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Trade Liberalization and Optimal Environmental Policies in Vertical Related Markets

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Abstract

This paper establishes a symmetric two-country model with vertically related markets. In the downstream market, there is one firm in each country selling a homogeneous good, whose production generates pollution, to its home and the foreign markets a la Brander (1981). In the intermediate good market, there is also one upstream firm in each country, supplying the intermediate good only to its own country’s downstream market. The upstream firms can choose either price or quantity to maximize their profits. With this setting, the paper examines the optimal environmental policy and how it is affected by the tariff on the final good. It is found that, under free trade, the optimal final-good output with imperfect intermediate-good market will have the same output level as that with perfect intermediate-good market after imposing the optimal emission tax. The optimal environmental tax is smaller and the optimal environmental policy is less likely to be a green strategy under trade liberalization if the market structure in the intermediate good market is imperfect than perfect competition. On the other hand, the optimal environmental tax is necessarily higher if the upstream firm chooses price than quantity. Moreover, the optimal environmental policy is less likely to be a green strategy under trade liberalization if the upstream firms choose quantity than price to maximize their profits.

Keywords: Environmental policy; Intra-industry trade; Vertical related market

JEL classification: D43; F13; H23
Introduction

As the WTO tightens restrictions on international trade policies, environmental regulations have increasingly turned to be the potential instruments for strategic trade. A literature has developed which studies how strategic environmental policies differ from efficient policies, see, for instance Conrad (1993), Barrett (1994), Ulph (1996), and Greaker (2003) provides a good review of literature. The main conclusion is that a rent-shifting or trade-related incentive distorts environmental policies. When firms play in a Cournot game, these incentives imply that environmental policies will be weaker than is efficient. This result is a straightforward application of theories of strategic behavior. By committing to a less restrictive environmental policy the government reduces the marginal costs of domestic firms and makes them more aggressive competitors in international markets.

On the other hand, environmentalists have generally considered international trade creates a threat to adequate environmental regulation. Kennedy (1994) points out “free trade will lead governments to relax their environmental standards in order to gain a competitive edge over their trading partners”. A few studies support this argument (Walz and Wellisch, 1997; Tanguay, 2001). However, Burguet and Sempere (2003) examine how trade liberalization affects environmental policies in the context of bilateral trade and imperfect competition. They showed that the environmental policies may be more stringent in the face of a bilateral reduction in tariffs. Along the same line of thinking, Roelfsema (2007) develops a political economic model and shows that if the median voter cares sufficiently for the environment, he has an incentive to delegate policy making to a politician that cares more for the environment than himself.

In their setting of the environment-for-trade policy, however, the important of the element of vertical-related market has been ignored. In a trade theoretical field, there is a considerable body of literature on the trade policy in vertical-related market such as Spencer and Jones (1991, 1992), Ishikawa and Spencer (1999), and Hwang et al. (2007) etc.. From there, we have learned that the vertical-related market structure plays an important role in the decision of trade policy. In an environmental issue, it is interesting to know the role of vertical structure in the decision of environmental policies. One research towards this area was provided by Hamilton and Requate (2004), in which a competitive upstream market was constructed with vertical two-part tariff contracts to demonstrate that the optimal policy to levy on a polluting input under both quantity and price competition in the international market is the Pigouvian tax. More recently, Yu (2007)
further investigate the horizontal “profit-shifting”, vertical “rent-extracting”, and “collusion-facilitating effect” in a model with a monopolistic upstream firm and oligopolistic downstream firms. Sugeta and Matsumoto (2007) found that the effect of change in emission tax on the degree of price discrimination in a vertical related model with one upstream firm discriminating the factor prices to the downstream firm. Canton et al. (2008) set a model with polluting firms selling final goods to consumers and outsourcing their abatement activities to an environment industry, and found the optimal tax rate is the result of trade-off that depends on the firms’ market power along the vertical structure.

We study these issues in a model of imperfect competition and bilateral trade. We establish a symmetric two-country model with vertically related markets. In the downstream market, there is one firm in each country selling a homogeneous good, whose production generates pollution, to its home and the foreign markets a la Brander (1981). In the intermediate good market, there is also one upstream firm in each country, supplying the intermediate good only to its own country’s downstream market. The upstream firms can choose either price or quantity to maximize their profits. With this setting, the paper examines the optimal environmental policy and how it is affected by the tariff on the final good. It is found that the optimal environmental tax is smaller and the optimal environmental policy is less likely to be a green strategy under trade liberalization if the market structure in the intermediate good market is imperfect than perfect competition. On the other hand, the optimal environmental tax is necessarily higher if the upstream firm chooses price than quantity. Moreover, the optimal environmental policy is less likely to be a green strategy under trade liberalization if the upstream firms choose quantity than price to maximize their profits.

