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"Haven't We Always Been Doing Mixed Methods Research?": Lessons Learned From the Development of the Horseless Carriage

Michael D. Fetters[1]

Recent authors have examined the origins of mixed methods research arguing that it is actually nothing new, and that current interest in mixed methods research is little more than a fad. For example, Pelto (2015) illustrated that anthropologists have used qualitative and quantitative methods together for more than 80 years, claimed that mixed methods research was nothing new, and questioned the excitement about mixed methods as an emerging methodology. The fields of social psychology (Festinger, Riecken, & Schachter, 1956; Milgram, 1974) and sociology (Jahoda, Lazarsfeld, & Zeisel, 1971) as well have had a history of combining qualitative and quantitative methods in single programs of research. In this issue, Maxwell traces evidence for combining qualitative and quantitative data back for centuries, and provides examples from the natural, social and health sciences traditions. (Maxwell, 2016) Also in this issue, Ramlo traces Q methodology to 1935 (Ramlo, 2016). Undoubtedly, combining qualitative and quantitative methods has occurred in other fields as well prior to emergence of the term *mixed methods* in the late 20th century. While there is clear evidence that using qualitative and quantitative data collection procedures together is not new (Teddlie & Johnson, 2009) during the early- to mid-20th century, mixed methods research never had a full chance to develop fully because of the power and ascendency of other paradigms, especially in the social and health sciences, that controlled how research was conducted and written. Regarding mixed methods research as a fad, one observer found difficulty in identifying anything novel about mixed methods research, and concluded that it was, ''arguably yet another in a long line of methodological trends in vogue in the guise of methodological innovation'' (Sandelowski, 2014, p. 3).

It strikes me that arguments claiming mixed methods research has been around for a long time, and it is just a fad, are a bit incongruous. To consider the critique of mixed methods research as ''not being novel,'' here I reflect on the development of the modern automobile from humble beginnings as a ''horseless carriage'' when a simple engine was connected to a carriage essentially designed for a horse, to consider the current state of mixed methods research. I extend the discussion about the roots of mixed methods research in a premodern era and describe the transition to the field of modern mixed methods research. Using lessons learned from analogies to innovations in the horseless carriage, I introduce ideas that will suggest continuous innovation in the field of mixed methods research.

[1]University of Michigan Medical School, Ann Arbor, MI, USA

Corresponding Author:
Michael D. Fetters, Department of Family Medicine, University of Michigan Medical School, 1018 Fuller Street, Ann Arbor, MI 48104-1213, USA.
Email: mfetters@umich.edu

As illustrated in Figure 1, I believe developments from the premodern period of the horseless carriage and mixed methods research to have many commonalities. While their histories differ by nearly a century, their trajectories from pre-modern to modern periods are remarkably similar. Both had many decades of tinkering, development and pockets of incremental successes before a period of accelerated development. For the horseless carriage, in the latter half of the 19th century, these efforts occurred in multiple countries and by pioneers of various walks of life such as Cugnot (self-propelled vehicle), Lenoir (internal combustion engine), Delamare-Deboutteville (gas-powered vehicle), and Benz and Otto (four-stroke combustion engine). Despite pockets of innovation, these pioneers worked independently. It would take some time before their efforts became systematic and the rudimentary horseless carriage would transform into the modern automobile.

Birth of Modern Mixed Methods Research

The 1980s, 1990s, and post 2000 provided a new intellectual and practice environment where mixed methods research could be ''born'' fully, and systematically articulated and developed. By the turn of the millennium, the time had come for mixed methods research. Numerous pioneering authors were laying out the modern mixed methods in multiple fields such as psychology (Cook & Reichardt, 1979), education (Jick, 1979; Rossman & Wilson, 1985), anthropology (Bernard, 1988), management research (Bryman, 1988), evaluation (Greene, Caracelli, & Graham, 1989), sociology (Brewer & Hunter, 1989; Fielding & Fielding, 1986), nursing science (Morse, 1991), family medicine (Miller & Crabtree, 1992), educational psychology (Creswell, 1994), social psychology (Tashakkori & Teddlie, 1998), and sociology and psychology (Kelle & Erzberger, 1999). After decades of tinkering, these pioneers were accelerating procedures and ideas about how to combine qualitative and quantitative methods. The idea of intentional linking of qualitative research with quantitative research with clear intentions for integration not only in an applied way, but also through systematic methodological approaches emerged rather simultaneously. Through writings illustrating various techniques and procedures, these modern day innovators began systematically considering the possibilities for linking the qualitative and the quantitative together.

