

# Investigating the Leadership Style Effect on the Technology Transfer Effectiveness: A Proposed New Model (An Applied Study on the Dairy Manufacturing Sector in Egypt)

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## Abstract

**Purpose:** Different leadership styles' effects on technology transfer effectiveness have not been implied in the literature. This study seeks to theoretically investigate the effect of five leadership styles; Classified according to personal authority of the leader; On technology transfer effectiveness.

**Design/methodology/approach:** This study identifies five leadership styles which affect technology transfer effectiveness including transformational leadership, transactional leadership, visionary leadership, charismatic leadership and culture based leadership. This study associates these five leadership styles to technology transfer effectiveness. A conceptual model is tested using a survey data collected from a sample of manufacturing plants in the dairy manufacturing sector in Egypt.

**Findings:** The results indicate that only four leadership styles significantly affect technology transfer effectiveness. Visionary leadership style has the strongest significant effect on technology transfer effectiveness, followed by culture based leadership style, then charismatic leadership style then transactional leadership. Transformational leadership does not significantly affect technology transfer effectiveness.

**Research Limitation/Implications:** Transformational leadership has been observed to have no significant effect on technology transfer effectiveness. A set of refined transformational leadership measures should be developed in future studies.

**Practical Implications:** This paper identifies the importance of leadership styles in achieving the success of technology transfer.

**Originality/value:** This study provides a theoretical foundation for the effect of the leadership styles on technology transfer effectiveness in the dairy manufacturing plants. This study is one of the first efforts that empirically examine the effect of leadership styles on technology transfer effectiveness.

**Keywords:** technology transfer, leadership style, transformational leadership, visionary leadership, transactional leadership, culture based leadership, charismatic leadership

## 1. Introduction

Technology transfer effectiveness has found increasing interest in the operations management (OM) literature. Bozeman (2000) defined technology transfer as the movement of know-how from one organizational setting to another. Sazali et al. (2009) defined technology transfer as knowledge transfer process which has four dimensions. These dimensions are knowledge characteristics, recipient characteristics, supplier characteristics and relationship characteristics. Technology transfer needs to be perceived in terms of achieving three core objectives. These objectives are introduction of new techniques by means of investment of new plants; improvement of existing techniques and generation of new knowledge (Sazali et al., 2012).

Technology transfer effectiveness is a very important aspect that describes the successfulness of technology transfer process. The traditional technology transfer effectiveness measures include competitiveness performance, financial performance and quality performance (Waroonkun, 2007). The inclusion for new measures for technology transfer effectiveness is very essential; these measures include degree of innovation, quality level, proper scheduling, and increase in the knowledge level (Whangthomkum et al., 2006). The literature discusses the effect of other factors like the absorptive capacity and the learning environment on technology transfer

effectiveness. It ignores discussing the effect of leadership styles as one of the factors affecting technology transfer on technology transfer effectiveness. The leadership styles are classified according to certain past classifications and recent ones. The past classification of leadership styles has been based on the decision making styles such as bureaucratic, coaching, empowering, facilitating, porting and laissez faire. Empowering, facilitating and supporting leadership styles are added to cope with work environment change (Hodgkinson, 2009). The most recent classification of leadership styles according to personal authority of the leader includes five leadership styles which are transformational, transactional, visionary, charismatic and culture based leadership (Wang et al., 2010).

Transformational leadership is the most studied leadership style over the past 30 years. Transformational leader is the one who raises the followers' level of consciousness about the value of the desired outcomes and the methods of reaching those outcomes (McCleskey, 2014). Transactional leadership in which a leader provides his/her followers with clear guidelines on what expectations and actions are required from them and in exchange transactional leaders support their followers by providing material for the fulfillment of tasks. Charismatic leadership is processing and articulating a vision taking in consideration sensitivity to followers needs and demonstrating novel behavior (Judge et al., 2006). It is also defined as a fairly stable, measurable characteristic exists in managers, so charismatic individuals seek to influence individual and organizational performance (Bass et al., 2014). Visionary leadership is the creation and communication of view of a desired goal that clarifies the current situation and assuring commitment to better future (Dhammika, 2014). Culture based leadership has a lot of characteristics such as identity negotiation (when leaders draft an identity proposal in interacting with followers); identity balance (when leader and follower identities are validated); task interaction (when leaders and followers concentrate on the tasks and their identities remain unchanged); and identity conflict (when identity balance is challenged and reconstruction is needed (Eberl, 2007)). The impact of leadership style on technology transfer effectiveness has not been implied in the literature. This research uses more realistic characteristics for all leadership styles and it relates them to realistic measures of technology transfer effectiveness. It evaluates which style of the five leadership styles has more influence on technology transfer effectiveness, and then determining which dimension in each leadership style has the greatest influence on technology transfer effectiveness.

## **2. Theoretical Background and Research Frame Work**

### *2.1 Leadership Styles*

There are two classifications for leadership styles, one classifies them according to personal authority of leader and the other classifies them according to decision making styles of leaders. Decision making styles of leaders classification is the past one and it classifies leaders' styles into bureaucratic, coaching, empowering, facilitating, supporting and laissez -faire styles. Recently, empowering, facilitating and supporting styles are added to cope with the change in work environment (Hodgkinson, 2009).

Desgagné (2002) classified leadership styles according to leader's personal authority into transformational, transactional and charismatic leadership style. This classification ignores both visionary and culture based leadership. Wang et al. (2010) illustrated the five leadership styles clearly.

#### *2.1.1 Transformational Leadership*

Bass (1996) developed a full range leadership model includes both transformational and transactional leadership. He suggested four dimensions for transformational leadership which are contingent reward, management by exception by its passive and active facets and laissez faire.

Contingent reward occurs by leader in exchange for followers 'support. In case of positive management by exception, leaders monitor followers' performance and take corrective action when necessary. In case of negative management by exception, leaders decrease the monitoring process and interfere when the problem appears. Leaders avoid their responsibilities in case of laissez faire type (Jung & Sosik, 2002). Transformational leadership is defined recently as the inspiration of followers to achieve extraordinary outcomes (Robbins & Coulter, 2007). Transformational leader pays attention to developmental needs of followers; the way followers look at old problems; encouragement of followers to put out extra effort to achieve group goals. Transformational leadership theory is about creation of positive change by leaders in the followers and let them take care of each other's interests and act in the interests of the group (Warrilow,S., 2012). There are four components of transformational leadership have been described recently.

