Which is the best turntable motor?

This appears to be a simple question but the answer may be very elusive. Paradoxically, either the inquiry cannot be answered or there are many possible answers. Are we forced to conclude that the question is not allowed or that there is more than one best? What is the problem?

Take a look at the abbreviated list of electric motor types shown below. Some of these classifications are commonly used in turntables, others are rarely used and a few are non-contenders. Electronic drive technologies have evolved along with the historical development of motors and this has led to some older motor types being adopted for new applications. There are many schools of thought (philosophies) that motivate turntable designers to focus on a particular concept, feature, specification or technology. The goal is clear enough: to cause a turntable platter to spin at a constant speed without introducing any unwanted effects. However there is no ideal solution. During development, choices need to be made that often result in compromise. It may not be possible to please all audiophiles all of the time but creative designers can certainly find a niche group that they can satisfy, even to the extent of yielding fervent followers.

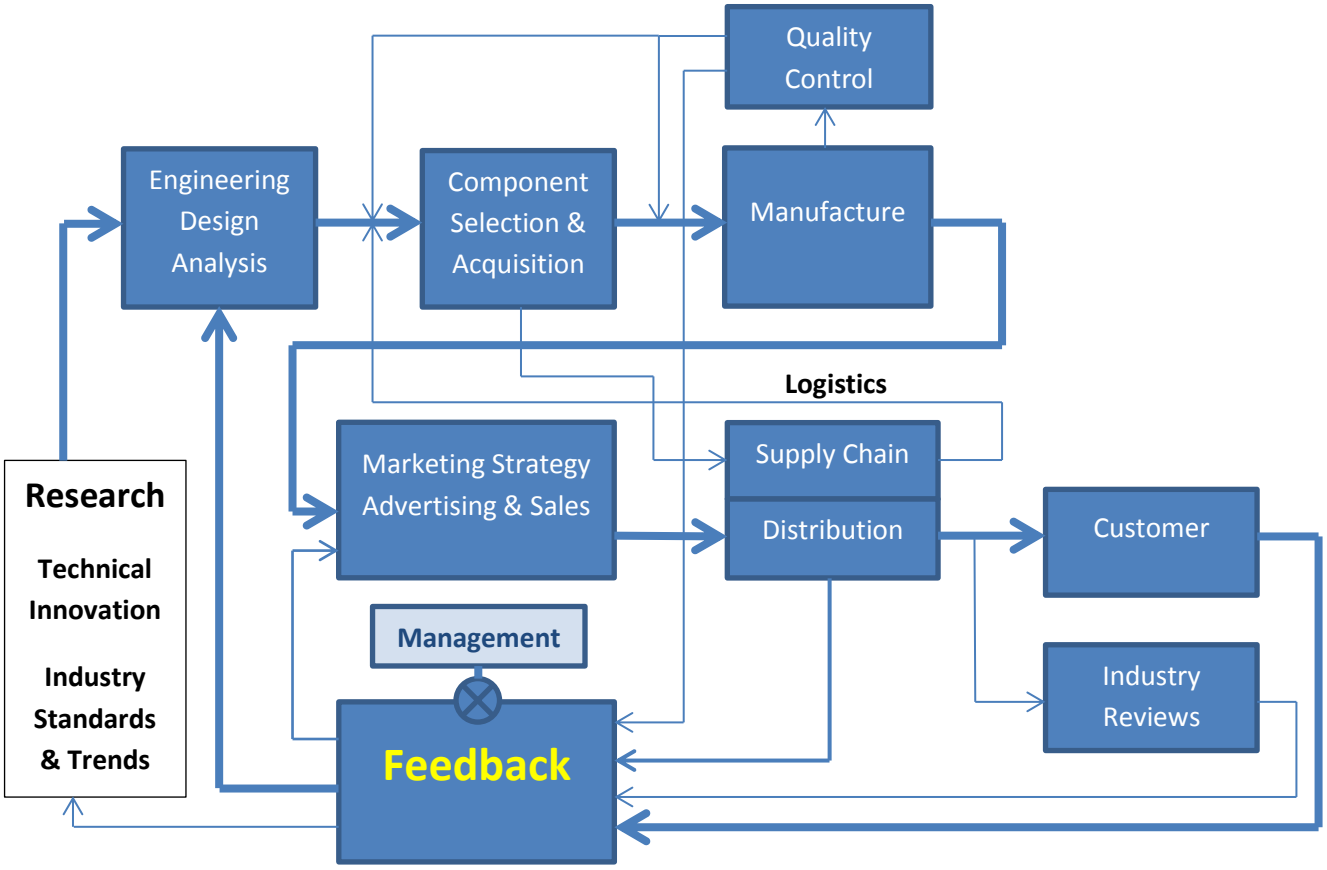
Classification of electric motors

AC Motor Types	**DC Motor Types**
Induction Motor	Brushed Motor
Polyphase cage rotor	Internal commutation
Polyphase wound rotor	Permanent magnet stator motor
Two-phase servo motor	Slotless permanent magnet motor
Single-phase induction motor	Brushless Motor
Shaded-pole motor	Electronically commutated motor
Split-phase motor	(synchronous AC motor)
Capacitor start motor	Switched reluctance stepper motor
Synchronous Motor	Synchronous reluctance motor
Polyphase synchronous motor	Variable reluctance stepper motor
Single-phase synchronous motor	Uncommutated Motor
Hysteresis synchronous motor	Homopolar motor
Permanent magnet synchronous motor	Ball bearing motor
(clock/timing motor)	Wound Stator Motor
Other AC Motors	Series connection
Universal and series wound motor	Shunt connection
Repulsion motor	Compound connection
Exterior rotor motor	
Sliding rotor motor	
Electronically commutated motor	
(brushless DC motor)	
Watt-hour-meter motor	

Component selection methodology

The selection of key components is not trivial. Making a choice is unavoidably influenced by many factors some of which can be quite perplexing. The situation is similar to attempting to solve a complex mathematical equation where all the variables and constants keep changing roles.

Regardless of the engineering knowledge, creativity and technical ability of design individuals or teams, a product is inextricably associated with the principle of enterprise. It is a cold fact that a business needs to be profitable but that doesn't necessarily mean the development process is devoid of soul. In fact, with the addition of feedback, the equation begins to acquire characteristics of a living organism.



It should be evident from the above diagram that, although research and design are very important, the choice of components can be affected by other events in the process including logistics and quality control. Notice that feedback is laced throughout the operational structure and is therefore critical for the development of the product and a major contributor to its ultimate success.

