International Market Selection: A Framework for Sequential Launches of New Medical Products

Michael Latta
Coastal Carolina University

International medical technology business managers need country market intelligence when devising launch plans for new products. A market entry system has increasingly become a key issue for companies who compete globally. This paper describes development and application of a new measure of predisposition to adopt medical surgical technology innovations developed from Rogers' diffusion of innovations theory. It was used with 1,824 surgeons from eight countries. Results show a rank order of country markets is possible with this new measurement system aiding development of an international roll-out plan for innovative medical surgical products that helps crossing the chasm and achieving success.

INTRODUCTION

In a seminal article on international marketing strategy, Wind, Douglas, and Perlmutter (1973) identified sixteen decision areas ranging from Market Measurement and Forecasting to Marketing Control. Their complete list is:

1. Market Measurement & Forecasting
2. Market Segmentation
3. Market Research
4. Product Development
5. Product Design
6. Product Quality
7. Customer Service
8. Product Mix
9. Brand Name
10. Price
11. Sales Promotion
12. Advertising
13. Channels of
14. Distribution
15. Sales Administration
16. Marketing Control

Using these decision areas they develop guidelines for developing global orientations (Ethnocentric, Regiocentric, Polycentric, and Geocentric) that lead to strategies and provide examples where they work. However, none of these decision areas includes market receptivity to an innovative product. Investigating diffusion of consumer goods, Helsen, Jedidi, and DeSarbo (1993) proposed a system of country segmentation based on the Bass diffusion model. The result was groupings of similar countries out of a

set of twelve. They assigned countries to segments based on data for color TVs, VCRs, and CDs. It is difficult to generalize their method or results to medical technology markets, but the general idea of using countries as a unit of analysis may apply. In another approach, Hunt and Morgan (1995) claim that the 'comparative advantage theory of competition, is a new theory evolving in the strategy literature. These authors claim a market orientation is potentially a resource for comparative advantage based on relative resources costs and relative resource value being at parity, advantage, or disadvantage. This approach seems to be good for beating competitive firms, but does not seem to be useful to determine which countries to focus on in a launch plan. Some authors concerned with technology adoption (Hitt, Ireland, & Palia, 1982) have defined the grand strategies that may be pursued by an organization: 1. Stability 2. Internal Growth 3. External Acquisitive Growth, and 4. Retrenchment, but these approaches do not deal with innovativeness. Others have examined how market entry decisions in the biomedical device sector affect financial performance, but that is the wrong direction of influence of innovation (Kang & Montoya, 2014).

None of the approaches above are useful in devising a market entry system for medical technology products. As global businesses expand their reach, international medical technology business managers need country market intelligence when devising a roll-out schedule. A market entry system has increasingly become a key issue for companies who compete globally. Typically the analysis involves macroeconomic data and political factors which ignore the predisposition of decision makers to adopt new innovations (Sakarya, Eckman, and Hyllegard, 2007). Technical models of new product diffusion such as the Bass Model (1969) focus on trial and repeat purchase for consumer products. Other approaches focus on sales forecasting in business-to-business or industrial markets (Webster, 1969). In an earlier approach, Beal, Rogers, and Bohlen (1957) started the development of what would become Rogers' adoption theory by validating the five stages and their sequence of new product adoption. In this research, a system to measure a predisposition to adopt innovations derived from Rogers' (1962; 2003) adoption stages were utilized to assess the percentage of medical product Innovators in each of eight countries. The goal was to determine which countries have the largest percentage of Innovators who purchase and utilize medical products allowing an order of launch to be established on the basis of a predisposition to adopt the type of medical technology under consideration.

If potential adopters in a country market are innovators and willing to try new products, that market may be a good prospect for success and should be moved up in the order of entry. If a country market does not have a significant percentage of innovators or is resistant to new products, it is not a good prospect for a successful launch and may be put last in order of entry. It is suggested here that Rogers' (2003) adoption theory may provide country market intelligence indicating which countries have users of medical technology that are innovative and which are likely to be slow to adopt new medical technology.

