

MEASUREMENT OF INNOVATION ATTRIBUTES

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Innovation attributes are most often measured as the perceptions by potential adopters of the characteristics associated with a particular innovation. An *innovation* is broadly construed as anything perceived to be new by a potential adopter, inclusive of information, ideas, practices or techniques, programs or interventions, technologies, processes, and policies.

Rogers (1963; 1983; 1995; 2003) and Rogers & Shoemaker (1971) synthesized studies of innovation attributes as a set of codified factors that affect the rate at which innovations are adopted. Other variables affect rate of adoption too, but the attributes of *relative advantage*, *complexity*, *compatibility*, *observability*, and *trialability* have been shown to explain significant variance in adoption decisions. Of this standard set of five attributes, relative advantage, complexity, and compatibility have been most strongly associated with adoption decisions.

Operationalization of innovation attributes has not been consistent nor led to the creation of consistently used validated measurement scales. This situation has occurred because researchers have most often wanted to ask perceptions concerning specific innovations which they typically want to name in the item wording. Also, given the broad definition of an innovation, certain attributes and additional attributes are more or less relevant depending on the innovation of study. Tornatzky and Fleischer (1990) developed a 2x2 matrix for characterizing innovations as radical vs. incremental innovation, and product vs. process innovation.

Tornatzky & Klein (1982) reviewed 105 publications that assessed innovation attributes and derived 10 attributes. For example, in measuring perceptions of large-scale environmental remediation technologies for removing or converting hazardous waste, the attribute of *applicability*, the degree to which an innovation has more than one use or has use in more than one context, was found to be important in discussions about innovations, since soil and weather conditions vary considerably across polluted sites (Dearing, Meyer & Kazmierczak, 1994). In addition to measuring innovation perception by potential adopters, this study measured how creators thought about their innovations, and how they talked about their innovations, in terms of attributes.

Marketing scientists, in focusing on consumer services and products, have conceptualized different and additional attributes. Management scientists, too, have contributed to this work. Moore & Benbasat (1991) created an instrument used expert judges to sort 75 items used in previous studies into factors representing the five standard attribute categories and three others of *voluntariness*, *image*, and *result demonstrability*. Three tests of convergent and discriminant validity were conducted and items and scales refined. Scales proved reliable; their validity was checked via factor analysis and discriminant analysis. Their result is a 38-item instrument

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comprising eight scales, with a shortened 25-item version of the strongest items (listed here below) also suggested.

From my own reviews, I have noted that the attribute *relative advantage* is often somewhat of an omnibus category. Researchers have tended to lump together rather different referents into it. Yet this attribute is most often operationalized more narrowly, as cost. Thus, I prefer to separate out what I think are the two dominant meanings of this attribute, *effectiveness* (performance) and *cost* (in money or other resources such as staff time). This parsing out of this attribute results in six basic innovation attributes:

1. Effectiveness
2. Cost
3. Compatibility
4. Simplicity (the inverse of complexity)
5. Observability
6. Trialability

The Simple Idea

Here is a straightforward set of items that directly measures the standard six attributes. Note that direct measurement is often supplanted by indirect and repeated item measurement.

(Name of innovation) was *complex* to understand or implement.

Strongly agree Agree Neutral Disagree Strongly disagree

(Name of innovation) was low in monetary or other *cost*.

Strongly agree Agree Neutral Disagree Strongly disagree

(Name of innovation) was *effective* in its results.

Strongly agree Agree Neutral Disagree Strongly disagree

(Name of innovation) was *compatible* with existing beliefs and practices.

Strongly agree Agree Neutral Disagree Strongly disagree

(Name of innovation) could be *tried* without fully committing to it.

Strongly agree Agree Neutral Disagree Strongly disagree

(Name of innovation) results could be *observed*.

Strongly agree Agree Neutral Disagree Strongly disagree

A Bit More Sophistication

Following is an instrument with more sophisticated item-wording and that addresses some of the multiple referents within each attribute-category.

