Router Table Versus Shaper

The popularity or big hand-held routers and their relatively low cost along with economical cutters for it make it natural for them to be used inverted in a table. This configuration gives the router the ability to perform much the same way as a shaper and gives rise to the question "what is the difference between a router table and a shaper?".

The typical woodworker - hobbyist could get by very well using a router table to perform the function of a shaper. Although a shaper and router table can perform the same function and may appear similar they are however quite different machines in several important areas.

Differences

The following are a list of differences between a common router table setup and a shaper:

1. Even though a router is advertised as having a 3hp motor, they are NOT truly as powerful as a 3hp shaper with an induction motor. The shaper motors are likely to be rated for constant use and are capable of taking much bigger cuts than would ever be attempted with a router. Compared to a 3hp router, a 3hp shaper motor has significantly more torque. A 3hp motor is more dangerous as well since it can use this torque against the user in a kick-back situation.
2. The universal motors used in routers operate with a higher noise level than a shaper that uses an induction motor.
3. Most shapers have a maximum speed at the lowest end of the router rpm range, most router bits are designed to operate best at speeds over 10k rpm. The same bit in a router spinning at over 18k rpm will produce a noticeably better cut using small diameter bits. This issue would mainly impact box and dovetail types of cuts.
4. Larger shapers have better magnetic switches. When power is removed (like a tripped breaker), the machine will not start up when power is restored; the start switch must be re-pressed.
5. Router inserts will often have the ability to accept PC type guide bushings for use in template work.
6. It is far easier and faster to change a cutter in a shaper than it is in a router.
7. There are more profiles available for shapers than there are for routers. In addition, there are several sets of cutters than can be stacked.
8. Shaper cutters last longer than router bits. This usually isn't an issue since most router bits would never become worn-out from use by a hobbyist.
9. Cutter height adjustments are easier and faster on a shaper. However, many routers are equipped with high resolution adjustment mechanisms thus they can be adjusted more precisely.
10. It should be easier to mount a power feeder to a shaper than a router table setup. A power feeder will allow the shaper to "climb cut" very safely. Climb cutting will often produce a superior cut.
11. Shapers have cast iron tables that are far better work surfaces than typical laminate topped router tables.
12. Shaper cutters and guide bearings are more expensive than equivalent router bits.
13. Shapers usually come with adequate fences with dust collection ports and hold down devices; most of these items are added cost extras for router tables.
14. Most shapers have the ability to reverse the rotation of the spindle. This allows the operator to decide which face of the piece is the reference or to use cutters with more than one profile grind.
15. Shaper cutters have much larger diameters than router bits. This produces a better cutting action with less ripple than a similar router bit due to tip speed and the angle of attack between the work-piece and the cutter.
16. If the cost of a small shaper is compared to a dedicated router table setup with the accessories needed to gain some of the shaper-like benefits, a router table is probably more expensive (see cost example).

Cost Example

Since I think a 3hp router is generally as powerful as a 1hp shaper, I have put together the following cost example based upon this. The particular brands listed have been chosen because they are readily available and appear to be quality components. Of those mentioned I have the Dewalt router and the Router Raizer and I do recommend them for this application.

Comparable Shaper Costs:	
$870	Delta 1.5hp shaper
$550	Jet 1hp shaper
$480	Grizzly 1.5hp shaper

Router Table Component Costs:	
$260	Dewalt 625 plunge router
$90	Router-Raizer lift
$129	Veritas router table top
$119	Veritas router table fence
$24	Veritas work hold-down
$24	Veritas work hold-down
$100	TWC steel bench leg set
$746	**Total router table cost**

Tooling

One very big difference between a router and shaper is in the available selection of cutters or "tooling". Router bits are much smaller in diameter, cheaper, and come in fewer variations than their shaper equivalents.

As an illustration of variety, consider a straight router bit. It is common to find this type of cutter available in:

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- simple straight of various diameters and cutter heights.
- solid carbide spiral capable of plunge work.
- with guide bearing on top.
- with guide bearing on bottom.