Diffusion of Innovations Literature Review

Rogers first introduced his adoption categories by saying there are individuals in any society who are innovative and will adopt an innovation sooner than those who are not (Beal, G. Rogers, E, & Bohlen, 1957). The value of this approach was established in research with Iowa farmers concerning antibiotics, chemical weed spray, preserving food by freezing, and use of new synthetic fabrics. In a highly detailed review of Rogers' theory, Ismail Sahin (2006) outlined how Rogers' ideas are related to technology-related new products.

In Rogers (2003) four components to diffusion of innovative products were identified as:

- Innovation – "An innovation is an idea, practice, or project that is perceived as new by an individual or other unit of adoption" (p. 12). Uncertainty plays a significant role in adoption and 'Consequences are the changes that occur in an individual or a social system as a result of adoption or rejection of an innovation" (p. 436). This component of adoption indicates information about an innovation's advantages and disadvantages should be supplied in order to communicate possible consequences of adoption.

- Communication Channels – Communication defines "a process in which participants create and share information with one another in order to reach a mutual understanding" (p. 436). This component was expanded upon by Rogers and Shoemaker (1971) in their extended discussion of the role of communication.
- Time – All aspects of Rogers' theory include time because diffusion is a process resulting in the adopter categories and the rate of adoption.
- Social System – This component is defined as "a set of interrelated units engaged in joint problem solving to accomplish a common goal" (p. 23).

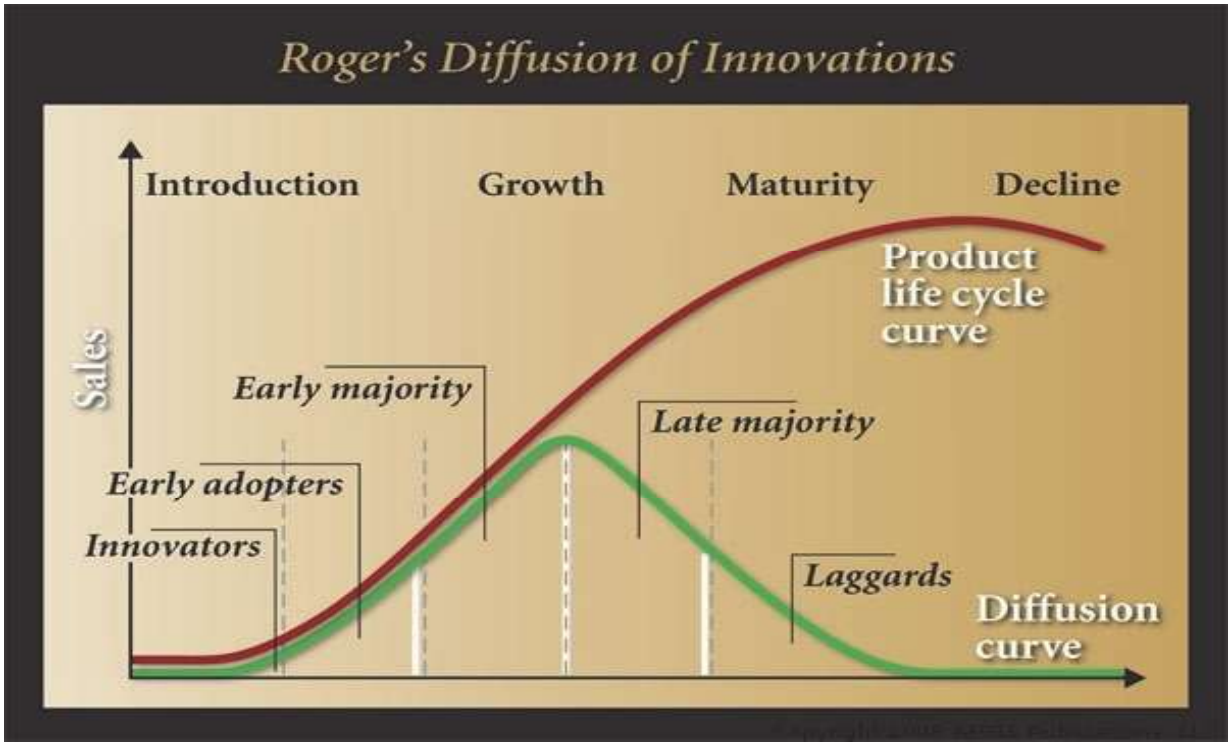
The four components lead to the Innovation-Decision Process described as "an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation" (p. 172).