<p>To what extent did the reasons below influence the decision to adopt _____?</p>	<p>Strongly influenced our decision</p>	<p>Moderately influenced our decision</p>	<p>Slightly influenced our decision</p>	<p>This did not influence our decision</p>
<p>_____ uses an evidence-based approach to _____. <effectiveness></p>				
<p>Results from _____ were easy to see. <observability></p>				
<p>_____ fit with our organization's mission or goals. <compatibility></p>				
<p>We would not have to make many changes in our organization. <compatibility></p>				
<p>Positive changes occurred as a result of _____. <effectiveness></p>				
<p>_____ could be modified to suit our needs. <compatibility></p>				
<p>_____ would help our constituents. <effectiveness></p>				
<p>We could offer _____ at an affordable price. <economic advantage></p>				
<p>Offering _____ would help us reach a new market. <economic advantage></p>				
<p>Clients/members could try _____ and stop it if they did not like it. <trialability></p>				
<p>_____ focused on behavior change. <observability></p>				
<p>We would not have to hire new staff to facilitate _____. <compatibility></p>				
<p>_____ training was a way of learning more prior to committing to use it. <trialability></p>				
<p>The _____ participant materials were easy to understand. <simplicity></p>				
<p>Our staff could quickly learn the _____ approach. <simplicity></p>				
<p>Satisfaction with _____ could be easily gauged. <observability></p>				
<p>For us, committing to _____ was not an all or nothing decision. <trialability></p>				

The Moore & Benbasat (1991) Instrument

Following is the set of items and their attribute groupings (constructs) that resulted from the instrument development test conducted by these management scientists concerning an information technology innovation and its adoption and use in an organization. Those items with asterisk * are the items suggested for inclusion in any “short” scales. Depending on the innovation and the user context in question, wording of these items may be considered as more appropriate for study of innovation implementation and use than for the decision to adopt.

Voluntariness

1. My superiors expect me to use a _____.
2. My use of a _____ is voluntary.
3. My boss does not require me to use a _____.*
4. Although it might be helpful, using a _____ is certainly not compulsory in my job.

Relative Advantage

1. Using a _____ enables me to accomplish tasks more quickly.*
2. Using a _____ improves the quality of work I do.*
3. Using a _____ makes it easier to do my job.*
4. The disadvantages of my using a _____ far outweigh the advantages.
5. Using a _____ improves my job performance.
6. Overall, I find using a _____ to be advantageous in my job.
7. Using a _____ enhances my effectiveness on the job.*
8. Using a _____ gives me greater control over my work.*
9. Using a _____ increases my productivity.

Compatibility

1. Using a _____ is compatible with all aspects of my work.*
2. Using a _____ is completely compatible with my current situation.
3. I think that using a _____ fits well with the way I like to work.*
4. Using a _____ fits into my work style.*

Image

1. Using a _____ improves my image within the organization.
2. Because of my use of a _____, others in my organization see me as a more valuable employee.
3. People in my organization who use a _____ have more prestige than those who do not.*
4. People in my organization who use a _____ have a high profile.*
5. Having a _____ is a status symbol in my organization.*

Ease of Use

1. I believe that a ____ is cumbersome to use.
2. It is easy for me to remember how to perform tasks using a ____.
3. My using a ____ requires a lot of mental effort.
4. Using a ____ is often frustrating.
5. My interaction with a ____ is clear and understandable.*
6. I believe that it is easy to get a ____ to do what I want it to do.*
7. Overall, I believe that a ____ is easy to use.*
8. Learning to operate a ____ is easy for me.*

Result Demonstrability

1. I would have no difficulty telling others about the results of using a ____.*
2. I believe I could communicate to others the consequences of using a ____.*
3. The results of using a ____ are apparent to me.*
4. I would have difficulty explaining why using a ____ may or may not be beneficial.*

Visibility

1. I have seen what others do using their ____.
2. In my organization, one sees ____ on many desks.*
3. I have seen a ____ in use outside my firm
4. ____ are not very visible in my organization.*
5. It is easy for me to observe others using ____ in my firm.

Trialability

1. I've had a great deal of opportunity to try various ____ applications.
2. I know where I can go to satisfactorily try out various uses of a ____.
3. A ____ was available to me to adequately test run various applications.
4. Before deciding whether to use any ____ applications, I was able to properly try them out.*
5. I was permitted to use a ____ on a trial basis long enough to see what it could do.*