Charisma is the degree to which the leader behaves in admirable ways and encourages followers to identify with the leader a clear set of values. Inspirational motivation is the degree to which the leader articulates a vision that

appeals to followers with optimism about future goals. Intellectual stimulation is the degree to which the leader challenges assumptions and encourages creativity in the followers. Personal and individual attention is the degree to which the leader responds to each individual follower's needs and acts as a mentor gives appreciation of the individual's contribution to the team. On the other hand, there are a lot identified weaknesses of transformational leadership. First is the ambiguity since the theory fails to clarify transformational leadership variables and positive work outcomes. Secondly, the theory considers the leadership process at the dyadic level. It explains a leader's influence on followers on the individual but not on the group level. In spite of considering leadership a key determinant of organizational effectiveness, the organizational process does not receive much attention in most of transformational leadership theories (Yukl, 1999). Bass (1998) had confirmed that transformational leadership is beneficial to both followers and organizations regardless of the situation.

Yukl (1999) suggested the situational variables which have been used as moderators between transformational leadership and followership. These situational variables include entrepreneurial culture, organic structure, stability of environment and dominance of boundary-spanning units over the technical core. Third, the theory suffers from overlapping among different transformational behaviors. Inspiring, developing and empowering have been omitted from transformational leadership theory. Fourth, the theory does not illustrate any situation where transformational leadership is detrimental. Transformational leadership is biased toward top management and demonstrates that top management can increase followers' high level of work involvement by increasing their workload which can result in decreasing the organizational effectiveness (Yukl, 1999). Lastly, transformational leadership theory assumes the heroic leadership. It is a basic assumption postulates that an effective leader will influence followers to exert exceptional effort.

Recently, transformational leaders were evaluated as more effective and higher performers compared to their transactional counterparts (Rubin et al., 2005). The most recent studies demonstrated an empirical evidence that transformational leadership is strongly correlated with employee work outcomes such as higher level of productivity, creativity, goal attainment and follower well-being (Eisenbeiß & Boerner, 2013).

Most of the literature investigated the effect of transformational leadership on other aspects than technology transfer effectiveness. Sivanathan et al. (2002) investigated the relationship between transformational leadership, emotional intelligence and moral thinking. Ozaralli (2002) studied the effect of transformational leadership on empowerment and team effectiveness. Castiglione (2006) illustrated the effect of transformational leadership on organizational learning. Singh et al. (2008) described how transformational leadership affects self-sacrifice. Ramli et al. (2014) clarified how transformational leadership increases team work improvement. Mak et al. (2014) demonstrated the effect of transformational leadership on increasing the organizational commitment.

### 2.1.2 Transactional Leadership

Transactional Leadership, also known as managerial leadership, focuses on the supervision role. The followers become motivated through rewards; The basic levels of need satisfaction in the context of Maslow's hierarchy of needs. Transactional leadership focuses on lower level needs by stressing specific task performance so getting specific tasks completed by managing each portion individually (Hargis et al., 2001). Transactional leadership in contrast to transformational leadership does not allow leaders to look forward but they look to keep things the same. In other words, transactional leadership looks at lower level needs while transformational leadership looks at higher level needs (Ogbonna & James, 2013).

Transactional leaders merely look to the followers' defaults, so this type of leadership is essential in case of crisis or newly fashioned projects. Transactional leaders are concerned with getting the processes' tasks completed rather than strategic thinking of improving the way of doing tasks. It depends on contingent reward or contingent penalization. Contingent reward is used to keep subordinates working at a good level at different times throughout completion. Contingent punishments are given in case of decreased quality performance. Contingent reward and punishment go hand by hand with active and passive management by exception.

Active management-by-exception takes place by leaders that correct the subordinate's performance throughout the process. Passive management-by-exception leaders wait for issues to arise then try to handle problems. Transactional leadership is primarily passive and tries to maintain the status quo. The status quo is maintained using the management by exception since it does not encourage taking corrective actions. Douglas McGregor's Theory Y and Theory X can also be compared with transactional and transformational leadership. Theory X can be compared with transactional leadership where employees are motivated through incentives and negative behavior is punished. Theory Y and transformational Leadership are found to be similar, because leaders work to encourage their subordinates to let them achieve trust and self-motivation. Previous literature don not illustrate the effect of transactional leadership on technology transfer effectiveness. Politis (2002) studied the effect of

both transformational and transactional leadership on organizational performance and self-managed teams. Zeng et al. (2011) demonstrated the role of transactional leadership on team innovativeness. Gibson, P et al. (2016) highlighted the effect of transactional leadership on organizational commitment.

### 2.1.3 Charismatic Leadership

Max Weber was the first to discuss charismatic leadership. Weber (1947) defined the charisma as something extraordinary or exceptional power resides in the leader. Robert House (1977) developed the theory of charismatic leadership. The core of this theory is the followers' attribution of extra ordinary abilities to their leaders. The personal characteristics and behaviors that distinguish leaders in this theory are prosocial assertiveness, self-confidence, need for social influence, communication of high expectations and confidence in followers and emphasis on symbolic and expressive aspects of the task. At this time, a lot of researchers discovered that charismatic leadership is an important precursor for beneficial organizational outcomes. Stocker et al. (2001) found that there were strong relationships between charismatic leadership and team outcomes which include team innovation. On the other hand, Waldman et al. (2001) found no direct relationship between charismatic leadership and organizational performance. Dvir et al. (2002) affirmed that charismatic leaders encourage followers to perform toward achieving higher goals and objectives. Based on House's theory, Kanungo et al. (2000) model is the first to discuss different charismatic leaders' behaviors and classifies them into different stages. The first stage is the follower's perception of status quo. The second stage is the vision formulation, the third stage is the implementation of this charismatic behavior which is extra-ordinary and include increased risk and self-sacrifice. This model relates these charismatic leadership behaviors to followers' effects. This model investigates the degree of trust in the leader, the degree of respect of the leader by the followers and the degree of satisfaction of the leader and the participation of the leader in the follower's sense of collective identity. Kanungo et al. (2000) model highlights the importance of the consideration of the followers as proved by Choi (2006). Howell, J. and Shamir (2005) emphasized that charismatic leaders inspire team members with their own self-confidence and communication of a sense of purpose and vision which ascertain the second stage results at Kanungo et al. (2000) model.

In addition, Howell, J. and Shamir, B. (2005) distinguish between personalized and socialized types of charismatic relationships and suggest that follower's self-concept plays a major role in determining the follower and leader relationship. Followers have a clear self-concept and derive their sense of direction from leader's message rather than from personal identification with the leader in the socialized relationships. On the other hand, followers often have low self-concept in personalized relationships. Keller, R. (2006) illustrated clearly that charismatic leadership is the primary component of transformational leadership that influences more successful team outcomes since charismatic leaders increase team efficacy through inspiration of a belief in the team's vision and confidence in team members' abilities, this affirms the third stage results' in Kanungo et al. (2000) model. Most of the previous literatures do not investigate the effect of charismatic leadership on technology transfer effectiveness. Roden (2000) demonstrated the effect of charismatic leadership on organizational commitment. Takala et al. (2000) illustrated how charismatic leadership affect s complexity and organizational life. Paulsen et al. (2009) demonstrated the role of charismatic leadership on change and innovation in R& D organizations.