Rogers (1962, 2003) concluded that the tendency of members of a social system, such as medical personnel in a country or farmers from a single Iowa town, to adopt innovations was classified into five adopter categories according to the amount of time passing from innovation availability to adoption. These categories and their accompanying segment sizes are:

Innovators (2.5%)
Early Adopters (13.5%)
Early Majority (34.0%)
Late Majority (34.0%)
Laggards (16.0%)

Figure 1 below shows how Rogers' cumulative percentages approximate the product life cycle in penetrating and dominating a market until maturity. This relationship makes Rogers' theory amenable to use in marketing strategy and new product innovation launches.

FIGURE 1
ROGERS' DIFFUSION THEORY DISTRIBUTION



The proportion of members of a social system falling into each of these categories appears in parentheses above. At one end are the risk takers or pioneers who adopt innovations early, such as those who line up overnight to buy the latest smart phone, while at the other end are those who resist adopting innovations for a long time or may never adopt, such as those who still use a flip-phone.

Outside the US, recent academic research has focused on adoption of new products and services across multiple countries. Recent studies include International markets for internet services (Kiiski & Pohjola 2001), mobile telecommunications (Gruber & Verboven 2001) and digital telecommunications switches (Antonides, Amesz, & Hulscher, 1999; Dekimpe, Parker & Savary 2000). These studies use secondary analysis of data from OECD and United Nations agencies or transaction data from credit card purchases. None of these earlier cross-country and regional studies involved direct measurement of medical personnel who make the decision to buy and use new medical technology.

Braak (2011) defined innovativeness in terms of "a relatively-stable, socially-constructed, innovation-dependent characteristic that indicates an individual's willingness to change his or her familiar practices" (p. 144). It is contended here that in accordance with Braak (2011), individuals have a predisposition to evaluate and decide whether or not to adopt innovations that are related to the adopter categories and rate of adoption. It is also contended here that this predisposition can be measured by asking an individual to select a predisposition from a set of five descriptions derived from Rogers' (2003) definitions of the adopter categories. This current research is directed at utilizing a measure of a predisposition to adopt new innovations developed by the current author to define Innovators and the other categories in Rogers' theory.

Rogers (2003, p. 163) specified five stages in adoption of an innovation: awareness, information, application, trial, and adoption. Webster (1969) noted that most research on new product adoption focused on the consumer at the neglect of what he calls 'industrial buyers' and the 'innovating firm.' Like Rogers, Webster identifies five stages in the evaluation of innovative new products by firms rather than consumers. These stages are: awareness, interest, evaluation, trial, and adoption.

Although these stages identified by Webster are not analogous to Rogers,' neither Webster nor Rogers identifies a predisposition to adopt new innovative products that could be part of country market entry decision making. Neither of them specifies how that predisposition may change over time at the micro level (individual buyer) or at the macro level (a social unit such as a hospital or surgical center in a country).

The present study is directed at measuring and understanding the international distribution of differences in this predisposition to adopt new medical technology at the individual country level. The medical technology area involved is surgical devices including: catheters, minimally invasive laparoscopic devices such as graspers, picks, and closure devices. The medical specialties include: Bariatric, Cardiothoracic, General, Gynecological, Interventional Radiology, and Urological surgeons. The main goal of the research process was innovative product design by assessing the value of new innovation attributes and determining what they must have and what they must not have when combined into a finished product. During this assessment, awareness of key innovation attributes provided a foundation for the surgeon to make a judgement about how the surgeon would describe his or her approach to adoption of this type of new medical technology. In other words, their answers to the adoption question would not be made in an innovation information vacuum.

