technical systems for managing the operational issues of sample and survey management with multiple modes. Multiple modes clearly add complexity to the entire process.

This brief paper outlines some of the challenges and practical approaches taken for handling an integrated approach for multi-mode survey collection. Specifically, we discuss some of the challenges in designing and implementing technical systems to support the complex methodological and operational approaches in these situations.

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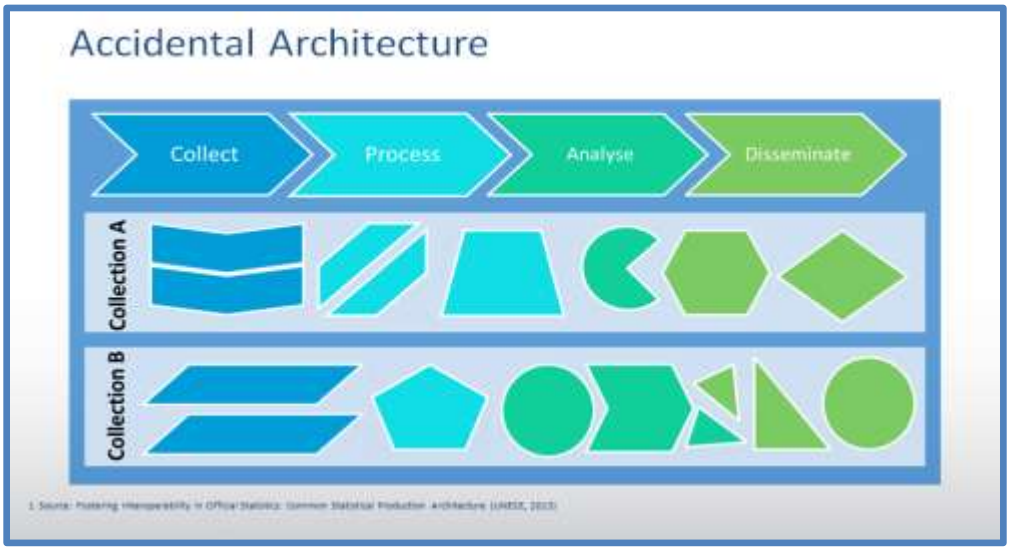
Introduction

More than 10 years ago, Edith de Leeuw (2005) stated that *"One of the most important challenges to survey researchers is deciding which data collection method or mix of methods is optimal…"* Since that time, there has been a steadily increasing literature documenting the need for and advantages of mixed mode data collection. Among other objectives, mixed mode surveys have demonstrated effectiveness in containing costs and in reducing certain types of errors in surveys. A mail survey can significantly reduce coverage error in data collection, and it has been shown repeatedly that an interviewer-administered survey is expected to obtain a higher response rate than a self-administered survey (Dillman, de Leeuw). Many major survey programs – the American Community Survey (U.S.), the Health and Retirement Study (U.S.), Labor Force Survey (UK), and the European Social Survey – have used or experimented with using and testing mixed mode data collection designs.

As the increased level of effort to effectively contact and engage respondents in survey requests continues to put pressure on research organizations to find more efficient methods for collecting complex human measures, we quickly learn that less well documented are the implications of mixed mode designs on the technical systems required to carry out these projects. Implementation of mixed mode design requires not only early planning and careful consideration of both operational and methodological design decisions in order to properly manage data collection protocols in production but also a thoughtful design to report and evaluate the protocol effectiveness during collection. The push to create integrated measurement protocols -- surveys collected by phone, in-person or self-reports on the web -- create unique challenges for survey managers, software developers, data managers, and IT professionals. Many survey organizations began collecting mixed mode surveys without a full set of technical tools, or an integrated solution. This 'accidental architecture' as labeled by the United Nations Economic Commission for Europe (UNECE, 2013), and further described recently by US Census Bureau (Thieme and Mathur, 2014) ultimately proves to be insufficient for sustainable collection procedures with complex surveys across multiple modes.

Illustration 1: Accidental Architecture



This short paper describes some of the primary design issues associated with mixed mode survey questionnaires and the implications of those design features on technical systems. We also end with a short summary of the newest integrated survey management system used by the University of Michigan, Survey Research Center, for multi-mode data collection projects.