### 2.1.4 Culture Based Leadership

There are four dimensions of culture found by Hofstede's (1980) classic model which are power distance, individualism, collectivism, masculinity-femininity and uncertainty avoidance. Hofstede (1980) model of cultural dimensions was the first to identify culturally specific perceptions regarding organizational effectiveness and decision making as well as transformational leadership behaviors from a cross-cultural perspective .Harris , P. and Moran (1996) illustrated that culture gives a group of individuals a sense of who they are and how they should act. In other words, cultures give community the individual actions and values (Harris, P. and Moran, R., 1996). The path goal theory developed by House (1996) clarifies that helping subordinates attaining their goal effectively is the main goal of the leader (Silverthorne, 2001). Path-goal theory is a leadership tool used to identify and effectively manage situational issues arising from either unfavorable followers' characteristic or in other words, to clarify the path for followers (Zabihi & Hashemzahi, 2012). Gibson (1995) assumes that leadership tends to be alike in countries with similar values. Roselina et al. (2002) clarified individualist-collectivist dimensions are positively related to the telling style of leadership. Dickson et al. (2003) reveal that transformational leadership tends to be directive in nature in high power distance. In contrast, leadership tends to be more participative in low power distance cultures. Alves et al. (2006) affirmed the same issue. Shao and Webber (2006) investigated the generalizability of transformational leadership and claimed that certain personality traits positively correlated to transformational leadership behavior in the USA context were

not evident in Chinese societies. Similarly, Ergeneli et al. (2007) studied the relationship between transformational leadership and Hofstede's dimensions across cultures, they found without empirical investigation that that some aspects of transformational leadership were universal, whereas others were cultural-specific. Jogulu and Wood (2008) affirm that cultural environment lead to differences in interpreting the leader by follower. Millage et al. (2015) confirm that leadership is conceptualized differently in different cultures. Some of the literature assumed that culture based leadership is derivated from transformational leadership. In addition, the effect of culture based leadership on technology transfer effectiveness has not been demonstrated yet. Ayoko et al. (2006) demonstrated the effect of culture based leadership on heterogeneous work groups. Nelson et al. (2009) demonstrated the relationship between culture based leadership and emotional intelligence. Yiing et al. (2009) illustrated the effect of culture based leadership on organizational commitment. Razalli et al. (2009) highlighted the effect of culture based leadership on responsiveness and performance of firms.

### 2.1.5 Visionary Leadership

Visionary leadership is the established goals for individual and group action which define what should be done in the future (Colton, 1985). This needs creation of a clear view of the current and the desired state to create commitment for better future (Conger, 1999). This increases trust in the leader, high level of performance of the followers and the overall organizational performance which all are positive outcomes (DuBrin, 1998). Effective communication of visionary leadership changes followers' attitudes resulting in organizational transformations (Waldman et al., 2001). Visionary leaders look beyond their role in communicating a vision to a wider scope of such a vision. This wide scope includes developing a network of support at all levels, promoting team work and promoting a culture of excellence (Robertson & Seneviratne, 1995). Visionary leadership differs from other forms of leadership in inspiring vision and communicating that vision among subordinates so that organizations brings positive outcomes in the future (Jul-Chan & Colin, 2004). Visionary leaders should consider followers' needs while developing their vision statement to reflect their needs (Kirkpatrick, 2004). This in its turn encourages followers to achieve the vision because they find it meaningful (Zaid, 2006). This can stimulate subordinates to scarify their individualized consideration (Valenzuela, 2007). Previous literature does not study the effect of visionary leadership on the technology transfer effectiveness. Groves (2006) studied the role of visionary leadership on organizational change.

### 2.2 *Technology Transfer Effectiveness*

There are a lot of models demonstrated the factors affecting technology transfer effectiveness in the literature, the researcher classified them to knowledge models, perceptual models and technology transfer effectiveness models. Knowledge models considered technology transfer as only knowledge transfer. Knowledge models include Szulanski (1999) model, Wiki Model for Diffusion (2008) and Sazali et al. (2009) model. There are four absorptive capacity stages described by Szulanski (1999) model. The initiation stage includes all events lead to the decision of the beginning of knowledge transfer. The implementation stage begins with the decision to transfer resources between knowledge recipient and source. In this stage, transfer of specific social ties is established to suit the anticipated needs of the recipient and to facilitate the introduction of new knowledge. The Ramp-up stage begins when recipient starts to use transferred knowledge or starts a new manufacturing process. Szulanski (1999) model considers that lack of the absorptive capacity by recipient affects stickiness in the ramp-up phase only. On the other hand. Timbrell et al. (2001) study considers the importance of this factor in both the integration and ramp-up phases.

Furthermore, Szulanski (1999) model concentrates on source more than recipient this has been illustrated in having fewer interactions between the source and recipient in this model which decreases technology or knowledge transfer process. This is because having more recipient's interactions increases and enhances the integration phase and increases knowledge transfer. Added to these, Szulanski (1999) model does not illustrate the dimensions of the knowledge absorptive capacity. Wiki Model for Diffusion, (2008) overcomes this by demonstrating these dimensions. In addition, it focuses on explaining behavior during the assimilation phase inside the organization which is affected by the organizational environment or culture or size or staff. The model explains that top management support is required for technology transfer success to overcome the loss of trust and decreased willingness to share during the assimilation (the implementation) phase. On the other hand, this model ignores to correlate top management commitment to different leadership styles or to investigate their effect on technology transfer effectiveness. Sazali et al. (2009) model extends the theoretical models adjusted for inter-firm knowledge transfer. It is considered as a holistic model with limited practical application. It determines the relationship between the knowledge based views and the organizational learning (OI) perspectives. It tries to prove the presence of a positive relationship between recipient's absorptive capacity and degree of technology transfer. It correlates technology supplier characteristics positively to tacit and explicit knowledge. This model

does not include the leadership role or leadership styles as one of the recipient's collaborativeness dimensions. Moreover, it demonstrates how the (multinational company) MNC's country of origin moderates the relationship between technology transfer characteristics and degree of technology transfer without referring to top management roles of technology transfer success. Perceptual models consider the human capital effect on technology transfer. They illustrate either the effects of people-ware on commitment attitude or transferee degree of acting as a reservoir of knowledge and skills or learning outcomes.

