

## **ROLE OF VALUES AND COMPETENCIES IN UNIVERSITY INTELLECTUAL PROPERTY COMMERCIALIZATION: A CRITICAL REVIEW**

Sabri Mohamad Sharif\*, Nurul Zarirah Nizam, Nurulizwa Abdul Rashid, Nor Ratna Masrom,  
Mohammed Hariri Bakri  
Fakulti Pengurusan Teknologi dan Teknousahawanan, Universiti Teknikal Malaysia Melaka  
\*sabri@utem.edu.my

### **ABSTRACT**

Values and competencies of the university researchers, and technology transfer officers strongly influence the commercialization process of the university-led intellectual property. Existing studies provide limited explanation as to how researchers' values and capability as entrepreneurs and as collaborating agent with other stakeholders may influence commercialization process. More studies need to be done to explain the dimensions of values and competency in the process of commercializing university intellectual property. Existing studies do not provide sufficient evidence about the relationship between values and competence. Studies on the role of values in intellectual property commercialization are almost non-existent. This study reviews the existing studies on values and competencies to explain the success and failure of commercialization in university-led intellectual properties.

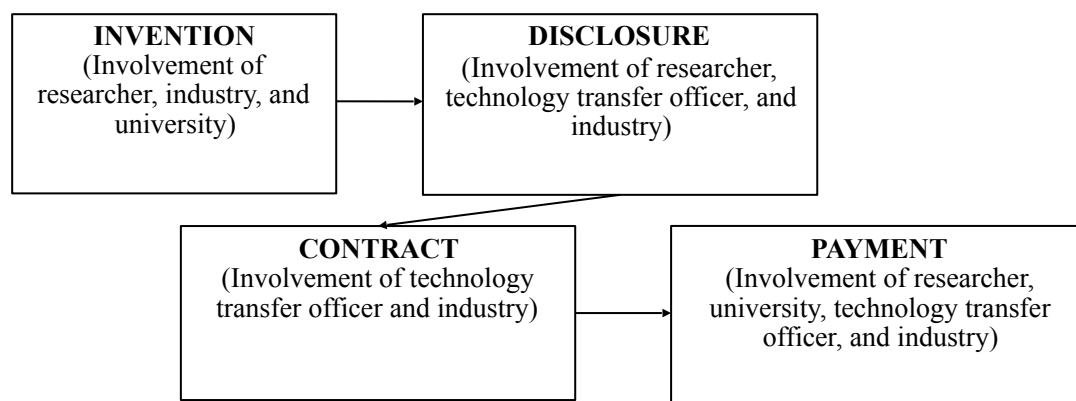
**Keywords:** *Values, Competencies, Technology Transfer, IP Commercialization*

### **INTRODUCTION**

Commercialization of intellectual property is one of the challenging tasks for effective innovation management at universities. Commercialization is the process that transfers inventions from university labs to market for wider public use (WIPO, 2006). Inventors, investors, and governments have long wondered what makes commercialization process successful (Curtin, 2012; Furman et al., 2002; Thursby & Kemp, 2002; Thursby & Thursby, 2011b). For decades, studies have revealed a number of factors related to industries, universities, and government that influence commercialization process (Geuna & Muscio, 2009; Hearn et al., 2004; Siegel et al., 2004; Stephan, 1996; Thursby & Kemp, 2002). The process of commercializing intellectual property involves various legal, marketing, as well as technical activities that are controlled by individuals and organizations involved in the process. These individual and organizational characteristics influence the success of commercialising intellectual property in universities. Current studies largely ignore the profound effect of individual and organizational characteristics and abilities on commercialization process in universities. This study critically reviews the roles of values and competencies as determinants of successful university-led commercialization of intellectual property.

### **IP Commercialization Process**

Intellectual property is an innovation that has been legally registered and thus provides legal right to the innovator and the right of use to other stakeholders (Rasmussen et al., 2006). Research capabilities, low research cost, and public-private funding opportunities have transformed universities into centers of innovation in recent years (Kroll & Liefner, 2008). Historically, the availability of research funds, relaxed legal procedures, and control over revenue earned from innovations are the major factors determining the success of commercialization (Debackere & Veugelers, 2005; Feldman et al., 2002; Lockett & Wright, 2005; Siegel & Phan, 2005; Thursby & Kemp, 2002; Wallmark, 1997). However, recent concerns over the degree of innovators' involvement, the level of innovation disclosure by innovators, the attitude and competencies of researchers and technology transfer officers, and the type of technology transfer contracts and payment mechanisms shed light on individual and organizational values influencing the success of intellectual properties commercialization at universities (Braunerhjelm, 2007; Dechenaux et al., 2011; Khazanchi et al., 2007; Thursby & Thursby, 2011b).



**Figure 1.** Stages of IP imbued with individual and organisational values (Mirowski & Van Horn, 2005)

### **Putting Values and Competencies in IP Commercialization: Missing Parts**

Scientists have considered the importance of values in social practices. Values are characteristics that make individuals and organizations different from each other in executing certain processes (Munson & McQuarrie, 1988). Positive values will have positive influence on commercialization processes. However, the way in which university values and individual values influence commercialization process of intellectual property has yet to be fully reflected in a single framework. Researchers usually discover new ideas after making countless sacrifices. Innovations being successfully commercialized, bring benefits to society. The facilities and assistance given to researchers during commercialization process influence the result of commercialization (Rasmussen & Borch, 2010; Rasmussen et al., 2006). Attitude of researchers which reflected their values is crucial in the disclosure of innovation itself, choosing the contract for the transfer of technology, and the type of incentive universities offered to their researchers.

Individual values are characteristics, principles, qualities, traits, thoughts, attitude/perception/belief of the individuals that distinguish their line of actions and their thoughts about certain phenomenon with respect to others (Schwartz, 2006). There are positive and negative individual values. Rokeach (1973) identified 36 individual values and categorized them into instrumental values and terminal values. Organizational values appeared as collective and mixed values in Sagib and Schwartz (1995). Sagib and Schwartz (1995) included five individual values as well. These studies on values are widely cited in the literatures of psychology and management to explain the inherent characteristics of individuals and organizations with respect to their performance in certain operation. Even though commercialization of intellectual property is values laden, past studies did not do a proper justice to the importance of values in explaining the outcome of certain phenomenon of interest.

Individual and organizations' competencies have an influence on their own work process. Competence is the skill, knowledge, and qualities that enable individuals and organizations to perform certain tasks with the required efficiency (Woodall & Winstanley, 1998). There are several types of competencies such as core competencies, organizational competencies, and task completion competencies. Core competencies are qualities that enable organizations to achieve superior goals and differentiate themselves from competitors (Prahalad & Hamel, 1990). Organizational competencies are broadly defined as organizational rules and clear goals, which provide guideline in the completion of certain tasks on time (Lockett & Wright, 2005; Rasmussen & Borch, 2010). Task completion competencies are task-specific qualities and skills which ensure that all plans are successfully implemented (Liu et al., 2010). Organizational success is heavily influenced by the values and generic and task-specific qualities of individuals in the organization (Corny, 2004; Taylor, 1911).