The relevant questions are how trade liberalization affects those trade-related incentives for environmental protection in a vertical related market. Note that a bilateral reduction in tariffs does not mean less protection for domestic firms. Indeed, while domestic firms face tougher competition in the domestic market, they also enjoy a better competitive position in the foreign market. Thus, the change in the level of domestic trade protection is itself ambiguous, and we should look rather at how the relative surplus from exports and imports conditions the trade-off between higher consumption and a cleaner environment. Moreover, by integrating the vertical related market, we also consider the outcome when the upstream market is perfect competitive.
The rest of the paper is structured as follows. Section 2 presents the model of vertical structure and downstream intra-industry trade with Cournot duopoly. The upstream firms can choose either price or quantity to maximize their profits. In Section 3, we will set out the market equilibrium conditions when the upstream firms’ choice variable is price and examines the conditions under which the environmental policy can be a Pigouvian tax with a focus on the additional effects caused by the intermediate-good industry. Moreover, we discuss the effects of trade liberalization on the optimal environmental policies to see the movement is an eco-dumping strategy or a green strategy. The case where the upstream firms’ choice variable is quantity is discussed in Section 4. Finally, Section 5 offers some concluding remarks.

The model

Consider a symmetric, vertically related structure model of downstream bilateral trade. In the final-good markets, there is a homogeneous, tradable good produced by two firms, each located in a different country, domestic \((d)\) and foreign \((f)\). The final-good production generates pollution. Each firm sells in both countries. For the home and foreign market, the demand for the good is given by an inverse linear demand function, \(P(Q) = a - bQ\) and \(P'(Q') = a - bQ'\) respectively, where \(P' < 0\), \(P'' < 0\), and \(P'' = P''' = 0\). Firms compete in quantities. Let \(X(Y)\) be the output of domestic (foreign) firm for the home market and \(X^*(Y^*)\) the output of domestic (foreign) firm for the foreign market. Thus, \(Q = X + Y\) and \(Q^* = X^* + Y^*\) stand for the total consumption in each of the markets. In addition, exports to each country are subject to a tariff, \(T\), for simplicity, that we assume exogenous and the same in both countries. We further simplify the analysis by assuming of constant marginal costs of production. The marginal cost of the domestic firm for the home (foreign) market is \(C (C + T)\), which is constant. Similarly, the marginal cost of the foreign firm for the home (foreign) market is \(C^*(C^* + T)\). We assume \(C = C^* = 0\), for simplicity.

In the intermediate-good markets, we frame our model around a decentralized vertical market structure that supports the downstream in its own country. The derived demand function for domestic and foreign market is \(p(x)\) and \(p'(y')\) respectively. The notations in lower case represent the variables in upstream market. Let \(x(y^*)\) be the output of domestic (foreign) upstream firm for the home (foreign) market. Moreover, the technology of production of the final
product is simplified by the assumption that one unit of the input is required to produce one unit of the final product. Thus, \( x = X + X^* \) and \( y = Y + Y^* \), the total input demand in each of the markets. The marginal cost of the upstream firm is \( c \). For simplicity and without loss of generality, we assume the constant marginal cost is nil again.

In each country there is a government whose goal is to maximize national welfare by setting the value of pollution tax \( E \) and \( E^* \) against the polluted production. The model involves three stages of decision. In the first stage, the home and the foreign governments simultaneously commit to their environmental instruments. Next, the second stage the upstream firms choose input-price or input-quantity to maximize profits. In the third stage, the market for the final good involves a Cournot-Nash equilibrium. This section sets out the equilibrium conditions for our main model and also develops the effects of an import tariff and an environmental policy in the final-good markets.

Firm \( d \) and \( f \) set their outputs for the home market and their output for the foreign market so as to maximize profits taking rival’s exports and also the input prices \( p \) and \( P^* \), policies \( T, E \) and \( E^* \) as given. The home firm’s profit is

\[
\max_{\{X,X^*\}} P^d = \left[ P(Q) - p - E \right] X + P^* (Q^*) - p - E - T \hat{X}^*. 
\]

The first order conditions are:

\[
P^d_X = XP_X + P(Q) - p - E = 0, \quad (2.1)
\]

\[
P^d_X^* = X^* P_X^* + P^* (Q^*) - p - E - T = 0. \quad (2.2)
\]

Foreign firm earns profits,

\[
\max_{\{Y,Y^*\}} P^f = \left[ P^* (Q^*) - p^* - E^* \hat{Y}^* \right] Y + P^* (Q) - p^* - E^* - T \hat{Y},
\]

and the first order conditions are:

\[
P^f_Y = Y^* P_Y^* + P^* (Q^*) - p^* - E^* = 0, \quad (4.1)
\]

\[
P^f_Y = YP_Y + P(Q) - p^* - E^* - T = 0. \quad (4.2)
\]