These models include Roy et al. (2004) model, Nicholson et al. (2010) model and Omar et al. (2011) model. Roy et al. (2004) model demonstrates the effect of buyer commitment and trust as internal factors on radical and incremental innovation. This model does not investigate the presence of direct link between communication and learning outcomes on side and technology transfer effectiveness on the other side. This model illustrates clearly the role of buyer commitment in inter-firm technology transfer. Since, buyer commitment is correlated to leadership styles, the researcher thinks to investigate the effect of different leadership styles on technology transfer effectiveness. Omar et al. (2011) model demonstrates the required employees' abilities and motivators for managing of existing technologies or acquiring a new one. This model concentrates on the employee as an important factor in technology transfer, while it ignores the role of leader in supporting the employee to develop his/ her Skills. Nicholson et al. (2010) model demonstrates the effect of task characteristics, technology characteristics and individual differences on learning outcomes, while, it does not consider different learning or leadership styles of individuals.

This illustrates how Nicholson et al. (2010) model fails to describe the leader's role in developing of employees' skills. This increased the importance of studying leadership styles effect on technology transfer effectiveness. Technology transfer effectiveness models are models demonstrate different factors affecting the technology transfer and try to relate these factors to technology transfer effectiveness. Each model uses different measures for technology transfer effectiveness. They include Bozeman (2000) model. Waroonkun (2007) model and Whangthomkum et al. (2006) model. These three models ignore completely the consideration of leadership or leadership styles as one of the factors affecting the technology transfer effectiveness. Bozeman (2000) model is the first model discusses different factors affecting the technology transfer effectiveness but it chooses governmental labs and universities as the field of application. Since, the success rate of the technology transfer in the business corporations is completely different from the success rate of technology transfer in the federal labs, it is considered as an empirical research. Bozeman (2000) model gathered a lot of factors affecting the technology transfer effectiveness. These factors include transfer agent, demand environment, transfer media, transfer recipient and transfer object. On the other hand, this model concentrates on demonstrating the role of technology absorption of in technology transfer success. Bozeman (2000) model suffers from lack of description of the relationship between each factor of the factors affecting technology transfer and technology transfer effectiveness. The interaction between the factors affecting the technology transfer in this model has not been discussed sufficiently. Added to these, transferor recipient determinants do not include either top management commitment role or leadership role. Bozeman, B. (2000) model ignored linking the factors suggested by him to affect the technology transfer process to either the opportunity cost or the economic development. Waroonkun (2007) model overcomes this point by correlating transferor competitiveness; As one of the factors affecting the technology transfer; To the economic development as one of technology transfer determinants. Waroonkun (2007) model links transferee (recipient) characteristics to organizational financial and schedule performance while this is not the case in Bozeman (2000) model which does not consider the effect of employees on technology transfer effectiveness. Whangthomkum et al. (2006) model demonstrates in a meaningful way the effect of increasing the human capability on technology transfer effectiveness. This paved the way to the researcher to think how different leadership styles can affect the employees' capabilities and technology transfer effectiveness. Whangthomkum et al. (2006) model is the second model discussing technology transfer effectiveness. It discusses only the effect of absorptive capacity as a critical factor in determining technology transfer effectiveness. The model classifies the absorptive capacity into four stages which include acquisition, assimilation, recognition and application stage. Whangthomkum et al. (2006) model tests only the link between both assimilation and application phases on one side and technology transfer effectiveness on the other side. It does not sufficiently clarify how the assimilation phase affects technology transfer effectiveness. In addition, the results of this model are considered to be biased since the respondents are only 62 managers. Whangthomkum et al. (2006) model does not illustrate how leadership can increase either company's absorptive capacity or technology transfer effectiveness. Warookun (2007) model is the third model to discuss technology transfer effectiveness; It collects a lot of factors affecting the transfer of technology such as transferor characteristics, transferee characteristics, learning environment and transfer environment.

In addition, it does not illustrate which factor has the greatest influence on technology transfer effectiveness. Waroonkun (2007) model gathered transferor commitment and communication as sub-factors of learning environment without demonstrating their relationship to technology transfer effectiveness. Waroonkun T. (2007) model demonstrates how communication and mutual trust affect relationship building and how they are affected by transferor characteristics. Waroonkun (2007) model clarifies the effect of top management commitment on technology transfer effectiveness without referring to how their leadership styles can affect the effectiveness of technology transfer. This increases the importance of studying how different leadership styles can affect technology transfer effectiveness by the researcher.

### 3. Conceptual Framework

The conceptual framework builds on the existing literature and it suggests different new realistic characteristics for either technology transfer effectiveness or leadership styles. It tries to test the effect of the five leadership styles on technology transfer effectiveness as demonstrated in Figure 1.