STUDY DESIGN

This research uses the same adopter measurement system first used with physicians, laboratory directors, managers, and supervisors in the US by the current author and extends it to surgeons in eight countries. An active commercial area of innovative product adoption of great interest in healthcare products is medical surgical technology products. The adopter question and response categories defining the adopter predisposition for this study of medical surgical technology products appear below.

In the Fifth Edition of Diffusion of Innovations (2003, p. 283), Rogers identifies 'Adopter Categories as Ideal Types). Each type has a core concept as indicated below:

Innovators - Venturesome
Early Adopters - Respect
Early Majority – Deliberate
Late Majority - Skeptical
Laggards - Traditional

In the discussion of 'Laggards,' Rogers' comments that term may carry a negative connotation. The online Merriam-Webster dictionary defines a 'traditionalist' as 'a person whose beliefs are centered on tradition and keeping things the way they are.' The present research uses 'Traditionalist' in place of 'Laggards' as a less negative term. Thus, as in the earlier predisposition to adopt research by the current author, one deviation from Rogers' terminology was the substitution of Traditionalist for Laggard as the name of the final adopter status category. This change is consistent with Rogers' approach and was prompted by pre-test respondents' dislike for the negative connotation conveyed by the term Laggard.

The adoption question used in this research appears below:

"How would you describe your approach to adoption of new medical technology? Are you:"

Adopter Category	Definition
Innovator	Venturesome and able to quickly understand and apply complex information about new medical technology
Early Adopter	One who commands respect and is an opinion leader about new medical technology
Early Majority	One who deliberates for some time before adopting new medical technology
Late Majority	One who is skeptical and waits for peers to adopt new medical technology first
Traditionalist	One who is in favor of the status quo unless there is a strong need to change to new medical technology

Prior to answering the adoption question, the participants were asked a series of commercial marketing research questions dealing with their roles in purchasing and using new medical-surgical technology. These screening questions are standard in this type of global marketing research and helped ensure the participants were in the role of deciding whether or not an innovation would be adopted. These questions included items concerning their title, decision- making role, and type of facility where they are employed as follows:

- What title they hold such as Surgeon or Interventional Radiologist?
- What decision making role they play regarding new medical/surgical devices?
- What type of health care facility they work in such as hospital or surgical center?

These items ensured the potential user/decision maker involved in answering the adopter question is also involved in the purchase and use of medical technology devices in their facility.

International Samples

The current international study involved the range of innovative surgical devices identified earlier and their use by surgeons in the specialties identified earlier in eight countries (Australia, Brazil China, Italy, Mexico, Spain, UK, and US). Data were gathered in 2014, 2015, and 2016. All participants were surgeons in hospitals or surgical centers who met the screening criteria identified earlier. The individual countries and their sample sizes are in Table 1 below.

TABLE 1
COUNTRIES AND SAMPLE SIZES

Country	Sample Size
Australia	60
Brazil	88
China	115
Italy	91
Mexico	30
Spain	30
UK	120
US	1,290
Total	1,824

Expectations

Expectations concerning the percentage of Innovators in these countries can be stated as follows:

1. Based on earlier research with health care personnel by the author, the percentage of Innovators in the medical/surgical device market from these eight countries will not conform to the theoretical value 2.5% first proposed by Rogers (1962).
2. An innovation-oriented country such as the US will lead the world in the percentage of medical technology device personnel who say they are Innovators.
3. A natural ordering of countries for new innovation introduction will be identified based on the percentage of Innovators identified in each country.

RESULTS

Figure 1 below provides data relevant to the first expectation concerning Rogers' adoption theory specifying 2.5% as the share of the potential market who are Innovators. Clearly there are more Innovators in each country than specified by Rogers in his original 1962 book or its revision in 2003.