Reaction to Early Innovations

What was the initial reaction to developments of the early horseless carriage and combining qualitative and quantitative data a century later? A mix of enthusiasm and skepticism seems a fitting description (Ramlo, 2016). In both cases of the horseless carriage and of mixed methods, there was skepticism within the broader community; the best applications were unclear, and questions about compatibility abounded. What would be the applications of a horseless carriage—to carry people or cargo, or to pull other wheeled vehicles? Where would one possibly operate them? Similarly, early on, in mixed methods it was difficult to link the qualitative with the quantitative because of the popularity of quantitative research as the scientific and most reputable approach to empirical research, especially in the United States. Underlying philosophies, sampling assumptions, and analytical approaches in mixed methods, to name a few, seemed disparate, incompatible and irreconcilable to others. What would the applications of mixed methods research be, developing instruments, improving trials, and developing and explaining theories?

Parallels in Design

In both cases, the optimal designs and names for these designs were unclear. Would the horseless carriage be open, closed, or a convertible? Would designs combining qualitative and

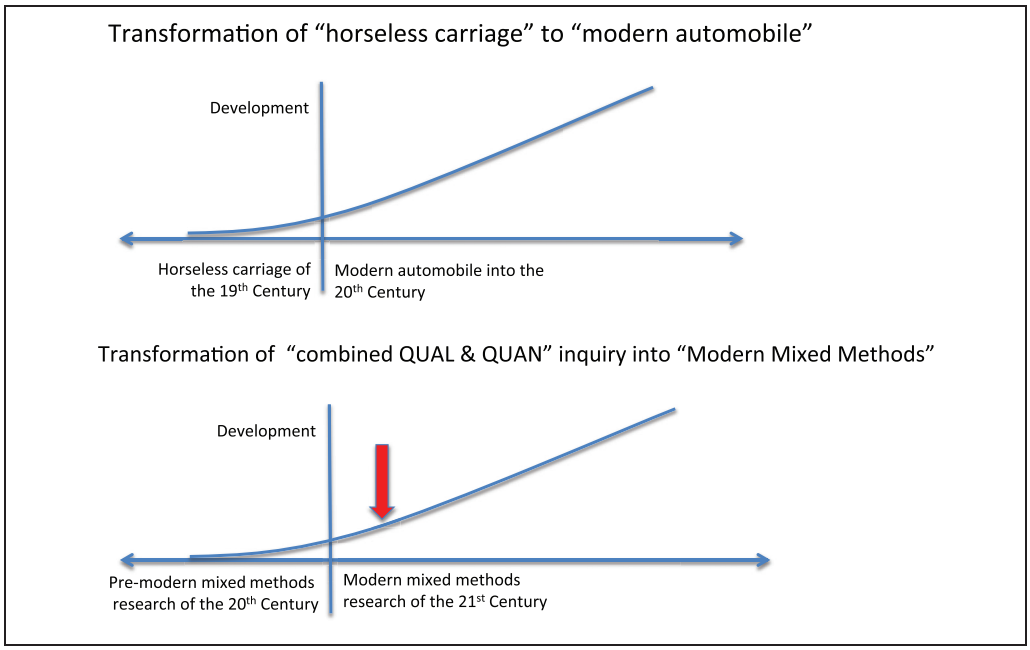

Figure 1. Similarities in the development of the automobile and mixed methods research.

quantitative research be triangulated, embedded, sequential, concurrent, conversion, multilevel, and so on? Successful designs would need to link the carriage with the engine, and the qualitative with the quantitative.

Parallels Between the Carriage and Traditional Qualitative Research

The carriage was already a proven innovation as it had extensive utility. It was a powerful mechanism for traveling that was flexible, and could carry people, pets, and parcels. A ride in a carriage took its passengers on journeys. Sometimes the journeys took participants down well-worn paths, but there were many paths off the beaten track also accessible to carriages of various sorts. From their rides in carriages, passengers developed their own stories. Some journeys were more remarkable and colorful than others, such as tires going flat, being stuck in the mud, or dealing with inadequacies of road conditions. When several passengers rode together, there were common elements of their stories, yet each had a different perspective, experience and rendering of what was seen, what was not, and what it meant. Each person had a unique perception and story about the ride. Despite its strengths, the horse drawn carriage had limitations, especially with its driving range limited to a small community.