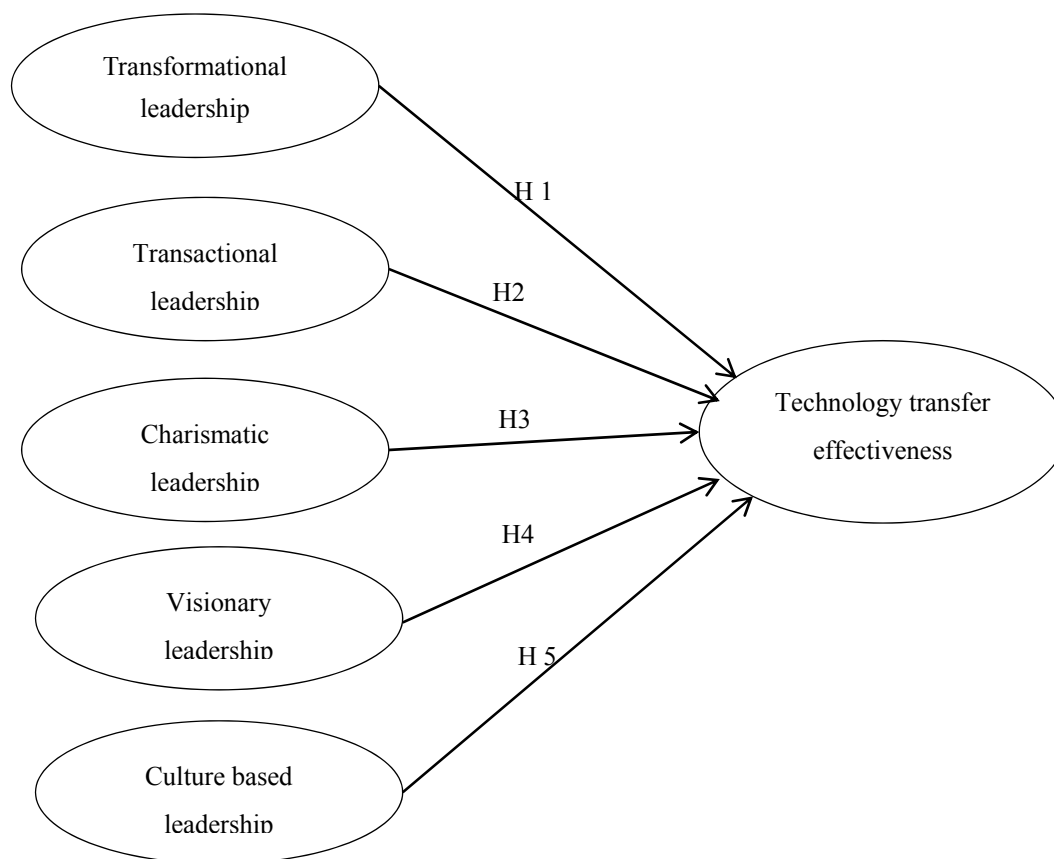


Figure1. Conceptual framework

#### 3.1 Independent Variables

##### 3.1.1 Transformational Leadership

Judge (2006) illustrated some characteristics of transformational leadership which include idealized influence, inspirational motivation, intellectual stimulation individualized consideration. Recently, Wang et al. (2010) illustrated more realistic characteristics for transformational leadership which include feeling of wellness by the sub-ordinate when working with leader and leader's inspiration of the sub-ordinate to rethink the key points of past smooth operations. As illustrated in the literature review by Ozaralli (2002), transformational leadership affects team empowerment and team effectiveness. This illustrates the probability of presence of a relationship between transformational leadership and increased management skills which is one of the metrics of technology

transfer effectiveness. Transformational leadership has a strong effect on the innovative work behavior (Saeed et al., 2014). This suggests the probability of presence of some sort of relationship between transformational leadership and the innovation rate as one of the metrics of technology transfer effectiveness. Based on the above discussion, we propose that transformational leadership significantly affects technology transfer effectiveness.

### 3.1.2 Transactional Leadership

Transactional leadership means that followers comply with their leader in exchange for praise, rewards in order to avoid disciplinary actions (Bass & Riggio, 2006). Densten (2006) illustrated that clear leader-follower relationships with clarified mutual outcomes should be illustrated. Walumbwa et al. (2008) illustrated clearer leader-follower relationships, by establishing clearer guidelines on what expectations and actions are required from followers in exchange of transactional leaders support for the fulfilment of their tasks. Wang et al. (2010) demonstrated clearer characteristics for transformational leadership which include taking of actions to help if the sub-ordinate target could not be reached and the non-interference by the leader unless sub-ordinate problem gets worse. Transactional leadership have a positive effect on team innovativeness (Zeng et al., 2011). This clarifies the probability of presence of a relationship between transactional leadership and innovation rate which is one of the metrics of technology transfer effectiveness. Based on the above discussion, we propose that transactional leadership significantly affects technology transfer effectiveness.

### 3.1.3 Charismatic Leadership

Judge et al. (2006) demonstrated four key characteristics for charismatic leadership which are possessing and articulating a vision, willing to take risks to achieve the vision, exhibiting sensitivity to follower's needs and demonstrating novel behavior. The need for more realistic clearer characteristics emerges. Wang et al. (2010) developed more realistic characteristics to match the new work environment which are job performance, the completion of tasks to achieve departmental objectives, initiation to find an effective action for the problem, rewarding for sub-ordinate for doing the task well and inspiration of new ways to solve the old problems for the sub-ordinate. Maldonado et al. (2009) assured that charismatic leadership has a positive effect on team co-operation and innovation. This illustrates the probability of presence of a relationship between charismatic leadership and innovation rate which is one of the metrics of technology transfer effectiveness. Charismatic leadership intensifies the processes of projection and transference (Zakkai et al., 1994). This is highly correlated to the degree of knowledge increase which is one of the metrics of technology transfer effectiveness. Based on the above discussion, we propose that charismatic leadership significantly affects technology transfer effectiveness.

### 3.1.4 Visionary Leadership

Robertson et al. (2002) clarified that visionary leadership should look beyond the leader's role in communicating a vision into a wider source of such a vision. This wide scope should include developing a network of support at all levels, promoting team work, and promoting a culture of excellence. Later, Wang et al. (2010) demonstrated clearer characteristics for visionary leadership which are belief of sub-ordinate in leader's judgment to solve any difficulties, inspiration of enthusiasm by leader for sub-ordinate participation in the corporate affairs, subordinate confidence in leader, consideration of leader as standard for learning and intimation by sub-ordinate. Taylor et al. (2014) highlighted that visionary leadership strongly affects participation, innovation and commitment. Innovation, participation and commitment are some of the new metrics of technology transfer effectiveness. Visionary leadership increases quality level, proper scheduling, and knowledge level in organizations which are some of the metrics of technology transfer effectiveness (Richardson et al., 1996). Based on the above discussion, we propose that visionary leadership significantly affects technology transfer effectiveness.

### 3.1.5 Culture Based Leadership

Eberl (2007) proposed four characteristics for culture based leadership which are identity negotiation (when leaders draft an identity proposal in interacting with followers); identity balance (when leader and follower identities are validated); task interaction (when leaders and followers concentrate on the tasks and their identities remain unchanged); and identity conflict (when identity balance is challenged and reconstruction is needed). More realistic and new characteristics for culture based leadership are demonstrated by Wang et al. (2010). They include giving sub-ordinate confidence by leader to achieve alone and making sub-ordinate feeling proud of being a member of the department. Culture based leadership strongly affects achievement of planned goals (Yiing et al., 2009). Achievement of planned goals is one of technology transfer effectiveness metrics. Culture based leadership encourages team based knowledge work (Pearce et al., 2006). Team based knowledge work is highly correlated to the increased knowledge level which is one of the metrics of technology transfer



effectiveness. Based on the above discussion, we propose that culture based leadership significantly affects the technology transfer effectiveness.

### *3.2 The dependent Variable*

#### *3.2.1 Technology Transfer Effectiveness*

Bozeman (2000) used insufficient measures for technology transfer effectiveness such as opportunity cost, economic development and market impact. Waroonkun (2007) used traditional metrics for technology transfer effectiveness such firm's financial performance and shareholder's value added. Whangthomkum, N. et al. (2006) established different metrics to illustrate degree of innovation, quality level, proper scheduling, and the increase in knowledge level. These measures include product and process performance, business performance and human resource capability. This is why the researcher used Whangthomkum et al. (2006) metrics for technology transfer effectiveness.