FIGURE 1
PERCENTAGE OF INNOVATORS BY COUNTRY AND ROGERS' THEORY

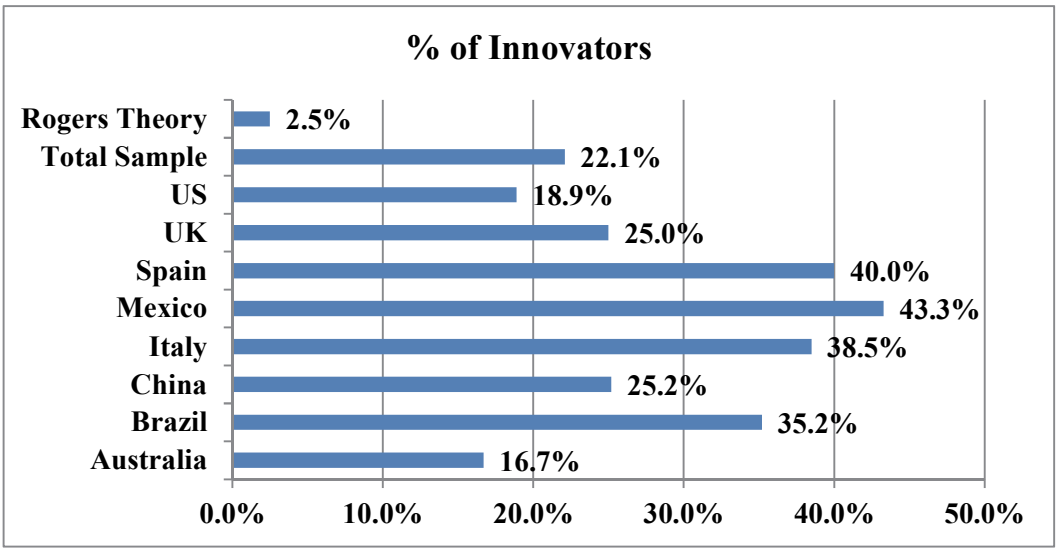


Figure 1 also has bearing on the second expectation concerning the percentage of Innovators in the US compared to the other seven countries. The US percentage of Innovators was not the highest among the eight countries at 18.9%. In fact the US was substantially behind all countries except Australia (16.7%) in the percentage of Innovators.

The natural ordering of countries for market entry based solely on Figure 1 would be as follows:

1. 43.3% Mexico
2. 40.0% Spain
3. 38.5% Italy
4. 35.2% Brazil
5. 25.2% China
6. 25.0% UK
7. 18.9% US
8. 16.7% Australia

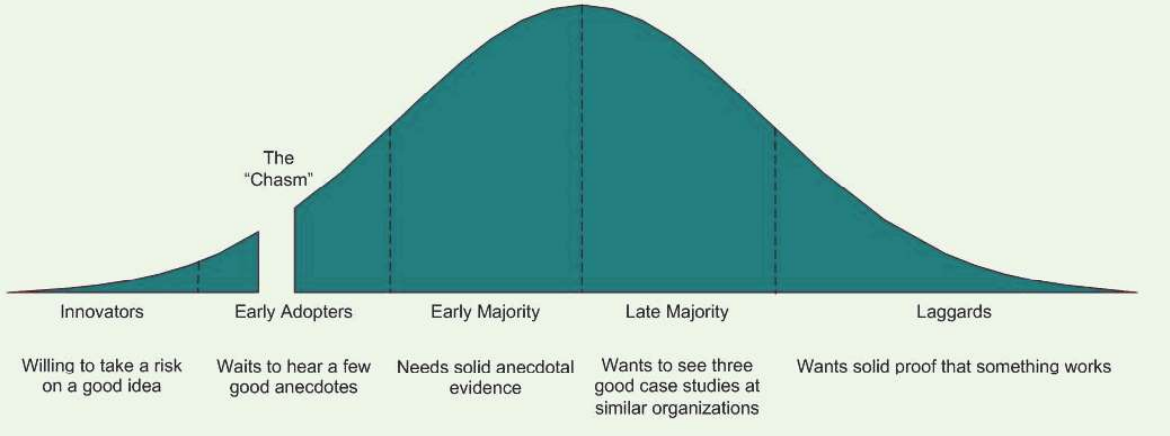
It can be argued that basing order of country entry solely on the above data would not be a good approach. This single criterion is an incomplete picture of the situation regarding gaining a foothold in an international market and places the largest market, US, next to last. Perhaps other factors should be considered such as crossing the chasm rather than falling into the chasm as time passes.