Generally a smaller scale enterprise has the advantage of closer "connections" in the feedback loop thus enabling each section to respond more rapidly to both internal and external influences. In any feedback controlled system, stability is an issue that needs to be carefully managed; if the response is too quick then changes may become erratic; if too slow then changes are inhibited.

Choosing the *right* motor: a scenario

A small, possibly fictitious company named BTEC – "**B**est **T**urntable **E**ver **C**reated", is developing their inaugural model. Sue is the owner-manager, marketing, logistics and finance officer. John is the engineer who performs the remaining functions for the company.

For the last three months Sue and John have been busily engaged researching the new product. The weekly meetings have been exciting and productive. They have already decided that the showcase model, BTEC-1, will be an audiophile turntable. It will have a solid wooden plinth, an exquisite piano black finish and a custom cut-out section to accommodate a selection of premium, industry standard tone arms. Considerable time and effort is currently being expended discussing candidates for the platter and drive system. John is inclined towards a high tech approach but Sue knows that true audiophiles would prefer a minimalist system that conforms to the KISS rule. Eventually they elect to proceed with a high mass platter and a belt drive. Now the only key component requiring debate is the motor. Sue asks John "Which is the best turntable motor?"

John sighs, turns his notebook towards Sue and reveals over two hundred pages of engineering data, reviews, articles, internet forum threads and other musings he has collected on the subject. Sue, now savvy to the complexities of the issue, remarks "Well, at least our decision to use a belt drive has reduced the spectrum of choice for the motor!"

Fast forward six months. The pre-production prototype has been undergoing testing for a feature article in a respected audio journal. The inexperienced reviewer, Peter, is meeting with John and Sue to discuss his findings and investigate the design philosophy supporting the BTEC-1. It seems that Peter is impressed by the appearance and overall performance of the turntable but has a question about the motor. "Why did you use an AC induction motor?" he asks. While Sue is explaining that the BTEC-1 was targeted at purist audiophiles, John examines the test results. He knows that despite the AC motor's characteristic 2% magnetic slip, inelegant manual speed change and risk of mains interference they had to trade off these concessions for the sake of a timely production release. John boasts "Our minimalist BTEC-1 model will soon be followed by the new BTEC-2 featuring a technologically advanced DC motor and external controller."

Encouraged by the discussion, Peter is intrigued by the potential of future BTEC developments and begins to wonder about which DC motor type is best.

The journal publishes Peter's extravagantly enthusiastic review.

Conclusion

Although the example scenario may not accurately represent the real world, the problem with the original question **is** real and persists.

The best choice of motor for any turntable system is the best motor for that particular application.

You were probably hoping for a more satisfying outcome, but this conclusion truly is the *best* I am willing to offer.