### *3.3 Research Hypotheses*

Drawing on the discussion offered in sections 2.1, 2.2 and 2.3 the following hypotheses have been stated:

**H1: Transformational leadership significantly affects technology transfer effectiveness.**

**H2: Transactional leadership significantly affects technology transfer effectiveness.**

**H3: Charismatic leadership significantly affects technology transfer effectiveness.**

**H4: Visionary leadership significantly affects technology transfer effectiveness.**

**H5: Culture based leadership significantly affects technology transfer effectiveness.**

## **4 Data and Measures**

### *4.1 Data Source*

Data used to test the hypotheses were drawn from Elmiligy et al. (2011) study. This is a large scale survey of manufacturing dairy plants in Egypt. Egypt have 3334 dairy firms, 97 per cent of these enterprises employ fewer than 10 workers. The remaining 3 per cent, 86 enterprises, are divided among 51 those have between 10 and 25 workers, 33 those employ between 25 and 100, two enterprises with between 100 and 250 workers and one with more than 250 workers. It is estimated that 85 per cent are traditional enterprises, 11 per cent are industries and 4 percent operate with a high level of technology. The companies which operate with high level of technology are 14 companies. There is a high degree of foreign capital in this industry, as 6 of the 14 largest enterprises are controlled by multinationals. The dairy industry is among the most profitable and growing industries. The drinking milk remained the highest growth segment in 2012, both in terms of value and volume, with respective growth rates of 26% and 18%. The fourteen firms have been surveyed in this research. The survey was administered personally; questionnaires were first developed in English. The questions were translated into Arabic and both Arabic and English questionnaire forms are administered together. The questionnaire scales were developed based on the literature and have undergone pilot testing and revision. The researcher uses judgmental sampling technique for collecting data from the fourteen largest dairy manufacturing companies in Egypt. The sample includes all the fourteen companies. The managers are asked to answer the questionnaire. The researcher distributed 550 questionnaires and received 320 questionnaires and so the total response rate is 58 %. The sampling unit is all the employees concerned with the technology transfer in the manufacturing facility. They include top management, middle level managers, supervisors and senior specialists. The departments concerned are production department, quality control department, quality assurance department and the engineering department. The researcher targets decision makers for technology transfer process and their sub-ordinates.

### *4.2 Data Measures*

#### *4.2.1 Descriptive Statistics*

The items used to measure constructs in this study were selected based on a review of relevant literature pertaining to leadership styles. To assure content validity, we included items that have been used in prior studies wherever possible. Transactional leadership has the lowest coefficient of variation. Charismatic leadership has the highest coefficient of variation as demonstrated in Table 1.

Table 1. Descriptive statistics for each construct

	Coefficient of variation	Mean	Standard Deviation
a) Charismatic Leadership	12.61%	5.148	0.647
b) Transactional leadership	14.79%	4.853	0.718
c) Visionary leadership	15.81%	5.508	0.871
d) Transformational Leadership	16.19%	5.458	0.884
e) Culture based leadership	16.74%	5.47	0.916
f) Technology transfer effectiveness	15.73%	5.66	0.88

#### 4.2.2 Correlation Matrix

A key informant approach was used to gather data. Depending on the content of each questionnaire item, one or more key informants responded to the survey questions. For items with multiple informants such as technology transfer effectiveness, the inter-rater agreement was assessed using the ratio method. The resulting inter-rater agreement coefficients are all above the suggested threshold of 0.70 as illustrated in Table 2. These results allowed generation of an aggregate data for each item by averaging responses from different informants. Measurement items draw on the existing literature (Wang et al., 2010; Whangthomkum et al., 2006). The constructs are measured by multiple items anchored on a seven- point scale. Technology transfer effectiveness was adapted from Whangthomkum et al. (2006). The five leadership styles were adapted from Wang et al. (2010). Charismatic leadership has the highest correlation with technology transfer effectiveness as demonstrated in Table 2.

Table 2. Correlation matrix at the construct level correlations

		Y- Technology transfer effectiveness
Y- Technology transfer effectiveness	Pearson Correlation	1
	Sig. ( 2-tailed )	0.001
	N	330
X1 Charismatic leadership	Pearson Correlation	.818**
	Sig. ( 2-tailed )	0.001
	N	330
X2 Transactional leadership	Pearson Correlation	.650**
	Sig. ( 2-tailed )	0.001
	N	330
X3 Visionary leadership	Pearson Correlation	.775**
	Sig. ( 2-tailed )	0.001
	N	330
X4 Transformational leadership	Pearson Correlation	.764**
	Sig. ( 2-tailed )	0.001
	N	330
X5 Culture based leadership	Pearson Correlation	.789**
	Sig. ( 2-tailed )	0.001
	N	330
X. leadership style	Pearson Correlation	.857**
	Sig. ( 2-tailed )	0.001
	N	330

\*\* Correlation is significant at the 0.01 level (2-tailed).

## 5. Analysis and Results

### 5.1 Common Method Bias (CMB)

The research design and data collection approach of our study allow us to mitigate common method bias (CMB) often observed in social science research (Podsakoff et al., 2003). In our study, the independent and dependent variables are based on different scale anchors. Also, a different set of informants completed the respective parts of the survey. Further, we employed Harman's one-factor test and the Marker variable test to rule out potential CMB. To perform Harman's test, all of the measurement scales were entered into a single exploratory factor analysis to determine if a single factor would account for the majority of the covariance among the various measures. The results indicate that no single dominant factor emerged. In fact, the EFA yielded six factors that have an eigenvalue greater than 1.

The Marker variable test adjusts the statistically significant correlations among the manifest variables by partialling out a correlation that is assumed to be caused by CMB. The second smallest correlation among the manifest variables is considered a reasonable proxy for CMB. In our analysis, all the significant correlations ( $p, 0.01$ ) are still significant after adjusting for the method effects. Thus, both Harman's test and the Marker variable test indicate no significant presence of CMB.

### 5.2 Reliability of Variables

Data reliability refers to degree of accuracy of the scale used and extent of stability and cohesion of scale in affecting the scale quality. Reliability is measured by the Cron-Bach alpha. Reliability means degree of giving the same results on successive trials using the same tool to measure variables (Cooper, D.R. and Schindler, P.S., 2003). Reliability of each construct is computed by its composite reliability. Composite reliability is an aggregate measure of the degree of intercorrelation or internal consistency among measurement items of the same construct. A reliability value greater than 0.70 is recommended (Nunnally, 1978). Composite reliability is (0.976) which is greater than recommended threshold of 0.70. Each construct has reliability value greater than 0.70 as demonstrated in table 3. Transactional leadership has the highest reliability. The Cron-Bach alpha for charismatic leadership is 0.919 which is less than that computed by Wang et al. (2010) model (0.9242). Cron-Bach alpha for transactional leadership is 0.934 which is greater than that computed by Wang, F. et al., 2010 model (0.801). Cron- Bach alpha for visionary leadership is 0.9307 which is greater than that computed by Wang et al. (2010) model (0.644). Cron- ach alpha for transformational leadership is (0.9286) which is greater than that computed by Wang et al. (2010) model (0.687). Cron- Bach alpha for culture-based leadership is 0.9766 which is greater than that computed by Wang, F. et al. (2010) model (0.754). Moreover, reliability of technology transfer effectiveness; as the dependent variable is (0.942) as demonstrated in table 3 which is more than that calculated in Whnagthomkum et al. (2006) model (0.9323). In addition, product and process performance and human resource capability as technology transfer effectiveness sub-variables have Cron –Bach's alpha values of (0.9217, 0.8488) which are greater than that computed in Whangthomkum (2006) model which are (0.776, 0.8017) respectively. Cron-Bach alpha values of business performance as a technology transfer sub-variable is 0.852, which is less than that estimated in Whangthomkum (2006) model (0.859). This is attributed to the minor difference in the nature of dairy industry on which this research is applied and the packaging industry on which Whnagthomkum et al. (2006) model is applied. Whnagthomkum et al. (2006) model is applied only on a limited number of respondents only 62 respondents, while; this research is applied on 320 respondents. Whangthomkum et al. (2006) model uses the four point Likert scale while this research uses the seven point Likert scale.