Study Design Considerations

There are two areas of study design that we will address separately. The first is the overall data collection protocol, and the second is the delivery of the sample. The data collection protocol is a complex set of decisions that are ideally made prior to the development of any technical systems. The most important decision is probably the modes in which the survey will be available to the respondent, but even that decision has numerous design questions which need to be answered:

- What mode will be used to contact the respondent?
- Will contact attempts be made in multiple modes?
- Will the mode be assigned to the sample unit or will the respondent have a choice?
- What order will the modes be available to the respondent?
- If a less expensive mode is used first, when will the switch be made to the other mode?
- After the switch, would the respondent still have the option of completing the questionnaire in the first mode?

These basic decisions will drive the specification for the technical system. The more options available to the respondent, the more complex the specification. As surveys continue to implement more sophisticated techniques for cost management and the reduction of errors, technical systems are pushed further to manage these complexities. The use of propensity models, adaptive designs, or sub-sampling allow for more controlled follow up of sample for reduced costs or errors, but in turn, add complexity to the technical requirements and demands on the technical solution implemented for the survey. Finally, the supervisory structure and size of the field staff may also require unique features in the technical systems.

Delivery of the sample is the second area to consider in study design. Ideally a technical system would be flexible enough to handle sample in various formats and from multiple frames. The advantages of mixed mode designs may result in more complex sample designs, for example a combination of address-based sample and telephone-based sample. A panel study using a list sample may elect to add a cohort from an address-based screening initiative. The technical system must be able to integrate these samples, keeping track of the mode of data collection, and ideally be able to report on them both in aggregate and separately and in timely manner. Additional questions related to sample delivery include:

- Will there be multiple sample releases or sample replicates?
- How are cases assigned to interviewers?
- Does the interviewer need the capability of transferring a case?
- If the respondent makes a request, can the interviewer assign the case to another mode?
- Does a case need to be available in concurrent modes (e.g., web and CATI)?

These are only a subset of the design questions that need to be answered prior to the specification of technical systems. Design features such as the use of respondent incentives, inclusion of biomarkers, refusal aversion protocols, the need for respondent signatures, or any other design feature will have an impact on the management system.

Instrument Development Considerations

Instrument development in multiple modes has a unique set of challenges and perspectives. There are certain design issues that are unique to uni-mode development, that is, trying to design a single data collection instrument that can be used in multiple modes. The issues are different, however, if a researcher is attempting to adapt an existing questionnaire from one mode to another. Furthermore, there are varying perspectives on the objectives of mixed mode design. Some approach this issue with the view that questions should be kept as similar as possible across modes, supporting the principle of standardization that all respondents should be presented with an identical stimulus. Others believe that it is better to optimize each mode, writing questions specific to that mode, with the goal of collecting comparable data across modes.

Here we will provide an overview of multi-mode instrument design from an IT perspective, we will briefly discuss questionnaire design considerations and the use of various devices for completing self-administered surveys, and again, we will focus on how these complexities impact the requirements for technical management systems.

Looking at the overall development and implementation required to support a multi-mode data collection protocol, again we are struck by the complexity, and particularly by how much complexity is introduced at the instrument development stage. Questionnaire design, instrument testing, device testing, reporting, and integration with the sample management system all create demands on the software and systems we rely on for implementation. Illustration 2 attempts to expose at least four main focal areas:

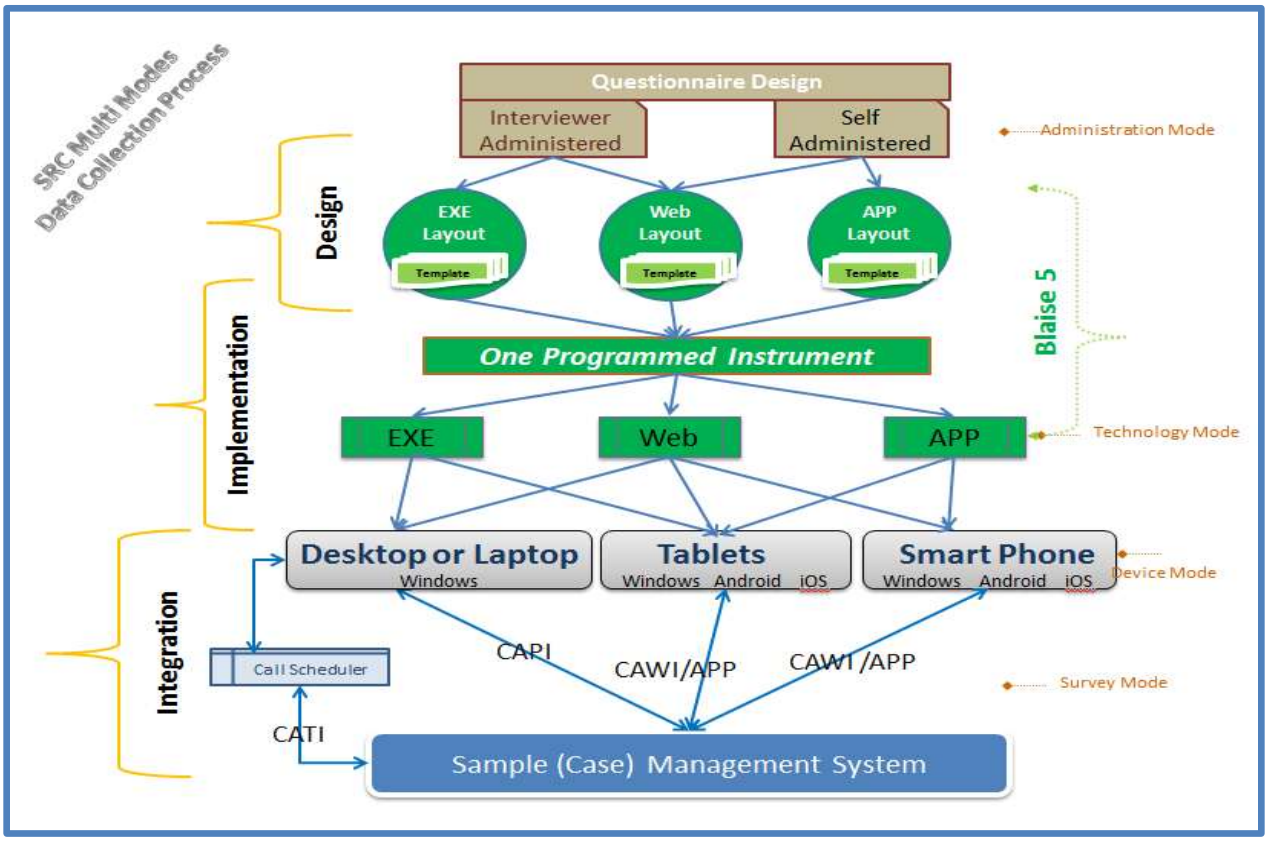
1. Questionnaire or instrument design – There is a basic decision to make about whether data collection will be self-administered, interviewer-administered, or both. Question wording and layout decisions will depend upon this decision.

2. Programming the instrument(s) and the technical approach for delivery – Software selection and the decision about whether to create one instrument or multiple instruments will be critical information to exchange seamlessly with the sample management system.

3. Integration of the various hardware environments – This involves working within an existing hardware infrastructure, or may involve hardware selection decisions which are still within the control of the researcher. For web surveys, however, there are greater considerations related to hardware as the researcher does not have control over the device with which a respondent may decide to complete a questionnaire.

4. Sample management functions – That is how to facilitate the data exchanges and output for reporting. Reporting requirements can be extremely complex and possibly simplified by using a data warehouse approach. (This paper does not address this topic.)

Illustration 2: Multi-Mode Data Collection Processes with IT Lens



Questionnaire Design Issues

As mentioned earlier, questionnaire design considerations may differ depending on whether the objective is to adapt an existing instrument into a new mode or to develop a new instrument to be used across modes. In either situation, however, each survey question must be evaluated to determine if it will work across modes, if it can be adapted to fit both modes, or if it does indeed need two different designs and/or layouts. We provide examples of only a few of the questionnaire design considerations that we face most frequently; we discuss these in the context of adapting an interviewer-administered questionnaire for self-completion in the web mode.