### **DEFINITION OF VALUES**

Values are individual and organizational characteristics that indicate their involvement in psychological, moral, and ethical decision process. Characteristics refer to principles, attitudes and belief in explaining the dimensions of values. Values are different from Value. Value represents outcome as in value maximization. Values have their roots in psychology and have been studied

extensively in marketing and consumer research. Values are mostly explained in individual behavioral process. The concept of organizational values is still emerging. Some organizational values are explained as work values. Table 1 gives a list of definitions of values from various backgrounds. Values are closely related with principles, virtues, attitude and belief (Rokeach, 1973). Values are strongly related to culture and social learning. Values are highly subjective, vary significantly between individuals and organizations, and influence the way competencies effect human behavior in society.

**Table 1.** Definitions of values

Definition/ Major Issues	References
<b>Individual Values</b>	
The principles and quality that guide human actions. Those qualities of behavior, thought, and character that society considers as intrinsically good, having desirable results, and worth emulating by others.	Vinson et al. (1977)
Values are criteria that people use to justify their behavior and judge other and themselves. <b>a.</b> Values are beliefs tied to emotion. <b>b.</b> Values refer to desirable goals that people strive to attain. <b>c.</b> Values are abstract goals. <b>d.</b> Values guide the choice in evaluating action, policies, people, and events.	Sagiv and Schwartz (1995)
Values are characteristics that help in the understanding of human psychological decision process.	Kahle (1996)
Values represent characteristics, attitude, and belief of individual and organization that assist in obtaining results.	Rokeach (1973)
Values in Islam are collective forces of belief, ethical behavior, and human relationship.	Mohd et al. (2011)
Values can be seen as character traits that help produce ethical individuals.	Meara et al. (1996)
Integrity, leadership skills, and superior capability in specific task are combined to form entrepreneurial values.	Morris and Schindehutte (2005)
<b>Organizational Values</b>	
Values are organizational ethical boundaries that range from personal to social and from moral to preference type values. Organizational values are work-related characteristics that guide human actions to achieve certain goals and are controlled by organizational specialization.	Dose (1997)
Honesty, fairness, concern for others and achievement are the four organizational values needed for effective corporate growth. Values are beyond corporate code of conducts and comprise a number of ethical and capability issues.	Williams (2011)
Work-related ethics, compliance, and good relationship with co-workers are major elements of values in organizations.	Roe and Ester (1999); Ros et al. (1999)

Several elements of values emerged from the discussions in Table 1. Basically, there are two types of values, individual values and organizational values. Individual values are characteristics, qualities, and beliefs related to individuals. Organizational values are standards, work practice, and qualities beyond

corporate code of conducts. Individual values are strongly influenced by social factors, while organizational values are influenced by both work specialization and social cultures. However, one common thing shared by individual and organizational values is that values are abstract guidelines for achieving goals. Therefore, values are connected to qualities and are used to determine goals.

### VALUES IN EXTANT STUDIES

Values are rooted in psychology, which borrowed by marketing and organizational management scientists. Values are used in extant literatures to explain attributes of consumer behavior and dimensions of human behavior at workplace (Roe & Ester, 1999; Vinson et al., 1977). As explained in the previous section, the two major types of values are individual and organizational values. Individual values are further divided into two categories: instrumental and terminal values (Rokeach, 1973). Instrumental values are generic individual values that differentiate one individual from another. These values include issues related to morality and qualities. On the other hand, terminal values are similar to value or outcome of instrumental values. National productivity, national economic progress, state of peace, and financial gains are some examples of terminal values. Table 2 shows the Rokeach Value Survey (Rokeach, 1973) that includes a number of instrumental and terminal values.

**Table 2.** Rokeach value survey - types of values (Rokeach, 1973)

SL	Terminal Values	Instrumental Values
1	A Comfortable Life _____ a prosperous life, easy, no pressure	Ambitious _____ hardworking and aspiring
2	Equality _____ brotherhood and equal opportunity for all	Broad-minded _____ open-minded
3	An Exciting Life _____ a stimulating, active life	Capable _____ competent; effective
4	Family Security _____ taking care of loved ones	Clean _____ neat and tidy
5	Freedom _____ independence and free choice	Courageous _____ stand up for your beliefs
6	Health _____ physical and mental well-being	Forgiving _____ willing to forgive others
7	Inner Harmony _____ freedom from inner conflict	Helpful _____ work for the welfare of others
8	Mature Love _____ sexual and spiritual intimacy	Honest _____ sincere and truthful
9	National Security _____ protection from attack	Imaginative _____ daring and creative
10	Pleasure _____ enjoyable, leisurely life	Independent _____ self-reliant; self-sufficient
11	Salvation _____ saved; eternal life	Intellectual _____ intelligent and reflective

SL	Terminal Values	Instrumental Values
12	Self-Respect _____	Logical _____
	self-esteem	consistent; rational
13	A Sense of Accomplishment _____	Loving _____
	lasting contribution	affectionate and tender
14	Social Recognition _____	Loyal _____
	respect and admiration	faithful to friends or group
15	True Friendship _____	Obedient _____
	close companionship	dutiful; respectful
16	Wisdom _____	Polite _____
	mature understanding of life	courteous and well-mannered
17	A World at Peace _____	Responsible _____
	a world free of war and conflict	dependable and reliable
18	A World of Beauty _____	Self-controlled _____
	beauty of nature and the arts	restrained; self-disciplined

Values explain consumer motivation and the psychological basis in making purchase decision (Kahle, 1996). Values explain the decision an individual make in a social context by combining social and individual values. In this regard, values can be explained based on three origins: (1) need related to human biological structure, (2) need to maintain social connections, and (3) need to manage group membership (Schwartz, 1992). Based on these three criteria, values can be divided into three major groups: values in individual interest, collective interest, and mixed interest. Values in individual interest are similar to individual values, while values in collective interest arise from social and organizational values. Mixed interest values are values with shared attributes between individual and collective values. These values are collectively named Schwartz Value Typology. Sagiv and Schwartz (1995) have grouped these three categories of values into 10 value types and have divided them into sub-groups of individual and instrumental values. Table 3 shows the Schwartz value types.

**Table 3.** Schwartz values types (Sagiv & Schwartz, 1995; Schwartz, 2006)

Type of Value		Characteristics
Collective	Tradition	Motives that conform to beliefs, the preservation of customs and good manners.
	Benevolence	The goal to preserve and improve well-being of those whom the individual frequently interacts. Honesty.
	Spiritualism	Need to make sense of reality. Personal harmony by transcending the reality of daily life.
	Achievement	Search for personal success by showing off personal achievements. Success, ambition. Ability.
	Stimulation	Enthusiasm, values associated with the need for excitement, novelty, risk.

Type of Value		Characteristics
Individual	Power	Attainment of social status, prestige, control, and dominance of others.
	Self-direction creativity	Generates new ideas, new projects etc. with ease.
	Self-direction Independence	Search for independence, self sufficiency
Mixed	Security	Search for safety, harmony, and social stability
	Ecology	Becoming one with nature, a world of beauty, environmental protection.
	Universalism	Appreciation, tolerance, protect the welfare of mankind and nature.