Crossing The Chasm

Another issue after product launch is getting sufficient market penetration fast enough for the new product to survive. Although Rogers believes there are no breaks in the innovation-adoption process (Rogers, 2003, p. 282), Geoffrey Moore in his book "Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Customers," originally published in 1991, with the third edition published in 2014, discusses what happens after the Innovators have adopted a new technology product.

Combining Rogers' adoption categories and Moore's chasm yields the diagram in Figure 2 below.

FIGURE 2
THE CHASM AND ROGERS' ADOPTION CATEGORIES



Moore suggests one should focus on a single category of customers at a time starting with the Innovators but continuing by shifting focus to the Early Adopters rapidly after launch. Moore also suggests the most uncertainty of success comes in the transition from the visionaries (Innovators) and those who command respect and are an opinion leader (Early Adopters) to reach the Early Majority. That transition is the chasm that new medical technology products may fall into unless the firm can rapidly create enough momentum for the product to gain a foothold and survive in a country market.

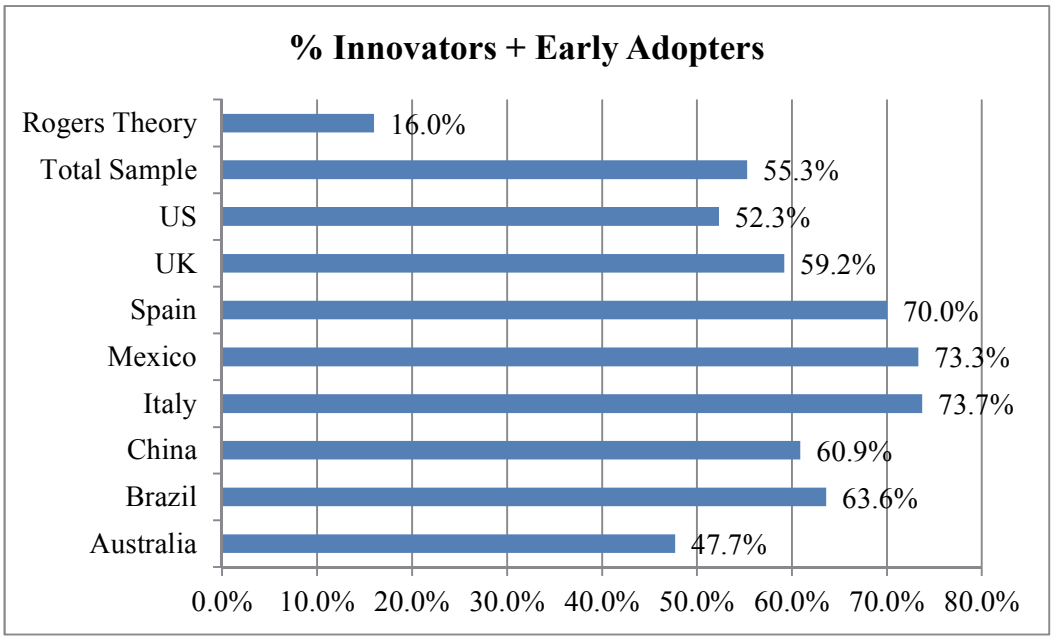
Moore's idea of a chasm when combined with Rogers' original technology adoption categories suggests just focusing on Innovators to determine order of market entry is a mistake and marketers should consider both Innovators and Early Adopters in selecting countries to enter first.