Table 3. Each construct reliability

The construct	The reliability measured by Cron- Bach alpha
Charismatic leadership	0.919
Transactional leadership	0.934
Visionary leadership	0.93307
Transformational leadership	0.9286
Culture based leadership	0.9766
Technology transfer effectiveness	0.942
Product and process performance	0.9217
Human resource capability	0.8488
Business performance	0.852

### 5.3 Hypotheses Testing

#### H1: Transformational leadership significantly affects technology transfer effectiveness.

Regression analysis for this hypothesis demonstrates that transformational leadership style does not significantly affect technology transfer effectiveness at a significance level of less than 0.01 and a confidence level of 99 %.

#### H2: Transactional leadership significantly affects technology transfer effectiveness.

Transactional leadership affects technology transfer effectiveness by 0.632 at a significance level of less than 0.01 and a confidence level of 99 % as demonstrated in Table 5. All hypothesis sub-variables are accepted to affect technology transfer effectiveness at a significance level of less than 0.01 and a confidence level of 99 % as demonstrated in Table 4.

Table 4. Regression analysis for transactional leadership

Model	R	R square	Adjusted R square	Std. Error of the Estimate
2	0.795 <sup>b</sup>	0.632	0.632	0.43224

The hypothesis is significant as demonstrated in Table 6. It has been noted from Table 6 that F value is equal to 685.707 for all the hypothesis sub-variables at a significance level of less than 0.01 and a confidence level of 99%.

Table 5. ANOVA table for transactional leadership ANOVA<sup>c</sup>

Model		Sum of squares	Df	Mean square	F	Sig.
2	Regression	292.584	2	128.112	685.707	< 0.001 <sup>b</sup>
	Residual	112.545	328	0.187		
	Total	405.128	330			

Transactional leadership sub-variables can be arranged according to their effect on technology transfer effectiveness using their (b) values. The sub-variable with the highest b value is the sub-variable which has the highest effect on technology transfer effectiveness. It is followed by taking of actions by leader to help if the sub-ordinate target could not be reached with beta (0.58), then finally comes the interference from leader which does not take place unless the sub-ordinate problem gets worse with (b =0.117) as demonstrated in table 6.

Table 6. Coefficients and t-test for the transactional leadership Coefficient<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig
	B	Std. Error	Beta		
2 (Constant )	1.555	0.111		13.9	<0.001
X2: Transactional leadership					
X2.1 Taking of actions by leader to help if sub-ordinate target could not be reached	0.580	0.020	0.725	29.5	**<0.001
X2.2 Interference from leader does not take place unless sub-ordinate problem gets worse	0.117	0.022	0.128	5.23	**<0.001

\*\* Significant at a level less than 0.01 and 99% confidence level.

#### H3: Charismatic leadership significantly affects technology transfer effectiveness.

Regression analysis for this hypothesis demonstrates that charismatic leadership style affects technology transfer effectiveness by 81.9 % (R<sup>2</sup> value is equal to 0.82) at a significance level of less than 0.01 and a confidence level of 99 % as demonstrated in Table 7. All hypothesis sub-variables are accepted to affect technology transfer effectiveness at a significance level of less than 0.01 and a confidence level of 99 % as demonstrated in Table 7.

Table 7. Regression analysis for charismatic leadership style

Model	R	R square	Adjusted R square	Std. Error of the Estimate
4	0.864 <sup>d</sup>	0.746	0.745	0.3598

The hypothesis is significant as demonstrated in Table 8. It has been noted from Table 8 that F value is equal to 583.621 for charismatic leadership at a significance level of less than 0.01 and a confidence level of 99 %.

Table 8. ANOVA table for charismatic leadership style ANOVA<sup>e</sup>

Model		Sum of Squares	Df	Mean Square	F	Sig.
4	Regression	302.211	4	75.553	583.621	0 <sup>d</sup>
	Residual	102.917	326	0.129		
	Total	405.128	330			

Charismatic leadership style sub-variables can be arranged according to their effect on technology transfer effectiveness using their beta values. The leader's pushing of sub-ordinate to achieve departmental objectives has the strongest effect on technology transfer effectiveness with (b= 0.269). It is followed by leader's initiation to find an effective action for the problem with (b= 0.184), then rewarding sub-ordinate for doing the task well by leader with (b= 0.146).

Finally, leader's inspiration of new ways to solve old problems for sub-ordinate which has the lowest effect on the technology transfer effectiveness with (b =0.133) as demonstrated in Table 9.

Table 9. Coefficients and t-test table for charismatic leadership style Coefficient<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
4	Constant	1.382	0.086		16.058	<0.001
	X3.1-Leader's pushing of sub-ordinate to achieve departmental objectives	0.269	0.042	0.317	6.42	**<0.01
	X3.2- Leader's initiation to find an effective action for problem	0.184	0.028	0.283	6.465	**<0.01
	X3.3- Rewarding sub-ordinate for doing the task well by leader	0.146	0.028	0.213	5.148	**<0.01
	X3.4- Leader's inspiration of new ways to solve old problems for sub-ordinate	0.133	0.031	0.151	4.261	**<0.01

\*\* Significant at a level less than 0.01 and 99% confidence level.

#### H4: Visionary leadership significantly affects technology transfer effectiveness .

Regression analysis for this hypothesis demonstrates that visionary leadership affects technology transfer effectiveness by 0.731 at a significance level of less than 0.01 and a confidence level of 99 % as demonstrated in Table 11. All hypothesis sub-variables are accepted to affect technology transfer effectiveness at a significance level of less than 0.01 and a confidence level of 99 % as demonstrated in Table 10.

Table 10. Regression analysis for visionary leadership

Model	R	R square	Adjusted R square	Std. Error of the Estimate
2	0.855 <sup>c</sup>	0.731	0.73	0.37007

The hypothesis is significant as demonstrated in Table 11. It has been noted from Table 12 that F value is 720.733 for all the hypothesis sub-variables at a significance level of less than 0.01 and a confidence level of 99 %.