Along with Schwartz and Rokeach, various organizations have formulated corporate and leadership policies based on values. Two major types are worth explaining here: leadership values and entrepreneurial values. Values are human identity. Values represent our way of thinking. A report by globe research (<http://www.grovetwell.com/pub-GLOBE-dimensions.html#DimensionExample>) has identified nine values-characteristics. However, these are more of leadership characteristics than values. These characteristics include performance orientation, avoiding uncertainty, humane orientation, institutional collectivism, assertiveness, future orientation etc. The National Defense University, United States, published a set of leadership roles on their website (<http://www.au.af.mil/au/awc/awcgate/ndu/strat-ldr-dm/pt4ch15.html>). They have also categorized values into individual and group values. Individual values include commitment, competence, candor, and courage. Group values and leadership characteristics include integrity, professionalism, care, teamwork, and stewardship. Entrepreneurial values are qualities that entrepreneurs need to have to grow in certain business contexts. Entrepreneurial values help increase firm's competitive advantage (Pralhad & Hamel, 1990). These values include characteristics such as competitive aggressiveness, innovativeness, and risk taking (Lumpkin & Dess, 1996). Entrepreneurial orientation is extensively important for firm success in the long-run. Investors in new ideas are becoming part of spin-off companies' ecosystem. Possibility of equity ownership in new spin-off companies motivates researchers to commercialize intellectual property. Hence, entrepreneurial values are important in the context of intellectual property. Extant studies use five widely used measures of entrepreneurial orientation to present entrepreneurial values (Lindsay et al., 2008a; 2008b; Naman & Slevin, 1993; Slater & Narver, 2000). Table 4 summarizes the five items that Naman and Slevin (1993) stated as entrepreneurial orientation in their fit index.

**Table 4.** Entrepreneurial orientation (Naman & Slevin (1993) as cited in Hult et al. (2003))

Factor	Explanation
Visionary	We believe that wide-ranging acts are necessary to achieve our objectives
Collaborative	We initiate actions to which other organisations respond
Creative	We are fast to introduce new products and services to the marketplace
Risk-taker	We have a strong proclivity for high-risk projects
Competitive	We are bold in our efforts to maximise the probability of exploiting opportunities

Values determine success (Schwartz, 2006). Commercialization of intellectual property involves studies on economic value created from intellectual property (Gambardella et al., 2011; Harhoff et al., 1999; Morris & Schindehutte, 2005). These studies are closely related to terminal values. Despite their importance, discussion of instrumental values are not given due weights in intellectual property

literatures. Discussion of entrepreneurship values are limited to management literatures, and is not clearly explained for intellectual property management at universities. Investors' values are not properly discussed in intellectual property literatures either. To ensure the success of commercialization process, intellectual property literatures must explain the values of individuals and organizations involved in the process.

**Table 5.** Values embedded in intellectual property (Source: Compiled from Literature Review by the Author)

<b>Researchers</b>	<b>Technology Transfer Officers</b>	<b>Others (University, Government, and Industry)</b>
Unsecured commercialization	Balance payoff between researcher and industry	Legal framework to differentiate social and inventors' right
Lack of interest (trade-off between academic and industry research)	Negotiate between industry and researchers	Opportunity for contractual relationship between researchers and industry
Social commitment of inventions	Financial gains in the form of fees and royalty	Government control over research output
Conducive research culture, motivation	Level of commitment towards university research	Customization and dynamism of national innovative policy
Extent of innovation disclosure		Advanced facilities
Level of equity participation	Capable transfer officers	Flow of fund for research and innovation
Degree of industry collaboration		
Control over financial output of innovation		Degree of research specialization
Degree of technology specialization		Research monitoring process, level of monitoring
Degree of openness		University control over transfer officers
Capable researchers		
Researchers' overall involvement in commercialization		

### **VALUES IN INTELLECTUAL PROPERTY COMMERCIALIZATION**

Values orientation is one of the most significant constructs in the history of social science (Kahle et al., 2000; Rokeach, 1973). Values orientation transforms an organization into a social, creative, and result-oriented organization (Sagiv & Schwartz, 1995). Values are embedded in intellectual property literatures. This subsection will explain how values are uniquely important in the process of commercializing intellectual property. However, the basis for values-driven commercialization process deserves some explanations. Similar to Rokeach (1973), Sagiv and Schwartz (1995), this study defines values as the characteristics of individuals and organization that explain attitude, belief, and principles applied during the commercialization of intellectual property at universities. Table 5 shows the evidences of values embedded in the commercialization of intellectual property. These contents from Table 5 are evidence of values-embedded intellectual property commercialization process. However,

existing studies on intellectual property commercialization have not given appropriate attention to these.

Values orientation is grouped for three major stakeholders of commercialization process. There are four perspectives regarding these values. Values in intellectual property commercialization at universities are influenced by (1) level of personal involvement, (2) level of personal control (over resources, plan and output), (3) level of capabilities (ability to complete task, and ability to collaborate, negotiate and manage), and (4) extent to which external stakeholders control the process (demand for research, monitoring process by stakeholders, government's involvement). Both individual and organizational values play important role in the process. The first two views are related to personal values, the third view is related to mixed values of individuals and organizations, and the last view is related to organizational values.

### **Researchers and Individual Values**

Individual values may arise from various dimensions. The basis for individual values provides room for subjectivity and may entice individuals to move away from university's innovation plan. Individuals who work in intellectual property commercialization process do it to gain reputation in the scientific community and for long-term financial gain. Lichtenthaler and Ernst (2007) found that researchers' desire for reputation is a significant determinant of successful commercialization, while research sharing among individual researchers and research administrators help reduce the life cycle effect (Boyd, 2003). Life cycle effect is the tendency of researchers to produce high quality research but publish less at the end of their research career. At the beginning of their research career, researchers tend to produce less quality ideas but publish more. Hence, Boyd (2003) indicated that researchers make a trade-off between age and career. Tendency to disclose research is also influenced by the life cycle effect.

Thursby and Kemp (2002) argued that willingness to conduct basic research is a major concern nowadays. It is generally thought that universities should conduct basic, academic, and philosophical researches. Researchers who can make effective trade-off between academic and industry research make progress in intellectual property commercialization. However, due to the economic and social benefits of innovation, universities now intend to innovate and commercialize more. Hence, disclosure intention and balance between academic and industry research have important influence on commercialization process. Moreover, researchers and universities also have commitment towards society. Researchers with feelings of social commitment would tend to commercialize more to honor that commitment.

When an idea is ready to be commercialized, researchers may act as risk averters. Researchers might want to minimize the possibility of loss due to unsuccessful innovation even though the innovation might have good future (Dechenaux et al., 2011). Commercialization process is also influenced by the degree of researchers' involvement. Researchers transfer commercialization responsibilities to technology transfer officers after the contract has been finalized. However, higher researcher involvement is necessary to transform prototype into product. Industries also seek researcher's active participation during this process. Rate of commercialization goes up if researchers were actively involved in commercialization process (Thursby & Kemp, 2002; Thursby & Thursby, 2011b).

Braunerhjelm (2007) reported that researcher's positive attitude towards commercialization and effective incentive structure have positive relationship with commercialization process. Thursby and Kemp (2002) argued that if promotion and incentive system were tied to progress of innovation, researchers would commercialize more. They also argued that researcher's ability to cooperate and broad-mindedness have positive influence on commercialization process. Moreover, equity and profit sharing options positively motivate the researchers to be involved in commercialization process (Feldman et al., 2002).