Parallels Between the Engine and Traditional Quantitative Research

The engine also was already a powerful tool and proven innovation. Based in mathematics and engineering, it harnessed the power of numbers. It was characterized by the need for precision, reliability, and reproducibility. It had many applications in driving various kinds of equipment in factories, or in pumping water. It was a critical element in the industrial revolution. Yet one only needs to examine an early internal combustion engine (take a look at the Henry Ford Museum in Dearborn) to appreciate the development from a hunk of pipes and gears, to the

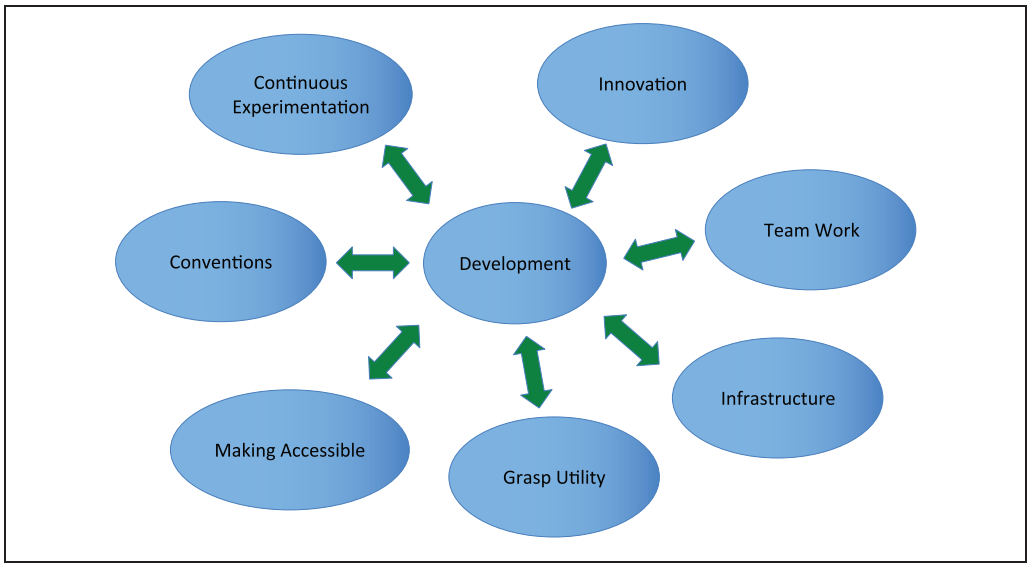

Figure 2. Elements common to development of modern automobile and mixed methods research.

efficient, sophisticated engine of today, which retains many similar features but has completely transformed since the original basic conglomeration of metal.

Comparison of Transmission and Integration

The transmission was a critical mechanism to link the carriage and the engine. Without the transmission, there was no horseless carriage. While early applications worked, many major and minor innovations were to come. Transmissions evolved and innovations led to variations in the clutch and the automatic transmission. Modern mixed methods now has multiple equivalents to the transmission of the horseless carriage that allows linking the qualitative and the quantitative data, such as data reduction, joint displays, data transformation, data correlation, data consolidation, data comparison, and data integration (Johnson & Christensen, 2000). Integration is the innovation linking the qualitative and the quantitative, and the basis for bringing together the methods for mixed methods studies.

Lessons Learned

So, what lessons can be learned from these analogies? Figure 2 illustrates elements common to development of the modern automobile and modern mixed methods research. Beginning at the top, there is innovation. Starting with the idea of linking the carriage with the engine, starting with the idea to integrate the qualitative with the quantitative—both share innovation. One only need look at the variety of alternatives to the gasoline combustion engine that are emerging—hybrids, battery-operated vehicles to say the least. Integration ideas also are fueling the growth of mixed methods.

Teamwork

Teamwork is a critical element to both. The horseless carriage developers needed teamwork on multiple fronts. For example, innovations in the horseless carriage required carriage developers, engine developers, transmission developers, chemists for materials, and interior/exterior

designers. Similarly, mixed methods research teams may, and often should, have useful combinations of qualitative, quantitative and mixed methods researchers, as well project coordinators, and research assistants.