- **Interviewer instructions** – The researcher needs to make a decision about how to handle instructions that were intended only for the interviewer. These may include how to respond if a respondent volunteers an answer outside the code frame, or how to "field code" what appears to the respondent as an open-ended question. With the knowledge we have from web surveys about how much information can be presented on the screen, these issues can pose significant challenges, especially when the researcher is trying to maintain the comparability of data across modes.

- **Help text/definitions** – The literature on web surveys (Couper, 2008) also informs us that respondents are unlikely to seek help or click on definitions, even when they are made available in web surveys. This poses the question of whether to present this information to respondents. We equip the interviewer with these resources if necessary, but adding the detail to every question would likely have an adverse effect on survey length, respondent burden, and completion rates.

- **Optional text (usually in parenthesis)** – Many interviewer-administered surveys include text that does not have to be read to the respondent unless needed. This may include the repetition of a reference period, a stem question, or a response code frame that is being used repeatedly. The researcher must decide how best to have this information available to the respondent at any point in a web survey without increasing respondent burden.

- **Item missing data –** A common struggle in multi-mode questionnaire design relates to whether or not to present "Don't Know" and "Refuse" options. In interviewer-administered surveys, it is common to record these answers when volunteered by the respondent, but not to offer them explicitly, because offering them is likely to increase the likelihood that they are selected (thereby increasing the rate of item-missing data). In a web survey, we do not want to offer the categories for the same reason, but without them, it is impossible to know whether a respondent skipped a question intentionally or inadvertently.

- **Grids --** There are instances where a grid design increases efficiency for interviewers and for respondents, but the design, layout, and length of grids needs to be considered carefully within the context of the survey, and the devices on which the survey might be completed.

These decisions affect not only the complexity required of the technical systems, but also the resulting data quality. In the case of item-missing data, it is not difficult to measure the mode-effect being introduced by a multi-mode design (the technical system should be designed to capture and report this information), but that can be more difficult to assess in other situations. An invaluable feature of survey software is the ability to designate the mode of administration and call out to the appropriate layout when the question is administered by an interviewer and when it is self-administered. However, even with this feature, there are still constraints on question design and layouts due to the underlying data structure.

There are additional design considerations that affect both the programming needs and the data quality. One example is the navigation of gate questions. Gate questions are questions that guide significant substantive paths through a questionnaire, and they are critical to the data. The researcher can decide to "prompt" a respondent to complete a gate question that is skipped in a self-administered survey, but this option needs to be used with discretion so as not to annoy the respondent, and lead to increased break-offs from the survey. Other items related to navigation include whether or not a respondent is allowed to back up in a questionnaire, and if so, are any previous responses retained or deleted as the respondent moves forward again.

One of the most common issues in mixed mode design discussions these days relates to the device with which a respondent chooses to complete a self-administered questionnaire. Desktops, laptops, tablets, and smart phones each present a new consideration for the designer, and the complexities are multiplied as different browsers and operating systems are introduced. These growing options for respondents have costly implications for design, programming, testing and integration of survey instruments. Researchers may decide to limit respondent options in this regard, but they are likely to introduce other errors if they make this choice.

Even after the questionnaire design decisions are made, there are still decisions about how best to implement these decisions. The technical team will need to work collaboratively with data managers and programming staff to consider whether it is optimal to create separate or integrated instruments. This will depend on the length and complexity of instruments, how many design decisions vary by mode, and how difficult the data harmonization process will be. Taking the underlying data architecture into account in the design phase will facilitate reporting capabilities and data management on the back end. It is also critical to consider what paradata are being collected and how those data are being used.

Mixed mode designs have greater implications regarding technical infrastructure as well. Web survey administration requires immediate communication with servers where CAPI administration does not. Web surveys have further considerations related to the speed and performance of the instrument which, again, expands the testing task as options for devices and operating systems increase. If the respondent is allowed to switch between modes, that is, to start the survey in one mode and complete the survey in another, additional features need to be added and tested. This is also true if a survey is using auxiliary systems for data collection, calling out to other programs for additional data collection.

All of these systems require the integration of features for managing the various components of the data collection design with the features required to manage and monitor the performance of the sample. Furthermore, reporting features must be integrated and tested in order to provide the management tools that will be critical as soon as production begins.