An equivalent shaper cutter could be found in:

- solid body with brazed carbide cutters (like a router bit). Can be used in combination with different sizes of separate bearings that can be placed either on top or bottom of the cutter as desired.
- insert type cutter head with "wing" cutters on the top / bottom to scribe a clean shoulder with no chip-out. Can also be used with separate bearings.
- sheer angle insert type cutter head with "wing" cutters on the top / bottom to scribe a clean shoulder with no chip-out. Can also be used with separate bearings.
- Jointing cutter head with four-sided inserts arranged in spiral or straight location patterns. Can also be used with separate bearings.
- Multi-profile heads that can accept different replaceable cutters including straight. Can also be used with separate bearings.

In addition to the example listed above, there are several profiles and special cutters that are not available for use on a router. A few examples of these are:

- large diameter, variable width, stacking tenon cutters.
- special relieved edge rail and stile cutters.
- matched sets of stacking rail and stile cutters that can be used for both passage doors or common kitchen cabinet doors.
- insert cutter heads to accept custom ground profiles.

There can also be a big difference in the cost for tooling to use in a router or on a shaper, below is a sample list of profiles:

Router profile	Cost	Shaper profile	Cost
straight, 1/2" dia	$13	straight, 1 1/2" high	$36
straight, 1/2" dia with top bearing	$16	bearing, 2 5/8" dia	$25
straight, 1/2" dia with bottom bearing	$16		
roundover, 1/4" rad	$12	roundover combo, 1/4", 3/8" rad	$36
roundover, 3/8" rad	$13		
chamfer, 45 degrees with bearing	$22	chamfer, 45 degrees	$36
bead, 1/4" dia with bearing	$18	bead, 1/4" dia	$23
raised panel, horizontal	$40	raised panel, horizontal	$60
rail and stile, 2pc set	$65	rail and stile, 6pc set	$180
Total.....	$215	**Total**.....	$396

The costs used in the example above are at the low end of the cost range for either sets of tooling and is only presented to illustrate typical cost differences.

Router Bits in a Shaper

Most shapers will accept router bits with the use of an adapter, these adapters may be an optional accessory depending upon the particular shaper. The router bit adapters used in shapers are not usually the "self ejecting" type that are commonly found on routers, this can make bit changes in a shaper less convenient than a router.

The usual top speed of a shaper is about 9,000rpm, the usual top speed of a router is about 22,000rpm. Consider a ½" straight bit installed in both machines to be used to cut box joints. The tip speed of the bit in the router (at 22k rpm) will be around 48 feet per second (fps), this will result in a very clean cut for the joints. The tip speed of the bit in the shaper (at 9k rpm) will only be about 19 fps, that is significantly slower than the router. The result will most likely be a lower quality cut on the joints. There is more than a feed rate issue involved here, a small diameter router bit is specifically designed to cut material at a high rotational speed, that is where the best cutting action is obtained.

On the other hand, consider a 3 ½" diameter raised panel cutter run in a router set at 9,000rpm (large diameter bits MUST be run at the slowest speed on a router, they should NEVER be run at high speed!). The tip speed is about 137fps. The same bit can be run on a shaper at 9,000rpm, the bit won't know the difference and the cutting action will be the same because the cutter will be turning at the speed it was originally designed to operate at. Depending upon the motor size of the shaper the overall operation may be a little better on the shaper though due to a potential significant difference in available torque.

To give an additional example, consider using the ½" diameter straight bit in a router to make a rabbet. With the router set at 22,000rpm the tip speed is about 48fps. A 4" diameter shaper cutter running at 9,000rpm has a tip speed of 157fps, at 6,000rpm it would be 105fps. Because of the tip speed, torque, and the cutting action which takes place more tangential to the stock, a higher quality cut should be the result.

Summary

The typical woodworker could get by without ever using a shaper, it would be very inconvenient in the least to get by without using a router. The same router that can be used for hand-held work can be used for many "router table" operations which will make profiling operations more convenient.

In reality the question isn't which machine to use but which cutter to use. If high performance, more versatile, or special cutters are desired (or for a lot of heavy cutting) a shaper is the tool to use. For pierced work, and "finger type" joints, a router table is preferred.

For reasons stated above, even if a woodworker had a shaper available that would not make a router table setup redundant.