In this research, the combined percentages of Innovators and Early Adopters range from a low of 47.7% in Australia to a high of 73.7% in Italy. The US is still ranked 7 and the only change is Italy and Mexico swap positions with Italy becoming 1 and Mexico 3 in the rank order. The new rank order is below:

1. 73.7% Italy
2. 73.3% Mexico
3. 70.0% Spain
4. 63.6% Brazil
5. 60.9% China
6. 59.2% UK
7. 52.3% US
8. 47.7% Australia

Figure 3 below presents the Innovator Plus Early Adopter density for the eight countries, the total sample, and Rogers' Theory. This data display suggests the medical technology products under consideration may have a good chance of crossing the chasm in all eight countries.

FIGURE 3
PERCENTAGES OF INNOVATORS PLUS EARLY ADOPTERS BY COUNTRY



DISCUSSION AND CONCLUSIONS

These results suggest that crossing the chasm and getting a Return on Marketing Investment (ROMI) in international markets may be improved by identifying which countries have the highest percentages of Innovators and Early Adopters in the innovative surgical medical technology product category. Rogers' model of diffusion of innovation has been applied in public health, agriculture, and the adoption of the internet among other industries. Rogers (2003) has distinguished between diffusion of innovations research that focuses on defining the characteristics of the five adopter categories and the other approach of studying how the perceived characteristics of innovations affect their rate of adoption (p. 219).

In consumer behavior, Midgley and Dowling (1978) argue that it is doubtful there is a personality trait of innovativeness. Rogers and Shoemaker (1971, p.27) say innovativeness is "the degree to which an individual is relatively earlier in adopting an innovation than other members of his system." It is not contended here that the predisposition to adopt innovations early is a personality trait. The surgeons in this research work in social systems defined by hospitals and surgical centers. It is contended here that they do have a predisposition to adopt innovations which is defined by their social position in their social system.

Yuksel (2015) reports using an "Innovativeness Scale" containing 20 Likert scale items of five-points developed by Hurt, Joseph, and Cook (1977). Although the scale has reported internal consistency Chronbach alpha coefficients reported to be .78 and .82 in two different studies involving teachers, a 20 item scale is not practical in research on medical technology products with audiences such as medical personnel. In another attempt at scale development in the education field, Celik, Sahin, and Aydin (2014) attempted to develop a mobile learning adoption scale that has seven-point Likert scale items with 18 items and 5 sub-dimensions. Even though this scale may have valid and reliable scores, it is also not practical for use with medical personnel involved in innovative product development and launch.

Although Mahajan, Muller, and Bass, in their extensive review of new product diffusion models (1990), caution researchers in using diffusion models in real world applications such as forecasting first-purchase sales volume for consumer products, it is contended here that this research defines a new

category of diffusion of innovations research in technology markets. This new approach uses Rogers' theory to measure a predisposition to accept well defined technology innovations quickly which allows marketers to identify countries likely to cross the chasm to success. This approach has generalizability given it now has been used with physicians, nurses, and dieticians as well as laboratory personnel in addition to these medical surgical technology personnel. Additional research is planned to investigate this predisposition and its relationships with other respondent characteristics to establish some construct validity. Establishing some construct validity can only enhance the case for using the predisposition to adopt measure in international marketing research surveys.

One potential limitation to these results is a single item measure of innovativeness. Research on this issue may allow a loosening of this restriction on measurement (Loo, 2001). Although multi-item measures are typically more reliable than single-item measures, the approach used here has been consistent in resulting distributions for physicians, laboratory personnel, and now surgeons. This approach has strong face validity and has now been used with a variety of medical personnel types.

REFERENCES

Antonides, G., Amesz, H., & Hulscher, I. (1999). Adoption of Payment Systems in Ten Countries – A Case Study of Diffusion of Innovations, *European Journal of Marketing,* 33, 1123-1135.