Researchers with strong drive for creative learning and high degree of technology specialization innovate more. Autio and Kauranen (1994) found that internal motivation of researchers is more important than technology-driven motivation or market pull motivation in setting up new companies. Their study showed that individual values play pivotal role in commercialization university intellectual property.

Commercialization process becomes slow if the innovation is completed with much hardship (Thursby & Thursby, 2011b). Commercialization growth is strongly and positively related to the facilities provided for researchers. Researchers need both financial and infrastructure assistances. With regard to



infrastructure assistance, universities should not only focus on logistics and instrumental facilities but also provide conducive environment for conducting research. Researchers would be demotivated if research culture, competition, and incentive structures are not properly planned (Thursby & Thursby, 2011a). Researchers' experience with certain industry and understanding of customer demands are influenced by the extent of university-industry interaction (Lockett & Wright, 2005; Thursby & Kemp, 2002). Thursby and Thursby (2011) suggested that more studies be conducted regarding the impact of researcher-controlled characteristics in commercialization of intellectual property. This means that a comprehensive model is needed to understand and explain how capable research people (researchers and research administrators) influence the success of commercialization of intellectual property at universities.

### **Technology Transfer Officers and Individual Values**

The intention and honesty of technology transfer officers are also part of individual values. Kneller (1999) argued that commercialization process may fail due to the different membership fee charged by technology transfer officers. Various researchers have found that the intention of the technology transfer officers is even more important when researchers have little knowledge regarding less expensive techniques of commercialization (Thursby et al., 2009; Thursby & Thursby, 2011c; Thursby et al., 2007; Tschirky & Koruna, 2004; Uranga et al., 2007). Technology transfer officers serve as intermediary between researchers and industry, and thus technology transfer officers with good coordination skills are instrumental in facilitating a successful commercialization (Rasmussen et al., 2006; Uranga et al., 2007). These studies clearly indicate that values are embedded in intellectual property commercialization process and have profound influence on the success of the commercialization process. However, existing studies ignore the importance of values. More studies are required to explain the dimensions of individual values in commercialization process.

### **Organizational Values and Commercialization of Intellectual Properties**

Argyres and Liebeskind (1998) found that organizational commitment and research culture exert strong influence on property rights. A competitive market for product motivates inventors. An organization with clear-cut commercialization policies can compete well in the market and sustain the pipeline of their innovations (Chakraborty & Mathew, 2003). Karuna (2004) argued that having a clear university innovation vision improved the opportunity for more commercialization. The desire to maintain relationship with other organizations improve the chances of organizations commercializing their intellectual property successfully (Borg, 2001; Hindle & Yencken, 2004).

Borg (2001) argued that a well-connected organization is more likely to be able to identify the economic output of their innovation. However, Braunerhjelm (2007) found that universities which lack clear-cut research policies, in combination with weak incentive structure and poor management of support facilities, do not connect well with relevant stakeholders. Even though individual values are positively present, poor management or lack of supporting organizational values may result in failure of commercialization of intellectual property (Braunerhjelm, 2007). Hence, organizational connectivity adds value to university's commercialization process.

Universities with supportive organizational policies, infrastructure, and systems; ability to share resources with other stakeholders; and have effective contract management with researchers were able to do more commercialization (Chang et al., 2005). A decentralized organizational innovation system, which involves many research groups, were able to do more commercialization (Debackere & Veugelers, 2005). The extent of organizational research sharing, degree of technological specialization, and a country's innovative capacity influence the process of commercialization (Furman et al., 2002). Ganz-Brown (1999) argued that organizational capabilities and research sharing successfully support commercialization when the legal conflicts related to intellectual rights are resolved. Organizations with clear-cut policies tend to be more successful in their commercialization efforts.

Universities that provide strong legal protection for inventors and policy support for entrepreneurs clear the hindrances for large scale innovation transfer from inventor level to consumer level (Hearn et al., 2004). Developing researchers' capabilities through training and workshops, and opening opportunities to connect individual researchers often have substantial influence on the process of commercialization (Borg, 2001). Kelli and Pisuke (2008) argued that both legal and economic aspects of intellectual property are crucial for successful commercialization. They found that the type of contract used and the adequacy of university's research infrastructure contribute towards successful

commercialization.

Technology Transfer Officer has an influence over the type of contract, terms and conditions, and overall post-innovation process. Apart from personal bias of technology transfer officers, the organizational setup of technology transfer office may have negative or positive characteristics, which in turn influence the process of commercialization. Kneller (1999) argued that if technology transfer officers intend to maximize their own profit by increasing management fee, the rate of commercialization would decrease.

Desire for reputation is yet another reason why universities license out their innovation. High number of innovation increases the goodwill of a university. However, the selection and disclosure of the innovation licensed out would have to be carefully handled since they might also have negative effect on the reputation of the university (Lichtenthaler & Ernst, 2007). Entrepreneurial development from innovation (Rasmussen & Borch, 2010; Thursby & Kemp, 2002) is one of university's major social contributions. The broad-mindedness of university innovation policy could open new job opportunities for the country. Universities create room for spin-off companies from commercialized ideas. The benefits from the spin-off companies will come back to the universities as a major source of revenue and reputation.

In addition to entrepreneurial activities, societies reap huge benefit from the contribution of the inventions in social development. More and more universities were attempting to commercialize new ideas for the benefit of the society and to support increasing government commitment towards social development (Rasmussen, 2008; Thursby & Kemp, 2002). The desire for social welfare was also significant due to ethical issues of inventions and holding property rights (Slaughter & Rhoades, 2009).

Governments are reducing the amount of funding for innovation management at universities. Universities have to increase their revenue from innovation management to finance innovation expenses. On the other hand, commercialization of intellectual property is one of the major sources of revenue for universities. As innovation management is expensive, universities tend to commercialize more to generate more earnings. Chakraborty and Mathew (2003) argued that higher revenue generation positively influences competitive position of any organization in the commercialization of intellectual property. The United States model of intellectual property reveals the use of equity entrepreneurship while giving more importance to innovators for their innovation, whereas universities earn the highest revenues in the non-United States model of commercialization of intellectual property (Feldman et al., 2002). Additionally, the setting up of spin-off companies is positively related to higher income for universities (Lockett & Wright, 2005). Spin-off companies which were formed as a result of university-led intellectual property commercialization share a percentage of profit, as royalty, with the university every year. Hence, the tendency for high income orientation influences the motivation for more commercialization of intellectual property. Rader (2004) concluded that universities preferred innovations that benefit them financially.

Some studies looked at work values instead of organizational values. By work values, literature refer to management ethics at workplace (Dose, 1997). Work values combine personal and social values that are related to workplace. Moral and ethical dimensions are major dimensions in organizational values. The core business practice of an organization should be guided by ethical and moral principles. Concern for others and sharing achievements are among organizational values that motivate employees to participate in decision-making (Williams, 2011). However, individual and work values are interrelated. Organizational values helped promote individual values (Ros et al., 1999).