Infrastructure

Expansion and development requires an infrastructure. The emerging horseless carriage needed production facilities and trained innovators and laborers. It required new venues for operating, for example, roads, petrol stations, as well as signage, signals, and laws to inform approaches. Likewise, mixed methods research needs universities to develop the procedures and to train budding researchers, and the infrastructure needs dissemination venues. These provisions have become realized through rapid growth in books, journals, professional organizations and meetings, and tools for analyzing such as software that allows sophisticated analytics.

Awareness

The horseless carriage needed to evolve and to offer value for it to become meaningful for the ''average'' person. Henry Ford's vision of developing mass production capacity transformed awareness and accessibility such that automobiles became available to many. Similarly, the value of mixed methods research was not promulgated successfully by early researchers. Development needed to move beyond a few disciplines and professions, for example, anthropology, social psychology, and evaluation, to multiple other disciplines and professions. With time and accessibility, awareness of the power of mixed methods followed.

Accessibility

Making the automobile accessible to others was accomplished through an international movement, for example, in the United States, Olds and Jeffery, Ford, Durant, Chrysler, Firestone; in Japan, pioneers such as Toyota, Mitsubishi, Honda; in France the Peugeot and the Renault Brothers, while in the United Kingdom, Simms. There is clearly an international mixed methods research movement as well. Europe has seen great activity in the United Kingdom by Bryman and O'Cathain, in Switzerland by Bergman, in Spain by Molina-Azorin. Onwuebugzie and de Lange have embraced the lead on promotion of mixed methods research in Africa. In Australia, Andrew, Halcomb, and Bazeley have taken a lead, while in Japan, active supporters have included Kakai and Inoue. In North America, Pluye and Poth of Canada as well as Tashakkori and Teddlie, and Johnson and Onwuegbuzie in the United States. Creswell and Plano Clark's and Mertens's work has reached the four corners of the world. Certainly not an exhaustive list, there are many others, too.

Conventions

Once the number of automobiles increased, the need for conventions for driving developed as well. The new technology required conventions about which side of the road to drive on (the lack of international agreement duly noted), a need for maintaining order when there were multiple vehicles in operation. This prompted the need for traffic signals, and a new lexicon and visual clues. With expanded development and use, mixed methods research also needed conventions for conducting the work, conventions for integrating, and a lexicon and visual means for describing the procedures to name a few.

Experimentation

A final analogy is the need for continuous experimentation. Well over a century since the automobile took on the fundamentals of its current form, the automobile continues to evolve through

research and development. In the past decade, modern hybrid automobiles have made their debut. Pure battery vehicles and expanded technology in batteries have come along as well. Even self-driving vehicles have made their debut. Who would have imagined self-driving vehicles as the horseless carriage pioneers were building transmissions to link the carriage and the engine? In mixed methods, new innovations are occurring in the procedures for conducting studies, in the philosophy behind the methodology, in the various approaches for integrating qualitative and quantitative results, and in the types of publishable papers that result from a study, to name a few.

Current State of Mixed Methods Research

Like the early automobile, which was a true step beyond the horseless carriage, modern mixed methods retains some quirky, inefficient, and imperfect features, *but it has clearly moved beyond historical roots* of just collecting and analyzing separately qualitative and quantitative research. While uptake has been slow, (Bryman, 2007), integration increasingly is now the hallmark and innovation that has modernized and come to characterize the horseless carriage of merged qualitative and quantitative research. Arguably, without integration, the bringing together of both forms of data for comparison and merging for possible outcomes of confirmation (a.k.a., triangulation) expansion of understanding (a.k.a., initiation) or identification of conflicting results, there is no mixed methods research. Like the automobile that evolved from the horseless carriage in the early 20th century, I believe that the applications, strengths and power of mixed methods research of the 21st century has only just begun to emerge! Already integrated designs, sampling procedures, data collection procedures, analytical procedures, and philosophical foundations have evolved. Strategies for writing and funding effective mixed methods proposals have emerged. (Wisdom & Fetters, 2015) These developments signal optimism for the continued development of mixed methods, particularly given rapid developments in software (Guetterman, Creswell & Kuckartz, 2015).

The Inspiration for Optimism

My inspiration for optimism about continued advancement in mixed methods comes from developments from other fields. My colleague John Creswell points out the example of the Pearson correlation coefficient with multiple regression. One might argue, ''We have always been doing regression, and certainly the Pearson correlation coefficient is part of regression analysis.'' But with regression and correlation we have vastly expanded available procedures, e.g., structural equation modeling, logistic regression, hierarchical linear regression. As for a parallel in a qualitative tradition, Margaret Mead in Samoa studied adolescents through observations and interviews. One might argue we have always been doing ethnography, but there is a far stretch between ethnographic fieldwork and analysis today compared to the early days of observation and interviewing by Margaret Mead.