Bass, F. (1969). A New Product Growth for Model Consumer Durables, *Management Science,* 15(5), 215-227.

Braak, J. (2001). Individual Characteristics Influencing Teacher's Class Use of Computers. *Journal of Educational Computing Research,* 25(2), 141-157.

Beal, G., Rogers, E., & Bohlen, J. (1957). Validity of the Concept of Stages in the Adoption Process, *Rural Sociology,* 22(2), 166-168.

Celik, I., Sahin, I., & Aydin, M. (2014). Reliability and validity study of the Mobile Learning Adoption Scale developed based on the Diffusion of Innovations Theory. *International Journal of Education in Mathematics, Science and Technology,* 2(4), 300-316.

Dekimpe, M., Parker, P., & Sarvary, M. (2000). Global Diffusion of Technological Innovations: A Coupled-Hazard Approach. *Journal of Marketing Research,* February, 47-59.

Gruber, H., and Verboven, F. (2001). The Diffusion of Mobile Telecommunications Services in the European Union. *European Economic Review,* 45, 577-588.

Helsen, K., Jedidi, K., & DeSarbo, W. (1993). A New Approach to Country Segmentation Utilizing Multi-national Diffusion Patterns. *Journal of Marketing* 57, October, 60-71.

Hitt, M., Ireland, D., & Palia, K. (1982). Industrial Firms' Grand Strategy and Functional Importance: Moderating Effects of Technology and Uncertainty, *The Academy of Management Journal*, 25, 2, June, 265-298.

Hunt, S., & Morgan, R. (1995). The Comparative Advantage Theory of Competition, *Journal of Marketing,* 59, April, 1-15.

Hurt, H., Joseph, K., & Cook, C. (1977). Scales for the Measurement of Innovativeness, *Human Communication Research,* 4(1), 58-65.

Kang, W. & Montoya, M. (2014). The Impact of Product Portfolio Strategy on Financial Performance: The Roles of Product Development and Market Entry Decisions, *Journal of Product Innovation Management,* 31(3):516–534.

Kiiski, S., & Pohjola, M. (2002). Cross-country Diffusion of the Internet, *Information Economics and Policy,* 13, 297-310.

Loo, R. (2017). "A caveat on using single-item versus multiple-item scales." *Journal of Managerial Psychology,* Jan.-Feb. 2002: 68+. Business Insights: Global. Web. 7 March.

Midgley, D. & Dowling, G. (1978). Innovativeness: The Concept and Its Measurement, *Journal of Consumer Research,* 4, March, 229-242.

Moore, G. (1991). *Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Cus*tomers, New York: Harper Business Essentials.

Rogers, E. (1st ed. 1962, 5th ed. 2003). *Diffusion of Innovation*, New York: The Free Press.
Rogers, E. & Shoemaker, F. (1971). *Communication of Innovations*, New York: The Free Press.
Sakarya, S., Eckman, M., & Hyllegard, K. (2007). Market Selection for International Expansion: Assessing Opportunities in Emerging Markets, *International Marketing Review,* 24(2), 208-238.
Sahin, I. (2006). Detailed review of Rogers' Diffusion of Innovations Theory and Educational Technology-Related Studies Based on Rogers' Theory, *The Turkish Online Journal of Educational Technology,* 5(2), Article 3, 14-23.
Webster, F. (1969). New Product Adoption in Industrial Markets: A Framework for Analysis, *Journal of Marketing,* 33(3), 35-39.
Wind, Y., Douglas, S, & Perlmutter, H. (1973). Guidelines for Developing, International Marketing Strategies, *Journal of Marketing,* 37, April, 14-23.
Yuksel, I. (2015). Rogers' Diffusion of Innovation Model in Action: Individual Innovativeness Profiles of Pre-service Teachers in Turkey, *Croatian Journal of Education,* 17, 507-534.