The above discussion gave an explanation of how organizational values are embedded in commercialization of intellectual property. However, existing studies have not provided a clear framework of organizational values. Organizational values include organization's involvement through their commitment towards innovation and commercialization, assurance of effective legal protection for innovators, clear research goals and standards, desire to connect, competitive innovation policies, adequate support facilities, degree of research specialization, desire for organizational reputation for innovation, and commitment towards a society-centric innovation system. Successful administration of commercialization process requires proper management of organizational values.

## **DEFINITION OF COMPETENCIES**

Competencies are ability of an individual to complete certain task within a certain period of time. Competencies can be specific to task, individual, or environment. Competent individuals can use their

knowledge, experience, and leadership skill to guide the objectives of achieving a target. Competence is positively related to performance. Various studies have explained competency from the multidimensional perspective. Table 6 gives a brief definition of competency from various perspectives. It shows that competency refers primarily to the ability to use resources, the ability to plan, technical skills, task related skills, and leadership skills to complete tasks. Competencies involve motivation and leadership skills. However, it is also true that people with superior competencies may have inferior quality values or vice versa. The relationship between values and competencies depends on other factors.

**Table 6.** Definition of competency

<b>Study</b>	<b>Definition</b>
<b>General Definitions</b>	
Jordan et al. (1999)	Competencies are means to foster excellence and may include quality of colleagues, knowledge base, facilities, equipment, support personnel, technical capabilities, and reputation.
Green (1999)	Competencies refer to both organizational and individual characteristics that are crucial in achieving certain goals. Competencies are context-based characteristics and may include technical skills and knowledge base, performance skills, and leadership skill.
Taylor (1911)	Competencies are ways to fulfil tasks.
Cockerill et al. (1995)	Competencies differentiate between output, and hence are influenced by values of individuals.
<b>Worker-Oriented Definitions</b>	
Boyatzis (1982)	The behavioral characteristics of an individual that are causally related to effective and/or superior performance in a job. This means that there is evidence that having these characteristic precedes and leads to effective and/or superior performance on the job.
Spencer and Spencer (1993)	An underlying characteristic of an individual that is casually related to effective and/or superior performance in a job or situation.
Schroder (1989)	A high performance or H-competency is a relatively stable set of behaviors, which produce superior workgroup performance in more complex organizational environments.
<b>Work-Oriented Definitions</b>	
MCI (1990)	Occupational competence (is) ... the ability to perform activities within an occupation or function to the level of performance expected in employment.
Nordhaug and Gr (1994)	Competence is the ability to perform activities in an occupation.
Moore et al. (2002)	According to Training Agency Standard, 2000, competence is an action, behavior, or outcome, which a person should be able to demonstrate.
<b>Other Dimensions</b>	
NCVQ (1997)	The ability to apply knowledge, understanding, and practical and thinking skills to achieve effective performance to the standards required in employment. This includes solving problems and being sufficiently flexible to meet changing demands.

<b>Study</b>	<b>Definition</b>
Woodall and Winstanley (1998)	Competence is the skills, knowledge and understanding, qualities and attributes, and sets of values beliefs and attitudes that lead to effective managerial performance in a given context, situation or role.
<b>Commercialization</b>	
Lee (2009)	The competence of market timing in invention and commercialization where competence positively influences the latter.

## **COMPETENCY IN EXISTING STUDIES**

Competency is a common topic in management. Competencies are resource to individuals and firms (Nordhaug & Gr, 1994). Competencies normally refer to individual's abilities and skills to accomplish certain objective (Jordan et al., 1999). Studies in management do not fully explain organizational competencies. Most studies in management explain individuals' competencies. Individual competencies can be further grouped into generic competencies and task-related competencies. Task competencies are influenced by contextual factors (Green, 1999). External factors such as degree of control by individuals, may influence task completion competencies (Liu et al., 2010). Core competencies that non-task related generic competencies are collective knowledge of any company to manage various skills and knowledge (Prahalad & Hamel, 1990). Generic competencies maintain the overall system of a company and help the company fight competition against corporate offerings in the market (Garavan & McGuire, 2001; Tschirky & Koruna, 2004). Together, task and generic competencies form competitive advantage of a firm (Prahalad & Hamel, 1990).

### **Competencies in IP Commercialization**

Competencies are common characteristic in intellectual property commercialization. The ability, skill, and knowledge of researchers and technology transfer officers are major determinants of success in commercialization (Sandberg, 2000). Various types of skills were discussed in intellectual property literatures. Competencies, with respect to intellectual property commercialization process, are commonly divided into four major categories: (1) competency of researchers, (2) competency of technology transfer officers, (3) competency of researchers as entrepreneurs, and (4) competency of universities. It is worth mentioning here that major studies of values listed capability as values, which might cause some confusion (Rokeach, 1973). Competencies and capabilities are often used interchangeably in these literatures.

### **Competencies of Researchers**

Competencies of researchers refer to the ability to conduct high quality research and cooperate during commercialization process. Qualified researchers were able to commercialize more (Autio & Kauranen, 1994). However, not enough studies have been done regarding the relationship between commercialization-specific ability and rate of commercialization. The arguments arise from the debate that researchers might be extraordinary in conducting research but are not very knowledgeable about the technical skills required for commercialization. Degree of participation and collaboration with other researchers facilitate the carrying out of commercialization (Thursby & Thursby, 2011b). Commercialization increases with unique contribution to meet the demands of industry. Researchers with higher research and technology specialization were more successful in commercialization (Hearn et al., 2004).

Higher involvement in academic administrative activity leaves less time to conduct research. Academic staffs had to sacrifice other priority to conduct basic research in order to commercialize more application researches (Thursby & Thursby, 2011c). The time taken to complete research project influences the output of commercialization. Out dated innovation cannot be commercialized. However, existing studies are not sufficient to explain the link between timeliness of researchers and their commercialization gains. Work dynamism is a general role played by professional researchers. In this role, researchers apply for multiple funds at a time and undertake various research tasks in relevant field. These researchers engage their stakeholders to act quickly upon the strategy to accomplish innovation task. Capability in teaching environment is common in extant studies (NCVQ, 1997).

However, capability of researchers in commercialization of intellectual property, especially with respect to values, has not been explained properly. More studies need to be done to understand how competencies or capabilities of researchers influence commercialization of intellectual property.

### **Competencies of Technology Transfer Officers**

Universities with effective research infrastructure and work force can achieve more successful commercialization. Active participation of research and non-research staffs increases the possibility of commercialization (Wallmark, 1997). Competent support staff understands the specific needs of researchers and can take timely actions (Furman et al., 2002). Among support staffs, the role of technology transfer officers is very special. They play a dual role with researchers as well as industries. Technology transfer officers should have legal, marketing, and technical skills to understand the supply and demand of innovation in economy. They must have knowledge of the economics and valuation aspects. Farsighted technology transfer officers understand the requirements for quality commercialization project (Jensen et al., 2003).