What Are the Innovative Features of Mixed Methods Research?

In *JAMA: Journal of the American Medical Association*, Ioannidis (2015) argues that major scientific breakthroughs are often difficult to discern. He characterizes major scientific breakthroughs as, ''They strike a new equilibrium between data, ideas or theory.'' I believe the current generation of researchers has witnessed the dawn of a new breakthrough, mixed methods research that is distinguished by four key features. First, in contrast to premodern ''horseless carriage mixed methods,'' modern mixed methods emphasizes thorough advances in analysis (Brannen and O'Connell, 2015; Onwuegbuzie & Hitchcock, 2015), integration of both qualitative

and quantitative data, and novel techniques to achieve integration continue to emerge through use of joint displays (Plano Clark & Sanders, 2015; Guetterman, Fetters, & Creswell, 2015) spatial analysis (Fielding & Fielding, 2015) and concept mapping (Feucht, March, & Olafson, 2015). Second, mixed methods research now has a lexicon and rubric that is understood and used across multiple disciplines and multiple countries (Creswell, 2015). This development alone has been innovative as it now allows researchers of multiple disciplines to actually ''talk'' and understand each other at a fundamental level. Third, mixed methods research can integrate philosophical frameworks through careful listening to both constructivism and postpositivism (and other paradigms) (Johnson, 2015). Fourth, modern mixed methods has led to teams of researchers (Curry et al., 2012; Szostak, 2015) that are heterogeneous, multidisciplinary and unleashing new and powerful approaches that even a staunch critic will acknowledge (Sandelowski, 2014).

Future of Mixed Methods Research

So where is the field going? There are several areas in the immediate future of great interest to modern mixed methods methodologists and researchers. Some are already underway, e.g. advances in development of integration procedures and development of meta-integration as systematic review for including qualitative and quantitative data lenses (Frantzen & Fetters, 2015; Leeman, Voils, & Sandelowski, 2015). Researchers are leveraging mixed methods research in implementation science (Damschroder & Hagadorn, 2011; Green et al., 2015), and the use of ''big data'' with ''small data,'' that is, how will qualitative findings be used to help clarify patterns at the ultramacroscopic level, and integration within and across levels of analysis. Likewise, the creation of new mixed methods and mixed methodologies is occurring (e.g., mixed methods observation, mixed methods experiments, mixed methods grounded theories, mixed methods case studies). Many of these advances can be anticipated to be enhanced or even derived from software development for mixed methods research (Guetterman, Creswell, & Kuckartz, 2015).

Acknowledging and Welcoming Integration Examples From the Past

Like the transition from the horseless carriage to the modern form of the automobile, modern mixed methods research is moving beyond most premodern casual simultaneous collection of qualitative and quantitative data collection to intentional, planned, and well-thought out approaches with specific integration procedures in a single study. Undoubtedly, there are examples of elegant integration in the robust history of premodern mixed methods, and perhaps some that need to be rediscovered. The story of the horseless carriage again provides an example. Early efforts at the battery-operated horseless carriage gave way to the combustion engine exclusively around a century ago. The battery-only option and hybrid use of combustion and battery operated have reemerged. I agree with Pelto (2015) that we should continually reexamine our past, and research retrieving some of those lost relics of integration from the premodern mixed methods research era is welcome. Such ''gems'' could enhance the goals of modern mixed methods research, such as transparent and systematic interactivity, and integration at multiple stages in the research process.

Final Conclusions

Is this analogy one of just passing interest and add to the long list of presentist ideas (Maxwell, 2016) or does it offer greater insight into the field of mixed methods research? Combining qualitative and quantitative research is not new, but modern mixed methods is characterized by a systematic approach to research (Greene, 2015). This approach has developed considerably over the years in areas such as a unique lexicon for integration through philosophy, designs, methods, and analytics. In addition, mixed methods is expanding to all disciplines across the world, and

through largely unprecedented heterogeneous, multidisciplinary teams. As the history of the horseless carriage suggests, future innovation will both be needed and will occur—hence, my final thought, ''Keep on tinkering, keep on creating—the fun goes on!''

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