Table 11. ANOVA table for visionary leadership ANOVA<sup>d</sup>

Model		Sum of squares	Df	Mean square	F	Sig.
2	Regression	296.115	2	98.705	720.733	<0.001 <sup>c</sup>
	Residual	109.013	328	0.137		
	Total	405.128	330			

Visionary leadership sub-variables can be arranged according to their effect on technology transfer effectiveness using their (b) values. The degree of subordinate confidence in leader is the sub-variable with the highest effect on technology transfer effectiveness with beta (0.658). It is followed by belief of sub-ordinate in leader's judgment to solve any difficulties with beta (0.262) as demonstrated in Table 12.

Table 12. Coefficients and t-test table for visionary leadership Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig
		B	Std. Error	Beta		
2	(Constant )	1.445	0.094		15.455	
	X4.1 Degree of subordinate confidence in leader	0.658	0.021	0.815	31.544	**<0.001
	X4.2 Belief of sub-ordinate in leader's judgment to solve any difficulties	0.262	0.028	0.247	9.254	**<0.001

\*\* Significant at a level less than 0.01 and 99% confidence level.

### H5: Culture - based leadership significantly affects technology transfer effectiveness.

Regression analysis for this hypothesis demonstrates that culture based leadership affects technology transfer effectiveness by 0.72 at a significance level of less than 0.01 and a confidence level of 99 % as demonstrated in Table 13. All hypothesis sub-variables are accepted to affect technology transfer effectiveness at a significance level of less than 0.01 and a confidence level of 99 % as demonstrated in Table 13.

Table 13. Regression analysis for culture based leadership

Model	R	R square	Adjusted R square	Std. Error of the Estimate
2	.849 <sup>c</sup>	0.72	0.719	0.37731

The hypothesis is significant as demonstrated in Table 14. It has been noted from Table 14 that F value is equal to 683.267 for all hypothesis sub-variables at a significance level of less than 0.01 and a confidence level of 99 % and the hypothesis is significant.

Table 14. ANOVA table for culture- based leadership ANOVA<sup>d</sup>

Model		Sum of squares	Df	Mean square	F	Sig.
2	Regression	291.81	2	97.27	683.267	< 0.01 <sup>c</sup>
	Residual	113.319	328	0.142		
	Total	405.128	330			

Culture based leadership sub-variables can be arranged according to their effect on technology transfer effectiveness using their beta values. Sub-ordinate's feeling of proudness as being a member of department sub-variable which has the highest effect on technology transfer effectiveness with (b) (0.388). It is followed by leader gives confidence to the sub-ordinate to achieve alone with beta (0.355) as demonstrated in Table 15.

Table 15. Coefficients and t-test for culture based leadership Coefficients<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients		Sig
	B	Std. Error	Beta	T	
2 (Constant)	0.09677	0.128		0.759	0.448
X5.1 Sub-ordinate's feeling of proudness as being a member of department	0.388	0.032	0.423	12.223	**<0.001
X5.2 Leader gives confidence to sub-ordinate to achieve alone	0.355	0.029	0.303	12.264	**<0.001

\*\* Significant at a level less than 0.01 and 99% confidence level.

#### 5.4 Summary and Conclusion

##### 5.4.1 Drivers of Considering Leadership Styles Effects on Technology Transfer Effectiveness

The paper identified a number of leadership styles and demonstrated how these leadership styles can enhance the effectiveness of technology transfer. Leadership styles can affect technology transfer effectiveness in different degrees. Visionary leadership has the highest effect, followed by culture based leadership then, charismatic leadership and finally transactional leadership as demonstrated in table 16.

Table 16. Regression analysis for leadership styles variables

Model	R	R square	Adjusted R square	Std. Error of the Estimate
1	0.857	0.734	0.734	0.36754
2	0.923	0.852	0.852	0.27436
3	0.926	0.857	0.856	0.26998
4	0.928	0.862	0.861	0.26529

a. Predictors: (constant), X4- Visionary leadership.

b. Predictors: (constant), X4- Visionary leadership, X5- Culture based leadership.

c. Predictors: (constant), X4- Visionary leadership, X5- Culture based, X3- Charismatic leadership.

d. Predictors: (constant), X5- Visionary leadership, X5- Culture based, X3- Charismatic leadership, X2-Transactional leadership.

It is important to consider how each leadership style affects the effectiveness of technology transfer since this has not been illustrated in any previous literature. This research provides an empirical evidence to support this perspective. This finding can be linked to the prior research in operations management for the factors affecting the technology transfer effectiveness.

##### 5.4.2 Managerial Implications

There are a number of reasons for operations managers to consider leadership styles as one of the major drivers for technology transfer effectiveness. Two possible rationales underpin this issue: creating suitable culture to enhance technology transfer effectiveness; Clear vision which enhance the success of technology transfer process. This research illustrates that visionary leadership has the strongest effect on technology transfer effectiveness which matches the need for a clear vision from the beginning to achieve the effective technology transfer. Culture based leadership comes secondary in its effect on technology transfer effectiveness, this in its turn matches with creation of a suitable culture to enhance technology transfer effectiveness.

#### 6. Limitations

The limitation to this research is that the surveys were only administered to the Egyptian manufacturing plants in the dairy industry.

#### 7. Conclusion

One of the main contributions of this research is the development of an operations perspective of leadership styles effect on technology transfer effectiveness. In contrast to earlier research, practices related to technology transfer effectiveness which have not considered the effect of leadership styles on technology transfer effectiveness. Based on prior literature which have illustrated leadership styles, there are five leadership styles which are visionary leadership, charismatic leadership, transformational leadership, transactional leadership and culture- based leadership. The metrics for technology transfer effectiveness used in this research are product and

process performance, human resource capability and business performance. A set of operations-based scales was developed and empirically validated using a large-scale survey of the manufacturing companies in the dairy industry in Egypt. Second, much of operations and strategy is concerned with the effect of knowledge management on technology transfer.

Thus, when considering a new area such as leadership styles effect, key leadership styles variables were expected to influence technology transfer effectiveness. To that end, relationships between technology transfer effectiveness and leadership styles practices were tested empirically. Evidence pointed to four leadership styles have greatly affected technology transfer effectiveness. These four leadership styles are visionary leadership style, culture-based leadership style, charismatic leadership style and transactional leadership style. Firms can use these practices to enhance the success of technology transfer.

## 8. Future Research

The development of these scales provides an empirical basis for further scale refinement by other scholars characterizing socially responsible practices. This research focused very explicitly on four leadership styles which have been demonstrated to affect technology transfer effectiveness as has been demonstrated in table 16. This illustrates that the research results have excluded transformational leadership style since it has no effect on technology transfer effectiveness in this research. Future researches can investigate if transformational leadership style has any significant effect on technology transfer effectiveness.

Additionally, a survey could be conducted on the general population to explore how leadership styles can affect technology transfer effectiveness.

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