The terms technology transfer officers and technology licensing officers are often used interchangeable. Most technology licensing officers are legal experts (Hamzah, 2006). Technology transfer officers must possess advanced management skills to negotiate between university researchers and industry clients (Kneller, 1999). They must also have a strong grasp of the latest development in industry, especially with regard to industry demand for commercialization. Information gap at the technology transfer officers' level have negative influence on the success of commercialization (Siegel et al., 2004). Third party technology transfer officers or contract research organizations are separate entities that undertake commercialization in their area of expertise. For instance, universities might hire contract researchers to commercialize research products in the biotechnology sector. However, these contract organizations sometimes lack skills needed to handle the challenges that arise from university and researcher-specific requirements (Mirowski & Van Horn, 2005). Despite the importance of the skills of technology transfer officers, most research highlight the importance of incentive structure and the difficulties faced by technology transfer officers (Debackere & Veugelers, 2005). Hence, more studies should try to explain the dimensions of technology transfer officers' competence and how their competencies influence the success of commercialization.

### **Competencies of Researchers as Entrepreneurs**

Inventors of ideas can get equity share in spin-off companies formed as a result of their innovations. In order to succeed in the entrepreneurial form of commercialization, university researchers must possess basic entrepreneurial skills and knowledge. Entrepreneurial skills are typically very complex and context-dependent (Mintzberg & Waters, 1982). Autio and Kauranen (1994) explained that non-entrepreneurial technologist looks into future opportunities and environmental challenges before boldly establishing new firms based on innovation. However, the skills that are necessary to enable researchers seize these opportunities are rarely discussed. On the other hand, it is wise not to expect full entrepreneurial orientation from academic researchers who are primarily non-entrepreneurs in nature (Lumpkin & Dess, 1996). Furthermore, entrepreneurial skills of researchers do not necessarily include hard skills. Behavioral management skills and knowledge, such as university's prior experience with licensing, structural characteristics of the university, and success relative to other industries, are also major determinants of researchers' entrepreneurial success (Feldman et al., 2002). Entrepreneurial skills of researchers pose significant challenge to innovation in the absence of funding. Researchers have to have excellent industry link to secure funds for research (Raine & Beukman, 2002). For the most part, entrepreneurial skills differ with the types of national innovation model adopted. If the university adopt the top-down approach similar to the United States' model of innovation, then researchers play pivotal role in choosing type of entrepreneurship and the role they are expected to assume (Goldfarb & Henrekson, 2003). Entrepreneurial skills in a new organization build on knowledge and strategies to start, manage, and establish certain products or ideas. Hence, a major but common role played by entrepreneurs is to establish a creative culture in organizations (Hult et al., 2003). To succeed in doing this, universities take the challenge of entrepreneurial establishment and start new businesses to manage spin-offs (Jacob et al., 2003). However, extant studies do not clearly explain what role a researcher-entrepreneur plays in entrepreneurial technology transfer and thereafter. Nonetheless, it can be understood from the above discussion that researchers may lead new business and play strategic role that involve soft skills related to decision-making and motivation.

More studies need to be done to understand this area to adequately explain the entrepreneurial skills and knowledge needed by researchers.

### **Competencies of the Universities**

In intellectual property commercialization, university competencies are characteristics and resources of universities that can facilitate the creation of innovative ideas (Rasmussen & Borch, 2010). Universities interact with industries and government to facilitate such innovation process. Hence, competent universities must establish a holistic, long-term, and clear research plan (Geuna & Muscio, 2009; Koruna, 2004; Lichtenthaler, 2008). Universities must be capable of producing qualified researchers and provide venues for the creation and dissemination of ideas (Lockett & Wright, 2005). Among the characteristics of a competent university is sharing of resources and collaboration with other universities (Rasmussen & Borch, 2010). Universities should monitor innovation process to ensure timely and quality output. Therefore, research evaluation should be tied with researchers' incentive and promotion. Hence, competent universities consider research output as an important input to overall research environment at the university (Walter et al., 2006). More studies need to be done to explain university's research-monitoring skill and its impact on commercialization process. Extant studies have only explained collaboration as a major skill of competent university. However, the above discussion raises questions as to whether universities should be skilled in other areas as well. These are the major limitations in the competency dimension of university intellectual property commercialization process.

### **CONCLUSION**

Intellectual property commercialization is a lengthy process. A high rate of commercialization has positive influence on the economic growth of a country. Universities also gain positive financial gains from commercialization of their research. However, university researchers possess limited technical, legal, and marketing knowledge to efficiently manage intellectual property commercialization process. Existing studies show that among the factors that enable universities to do more commercialization are large funding, availability of support staff, and sound legal environment. However, analysis of intellectual property literatures reveals that the commercialization process is laden with values. In addition to competencies and capabilities, a number of individual and organizational values influence commercialization process at universities. However, existing studies on commercialization of intellectual property have not given focus to the importance of these values.

Values are attitude, belief, and view that an individual or organization has concerning others. Rokeach value survey and Schwartz values typology are the two widely used values typologies. However, these typologies were utilized in studies concerning individuals as consumers and do not explain the unique values of researchers in research environment. Moreover, values in the two typologies (Schwartz and Rokeach), for the most part, explain individual values and are limited in application when the analysis involved organizations. Rokeach and Schwartz combine individual qualities (values) with skills (competencies). For instance, in Rokeach value survey, capable is an item related to competence.

The study reviews the existing studies on values and competencies to explain the success and failure of commercialization in university-led intellectual properties. There is a need to explain the dimensions and types of values in intellectual property commercialization process. Existing studies provide limited explanation as to how researchers' capability as entrepreneurs and as collaborating agent with other stakeholders may influence commercialization process. More studies need to be done to explain the dimensions of competency in the process of commercializing university intellectual property. Values and competence cannot function separately. Moreover, existing studies do not provide sufficient evidence about the relationship between values and competence. Studies on the role of values in intellectual property commercialization are almost non-existent.

### **ACKNOWLEDGEMENTS**

The author would like to thank Universiti Teknikal Malaysia Melaka (UTeM) and Centre for Technopreneurship Development (CTED) for their support in obtaining materials for this invaluable research.