Technical System Considerations

It is clear that every design decision has implications for the technical systems required to manage a project, and that the complexity increases exponentially as features are added, developed, tested, and integrated with one another. What poses an even greater challenge is the creation of a system that is flexible enough to accommodate multiple projects with varying levels of complexity. The remainder of this paper focuses on developmental work being carried out at the University of Michigan Survey Research Center for the purposes of survey and sample management. We talk first about information management needs, other system requirements and proposed solutions. Then we will describe our work related to the development on the Michigan Survey Management System (MSMS) and some of its specific capacities.

An integrated management information system for handling mixed mode data collection projects must include features for both sample management and survey management. The sample management functions must include control of preload data, sample releases, sample replicates, mode, interviewer assignment, case transfer, and closing cases. Integrated systems are also required to manage all process functions related to the data collection including prenotification, respondent communication, administration of the survey itself, other study protocols (e.g., biomarkers, neurocognitive testing) logging receipt of materials, and the status of these activities at both the case level and the task level. Finally the systems must work together to maintain reporting capacity that is flexible to enough to monitor production rates in aggregate or broken down by any of the subgroups mentioned above.

System Requirements and Solutions

In order to execute all of the functions that have been described thus far, the following features are desired:

- The system should be able to support mixed- and multi-mode protocols in one project. This terminology may not be universally understood, but the issue speaks to the capacity for a project to have cases assigned to given modes and to use multiple modes within a single case; the protocol can include sequential or concurrent modes.
- All protocols should be automated to the greatest degree possible so that they can be repeated and applied consistently across respondents, interviewers, iterations of reports, etc.
- Survey management and sample management capabilities should be integrated into a single system.

- The system should accurately reflect survey management process, that is, the steps required to complete a successful data collection should be apparent to the user.
- Ideally, a well-integrated system would ultimately reduce the effort required to collect data, resulting in efficiencies in either time or cost, or both.
- Minimize application recompiles and deployments.

As we work toward the full development and implementation of this system, we have found the following solutions to be effective in meeting our objectives:

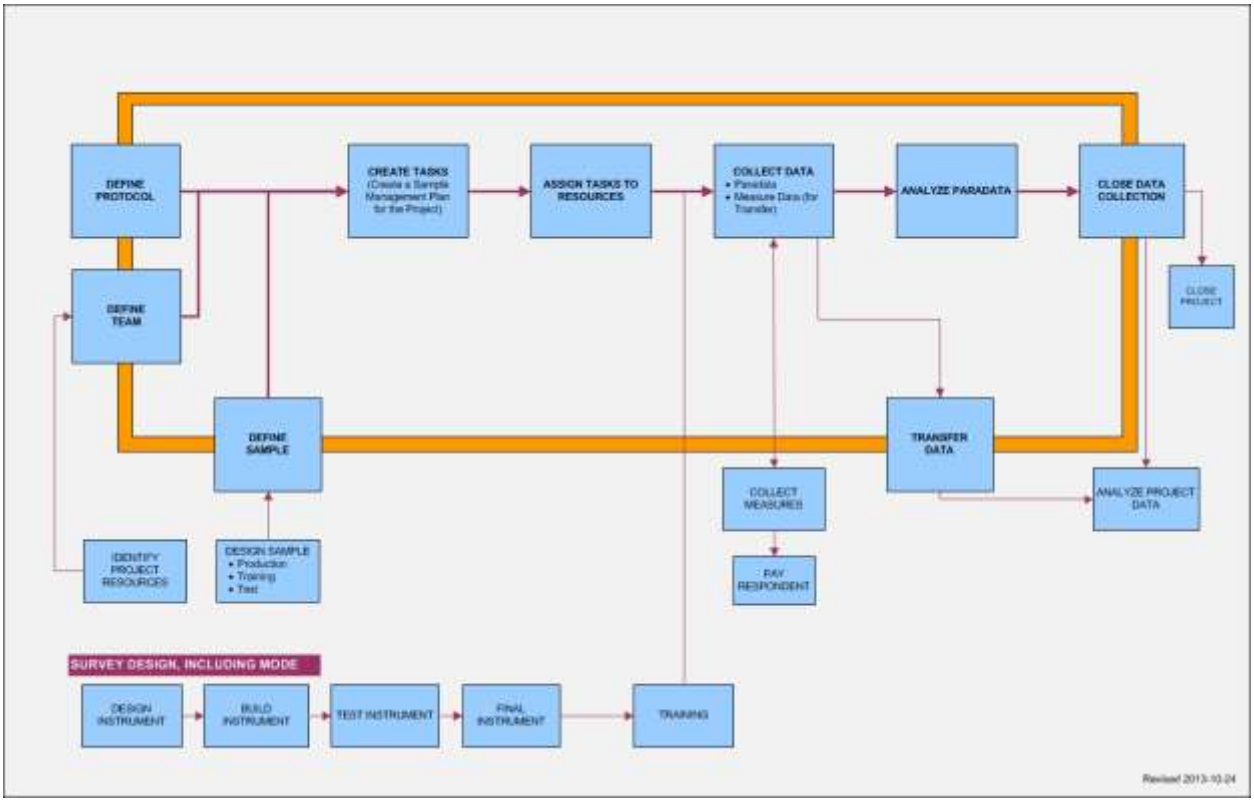
- We have implemented automated rules sets that can be applied to important process steps, e.g. task rules.
- We have adapted a task-level structure throughout system.
- The system is characterized by its interrelated set of applications and services.
- The system architecture reflects business objects and their relationships to one another.
- Project implementation is operationalized through configuration files instead of through changes to compiled code.
- Project-level configuration is intended to provide a balance of standardized and customized features.