### **REFERENCES**

- Autio, E., & Kauranen, I. (1994). *Technologist-entrepreneurs versus non-entrepreneurial technologists: Analysis of motivational triggering factors*. *Entrepreneurship & Regional Development*, 6(4), 315-328.
- Borg, E. A. (2001). *Knowledge, information and intellectual property: Implications for marketing relationships*. *Technovation*, 21(8), 515-524.
- Boyatzis, R. E. (1982). *The competent manager: A model for effective performance*. John Wiley and Sons.
- Boyd, E., Cho, M., Bero, L. (2003). *Financial conflict of interest policies in clinical research: Issues for clinical investigators*. *Academic Medicine*, 78, 769-774.
- Braunerhjelm, P. (2007). *Academic entrepreneurship: Social norms, university culture and policies*. *Science and Public Policy*, 34(9), 619-631.
- Chakraborty, B., & Mathew, M. (2003). *Intellectual property management practices*. In *IEEE Portland International Conference on Management of Engineering and Technology*, pp. 172-177.
- Chang, Y. C., Chen, M. H., Hua, M., & Yang, P. Y. (2005). *Industrializing academic knowledge in Taiwan*. *Research Technology Management*, 48(4), 45-50.
- Cockerill, T., Hunt, J., & Schroder, H. (1995). *Managerial competencies: Fact or fiction?* *Business Strategy Review*, 6(3), 1-12.
- Corny, T. (2004). *Values versus competencies: Implications for the future of professional youth work education*. *Journal of Youth Studies*, 7(4), 513-527.
- Curtin. (2012). *Does your research have commercial potential? Investing in innovative research*.
- Debackere, K., & Veugelers, R. (2005). *The role of academic technology transfer organizations in improving industry science links*. *Research Policy*, 34(3), 321-342.
- Dechenaux, E., Thursby, J., & Thursby, M. (2011). *Inventor moral hazard in university licensing: The role of contracts*. *Research Policy*, 40(1), 94-104.
- Dose, J. J. (1997). *Work values: An integrative framework and illustrative application to organizational socialization*. *Journal of Occupational and Organizational Psychology*, 70(3), 219-240.
- Feldman, M., Feller, I., Bercovitz, J., & Burton, R. (2002). *Equity and the technology transfer strategies of American research universities*. *Management Science*, 48(1), 105-121.
- Furman, J. L., Porter, M. E., & Stern, S. (2002). *The determinants of national innovative capacity*. *Research Policy*, 31(6), 899-933.
- Gambardella, A., Harhoff, D., & Verspagen, B. (2011). *The determinants of the private value of patented inventions*. [http://www.wipo.int/edocs/mdocs/mdocs/en/wipo\\_ip\\_econ\\_ge\\_2\\_11/wipo\\_ip\\_econ\\_ge\\_2\\_11\\_determinants.pdf](http://www.wipo.int/edocs/mdocs/mdocs/en/wipo_ip_econ_ge_2_11/wipo_ip_econ_ge_2_11_determinants.pdf).
- Ganz-Brown, C. (1999). *Patent policies to fine tune commercialization of government-sponsored university research*. *Science and Public Policy*, 26(6), 403-414.
- Garavan, T., & McGuire, D. (2001). *Competencies and workplace learning: Some reflections on the rhetoric and the reality*. *Journal of Workplace Learning*, 13(4), 144-164.
- Geuna, A., & Muscio, A. (2009). *The governance of university knowledge transfer: A critical review of the literature*. *Minerva*, 47(1), 93-114.
- Goldfarb, B., & Henrekson, M. (2003). *Bottom-up versus top-down policies towards the commercialization of university intellectual property*. *Research Policy*, 32(4), 639-658.
- Green, P. C. (1999). *Building robust competencies: Linking human resource systems to organizational strategies*. Jossey-Bass.
- Hamzah, Z. (2006). *Intellectual property law and strategy*. Sweet and Maxwell Asia.
- Harhoff, D., Narin, F., Scherer, F. M., & Vopel, K. (1999). *Citation frequency and the value of patented inventions*. *Review of Economics and Statistics*, 81(3), 511-515.
- Hearn, G., Cunningham, S., & Ordonez, D. (2004). *Commercialisation of knowledge in universities: The case of the creative industries*. *Prometheus*, 22(2), 189-200.
- Hindle, K., & Yencken, J. (2004). *Public research commercialisation, entrepreneurship and new technology based firms: An Integrated Model*. *Technovation*, 24(10), 793-803.
- Hult, G. T. M., Snow, C. C., & Kandemir, D. (2003). *The role of entrepreneurship in building cultural competitiveness in different organisational types*. *Journal of Management*, 29(3), 401-426.
- Jacob, M., Lundqvist, M., & Hellsmark, H. (2003). *Entrepreneurial transformations in the Swedish university system: The case of Chalmers University of Technology*. *Research Policy*, 32(9), 1555-1568.

- Jensen, R. A., Thursby, J. G., & Thursby, M. C. (2003). *Disclosure and licensing of University inventions: 'The best we can do with the s\*\*t we get to work with'*. *International Journal of Industrial Organization*, 21(9), 1271-1300.
- Jordan, G. B., Striet, L. D., & Binkley, J. S. (1999). *A framework for assessing the effectiveness of research organizations*. Sandia National Laboratories.
- Kahle, L. R. (1996). *Social values and consumer behavior: Research from the list of values*. In *The Psychology of Values: The Ontario Symposium*, pp. 135-151.
- Kahle, L. R., Rose, G., & Shoham, A. (2000). *Findings of LOV throughout the world, and other evidence of cross-national consumer psychographics: Introduction*. *Journal of Euromarketing*, 8(1-2), 1-13.
- Kelli, A., & Pisuke, H. (2008). *Intellectual property in an innovation-based economy*. *Review of Central and East European Law*, 33(2), 223-238.
- Khazanchi, S., Lewis, M. W., & Boyer, K. K. (2007). *Innovation-supportive culture: The impact of organizational values on process innovation*. *Journal of Operations Management*, 25(4), 871-884.
- Kneller, R. (1999). *Intellectual property rights and university-industry technology transfer in Japan*. *Science and Public Policy*, 26(2), 113-124.
- Koruna, S. M. (2004). *External technology commercialisation - Policy guidelines*. *International Journal of Technology Management*, 27(2-3), 241-254.
- Kroll, H., & Liefner, I. (2008). *Spin-off enterprises as a means of technology commercialisation in a transforming economy—Evidence from three universities in China*. *Technovation*, 28, 298-313.
- Lee, G. K. (2009). *Understanding the timing of 'fast-second' entry and the relevance of capabilities in invention vs. commercialization*. *Research Policy*, 38(1), 86-95.
- Lichtenthaler, U. (2008). *Open innovation in practice: An analysis of strategic approaches to technology transactions*. *IEEE Transactions on Engineering Management*, 55(1), 148-157.
- Lichtenthaler, U., & Ernst, H. (2007). *Developing reputation to overcome the imperfections in the markets for knowledge*. *Research Policy*, 36(1), 37-55.
- Lindsay, N. J., Jordan, A., & Lindsay, W. A. (2008a). *Values and entrepreneurial attitude as predictors of nascent entrepreneur intentions*. [http://130.18.86.27/faculty/warkentin/SecurityPapers/Merrill/LindsayJordaanLindsay2005\\_ICSB\\_Values.pdf](http://130.18.86.27/faculty/warkentin/SecurityPapers/Merrill/LindsayJordaanLindsay2005_ICSB_Values.pdf).
- Lindsay, W., Lindsay, N., Jordan, A., & Dottore, A. (2008b). *Values, entrepreneurial attitudes, and start-up intentions of indigenous South African nascent entrepreneurs*. In *5th AGSE International Entrepreneurship Research Exchange*, pp. 191-205.
- Liu, J. Y. C., Chen, H. H. G., Jiang, J. J., & Klein, G. (2010). *Task completion competency and project management performance: The influence of control and user contribution*. *International Journal of Project Management*, 28(3), 220-227.
- Lockett, A., & Wright, M. (2005). *Resources, capabilities, risk capital and the creation of university spin-out companies*. *Research Policy*, 34(7), 1043-1057.
- Lumpkin, G. T., & Dess, G. (1996). *Clarifying the entrepreneurial orientation construct and linking it to performance*. *Academy of Management Review*, 21(1), 135-172.
- MCI. (1990). *Management competences: The standards project. Final report, Management Charter Initiative*.
- Meara, N. M., Schmidt, L. D., & Day, J. D. (1996). *Principles and virtues*. *The Counseling Psychologist*, 24(1), 4-77.
- Mintzberg, H., & Waters, J. A. (1982). *Tracking strategy in an entrepreneurial firm*. *Academy of Management Journal*, 25(3), 465-499.
- Mirowski, P., & Van Horn, R. (2005). *The contract research organization and the commercialization of scientific research*. *Social Studies of Science*, 35(4), 503-548.
- Mohd, E. M. H., Nordin, M., Nur, A. A., & Khairul, A. A. (2011). *Islamic values, leadership legitimacy and organisation sustainability*. Working Paper, Universiti Kebangsaan Malaysia.
- Moore, D. R., Cheng, M. I., & Dainty, A. R. J. (2002). *Competence, competency and competencies: Performance assessment in organisations*. *Work Study*, 51(6), 314-319.
- Morris, M., & Schindehutte, M. (2005). *Entrepreneurial values and the ethnic enterprise: An examination of six subcultures*. *Journal of Small Business Management*, 43(4), 453-479.
- Munson, J. M., & McQuarrie, E. F. (1988). *Shortening the Rokeach value survey for use in consumer research*. *Advances in Consumer Research*, 15(1), 381-386.



- Naman, J. L., & Slevin, D. P. (1993). *Entrepreneurship and the concept of fit: A model and empirical tests*. *Strategic Management Journal*, 14(2), 137-153.
- NCVQ. (1997). *Assessment of NVQs and SVQs*, NCVQ/SCOTVEC.
- Nordhaug, O., & Gr, K. (1994). *Competences as resources in firms*. *International Journal of Human Resource Management*, 5(1), 89-106.
- Prahalad, C. K., & Hamel, G. (1990). *The core competence of the corporation*. *Harvard Business Review*, 68(3), 79-91.
- Rader, D. (2004). *Intellectual property licensing: A profitable business tool for disseminating technology*. In *ASME International Mechanical Engineering Congress and Exposition*, pp. 233-238.
- Raine, J. K., & Beukman, C. P. (2002). *University technology commercialisation offices - A new zealand perspective*. *International Journal of Technology Management*, 24(5-6), 627-647.
- Rasmussen, E. (2008). *Government instruments to support the commercialization of university research: Lessons from Canada*. *Technovation*, 28(8), 506-517.
- Rasmussen, E., & Borch, O. J. (2010). *University capabilities in facilitating entrepreneurship: A longitudinal study of spin-off ventures at mid-range universities*. *Research Policy*, 39(5), 602-612.
- Rasmussen, E., Moen, Ø., & Gulbrandsen, M. (2006). *Initiatives to promote commercialization of university knowledge*. *Technovation*, 26(4), 518-533.
- Roe, R. A., & Ester, P. (1999). *Values and work: Empirical findings and theoretical perspective*. *Applied Psychology*, 48(1), 1-21.
- Rokeach, M. (1973). *The nature of human values*. New York Free press.
- Ros, M., Schwartz, S. H., & Surkiss, S. (1999). *Basic individual values, work values, and the meaning of work*. *Applied Psychology*, 48(1), 49-71.
- Sagiv, L., & Schwartz, S. H. (1995). *Value priorities and readiness for out-group social contact*. *Journal of Personality and Social Psychology*, 69(1), 437-448.
- Sandberg, J. (2000). *Understanding human competence at work: An interpretative approach*. *Academy of Management Journal*, 43(1), 9-25.
- Schroder, H. M. (1989). *Managerial competence: The key to excellence*. Kendall/Hunt Publishing Company.
- Schwartz, S. H. (1992). *Universals in the content and structure of values: Theoretical advances and empirical test in 20 countries*. In *Advances in Experimental Social Psychology*. Academic Press, pp. 1-65.
- Schwartz, S. H. (2006). *Basic human values: Theory, measurement, and applications*. *Revue Française de Sociologie*, 42(1), 249-288.
- Siegel, D. S., & Phan, P. H. (2005). *Analyzing the effectiveness of university technology transfer: Implications for entrepreneurship education*. In *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth*. Emerald Group Publishing Limited, pp. 1-38.
- Siegel, D. S., Waldman, D. A., Atwater, L. E., & Link, A. N. (2004). *Toward a model of the effective transfer of scientific knowledge from academicians to practitioners: Qualitative evidence from the Commercialization of University Technologies*. *Journal of Engineering and Technology Management*, 21, 115-142.
- Slater, S. F., & Narver, J. C. (2000). *The positive effect of a market orientation on business profitability: A balanced replication*. *Journal of Business Research*, 48(1), 69-73.
- Slaughter, S., & Rhoades, G. (2009). *The social construction of copyright ethics and values*. *Science and Engineering Ethics*, 16(2), 263-293.
- Spencer, L., & Spencer, S. (1993). *Competence at work: A model for superior performance*. John Wiley and Sons Inc.
- Stephan, P. (1996). *The economics of science*. *Journal of Economic Literature*, 34(1996), 1199-1235.
- Taylor, F. W. (1911). *The principles of scientific management*. Harper and Row.
- Thursby, J., Fuller, A. W., & Thursby, M. (2009). *US faculty patenting: Inside and outside the university*. *Research Policy*, 38(1), 14-25.
- Thursby, J. G., & Kemp, S. (2002). *Growth and productive efficiency of university intellectual property licensing*. *Research Policy*, 31(1), 109-124.
- Thursby, J., & Thursby, M. (2011a). *Faculty participation in licensing: Implications for research*. *Research Policy*, 40(1), 20-29.
- Thursby, J. G., & Thursby, M. C. (2011b). *Faculty participation in licensing: Implications for research*. *Research Policy*, 40(1), 20-29.

- Thursby, J. G., & Thursby, M. C. (2011c). *Has the Bayh-Dole act compromised basic research? Research Policy*, 40(8), 1077-1083.
- Thursby, M., Thursby, J., & Gupta-Mukherjee, S. (2007). *Are there real effects of licensing on academic research? A life cycle view. Journal of Economic Behavior and Organization*, 63(4), 577-598.
- Tschirky, H., & Koruna, S. M. (2004). *Technology marketing: A firm's core competence? International Journal of Technology Management*, 27(2-3), 115-122.
- Uranga, M. G., Kerexeta, G. E., & CampÃ s-Velasco, J. (2007). *The dynamics of commercialization of scientific knowledge in biotechnology and nanotechnology. European Planning Studies*, 15(9), 1199-1214.
- Vinson, D. E., Scott, J. D., & Lamont, L. M. (1977). *The role of personal values in marketing and consumer behavior. Journal of Marketing*, 41, 44-50.
- Wallmark, J. T. (1997). *Inventions and patents at universities: The case of Chalmers University of Technology. Technovation*, 17(3), 127-139.
- Walter, A., Auer, M., & Ritter, T. (2006). *The impact of network capabilities and entrepreneurial orientation on university spin-off performance. Journal of Business Venturing* 21(2006), 541-567.
- Williams, S. L. (2011). *Engaging values in international business practice. Business Horizons*, 54(4), 315-324.
- WIPO. (2006). *Basic issues in technology commercialisation: From concept to market. [http://www.wipo.int/uipc/en/documents/pdf/okongwus\\_iptto\\_1.pdf](http://www.wipo.int/uipc/en/documents/pdf/okongwus_iptto_1.pdf)*.
- Woodall, J., & Winstanley, D. (1998). *Management development: Strategy and practice. Wiley-Blackwell*.