Michigan Survey Management System (MSMS)

The Michigan Survey Management System (MSMS) is an integrated survey management information system for handling mixed mode data collection projects, across all users – respondent self-administered, interviewers (telephone or field) and external collection activities such as verification call backs or managing follow-up contacts (e.g., scheduling phlebotomy appointment, etc.). MSMS reflects a change from using a sample-based framework, or case “ownership", to a task-based system which allows for greater flexibility of task assignments across users. It provides users with concurrent access to sample information such as call records and contact history (capturing both in-bound and out-bound contact attempts) rather than limiting that information to the interviewer to whom a case was assigned. As an example, the system can be used to sequentially send an advance prenotification letter to the respondent, send an email invitation to participate in a web survey, prompt the interviewer to make a non-response reminder call, send a reminder email message and deploy the survey instrument in either the CATI or web mode.

The illustration below reflects basic survey design and flow. The thick orange line defines the boundaries of MSMS and external processes or systems. The survey process was evaluated closely to inform this new IT management system.

Illustration 3: Survey Process Diagram



MSMS Customization

The Survey Research Center routinely conducts multiple projects concurrently, and we are likely to have as many unique designs as we have projects in production. It is important to be able to generate standard metrics to monitor progress that work across projects, but it is equally important to be able to tailor technical systems to meet the unique requirements specified in any data collection protocol. We have worked hard to achieve the optimal balance of these two needs. The MSMS configuration allows each project to use and show the attributes appropriate to its protocol. To support an environment of continuous improvement, the system has been created such that protocols can leverage and improve upon what has worked well, without affecting other projects. MSMS applications have designated regions within which projects can define the content that best suits their needs. This definition is done using configuration files that are changeable throughout the project without redeploying the application.

Finally, to meet the needs of survey researchers today, it is essential that technical systems be developed to provide access to process data (paradata). Examination of these data can inform decisions and guide the trade-offs during the data collection, but for this to be effective, the paradata need to be available to the research in a timely manner. The development of a mixed mode technical management system should facilitate access to paradata that might inform production decisions such as when to switch modes or other aspects of responsive design. This might include access to actual survey measures, as it may be of interest to examine the effects of mode on survey estimates, and it may include access to process data in addition to the more traditional key stroke files that come to mind when we think of paradata.

Closing Summary

Robust data capture software systems which provide options for multi-mode, cross platforms and devices, self-administration and interviewer- administration provide great opportunity for complex survey and ancillary data collection. As we continue to develop and test these systems, it is useful to embed small experiments where possible to further inform the development of the systems as well as the data collection protocols themselves. It is also important to emphasize the need for built-in flexibility as the increasing growth in technology will continue to present us with both challenges and opportunities.

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