The constant marginal cost assumption implies that markets are separated: the output choice for one of the markets is independent of the output choice for the other. We assume the
demand function is well defined, and the second order and stability conditions are hold globally, so that an interior, unique solution exists. The Cournot equilibrium outputs of firm $d$ are $X(p, p^*, E, E^*; T)$ and $X^*(\bullet)$, and those for firm $f$ are $Y(\bullet)$ and $Y^*(\bullet)$. From those first order conditions, we obtain

$$X_p = X_E = \frac{P_f}{F_1} < 0, \quad X_p^* = X_E^* = X_T = \frac{-P_d}{F_1} > 0; \quad (5.1)$$

$$Y_p = Y_E = \frac{-P_{fy}}{F_1} > 0, \quad Y_p^* = Y_E^* = Y_T = \frac{P_d}{F_1} < 0; \quad (5.2)$$

$$X_p^* = X_E^* = X_T^* = \frac{P_{fy}}{F_2} < 0, \quad X_p^{**} = X_E^{**} = -\frac{P_d}{F_2} > 0; \quad (5.3)$$

$$Y_p^* = Y_E^* = Y_T^* = \frac{-P_{fy}}{F_2} > 0, \quad Y_p^{**} = Y_E^{**} = \frac{P_d}{F_2} < 0, \quad (5.4)$$

where $F_1 = F_2 = b^2/3 > 0$ are the stability conditions in two downstream markets respectively. From (5.1) and (5.2), the rise in intermediate-good price or pollution tax will increase the production cost, thus the firm’s output will decrease, the rival firm’s output will increase. Similar implication can be applied in (5.3) and (5.4). Observing the above, we have $X_p = X_p^* = Y_p^* = Y_p^{**}$, $X_E = X_E^* = Y_E^* = X_T = Y_T = -2/3b$; and $X_p^* = X_p^{**} = Y_p^* = Y_p^{**} = X_E^* = X_E^{**} = Y_E = Y_E^{**}$, $X_T = Y_T^* = 1/3b$ with linear demand and symmetry.

Now we turn to the second-stage equilibrium. A general thinking to a monopoly model is each firm’s disregard of the other firm’s reactions to its price or quantity decisions. The monopolist regards himself as having no rivals and then results in the same profit if the firm takes either quantity or price as a choice variable to maximize its profit when it faces the final product demand curve. Nevertheless, in our model here, in the intermediate good market, there is one upstream firm in each country, supplying the intermediate good only to its own country’s downstream market. One may think the upstream firm acts as a monopolist. In reality, although the markets for the intermediate good are segmented, they are connected through the decisions of the downstream firms how much to supply. The sudo-monopolistic upstream firm cannot decide any price or quantity without considering the reaction of upstream firm in the foreign country. In
these circumstances each firm can anticipate that its price or quantity decisions may call forth a response from rivals. In view of existing literature, Sugeta and Matsumoto (2007) and Yu (2007) taking the prices as a choice variable, and Canton et al. (2008) taking the outputs as a choice variable in the intermediate-good market, we have never seen anyone to compare the differences between the two choice variables in intermediate-good markets.

Although the markets for the intermediate good are segmented, they are connected through the decisions of the downstream firms how much to supply. The upstream firms can choose either price or quantity to maximize their profits. In next section, we will set out the optimal environmental policy when the upstream firms’ choice variable is price and examines the conditions under which the environmental policy can be a Pigouvian tax with a focus on the additional effects caused by the intermediate-good industry. Moreover, we discuss the effects of trade liberalization on the optimal environmental policies to see the movement is an eco-dumping strategy or a green strategy. Section 4 will find out the equilibrium when the upstream firms’ choice variable is quantity.

**The intermediate-good markets: choose input-price**

Now consider the intermediate-good market. To derive the demand for the input in each country, the first order conditions (2) are initially used to have the partial derivatives with respect to input price, shown in (5). The input price \( p \) is simply the domestic market-clearing price, which equates the demand by the firm \( d \) at the price \( p \) to the total amount of the input produced in country \( d \) in stage 2, that is \( X + X^* = x \). Similarly, \( p^* \) is the market-clearing price in foreign intermediate-good market, \( Y^* + Y = y^* \). According to this, we obtain the demand functions for input markets in two countries respectively:

\[
x = x(p, p^*; E, E^*, T) = \frac{1}{3b} \left[ 2(a + p^* + E^*) - 4(p + E) - T \right],
\]

\[
y^* = y^*(p, p^*; E, E^*, T) = \frac{1}{3b} \left[ 2(a + p + E) - 4(p^* + E^*) - T \right],
\]

The discussions above support us to find the optimal solution for the second stage.

**Optimal Intermediate-good Price**

The profit earned by the domestic firm is then given by

\[
\text{Max } \pi^d = px.
\]
At the second-stage equilibrium in each market, upstream firm sets the input price to maximize profit. The first-order condition is

\[ p^d_p = x + px_p = 0. \] (7)

Similarly, the profit for the foreign firm and the first-order condition:

\[ \max_{\{p^f\}} p^f = p^* y^*, \] (8)

\[ \pi^f_{p^*} = y^* + p^* y^*_p = 0. \] (9)

From (7) and (9), the quantity of the intermediate good for two countries depends on both the prices \( p \) and \( p^* \). Although the markets for the intermediate good are segmented, they are connected through the decisions of the downstream firms how much to supply. Solve the two equations together and yield the equilibrium \( p = p\left(E, E^*, T\right) \) and \( p^*(\bullet) \). The effects of pollution tax and import tariff on the input price can be found by totally differentiating the two first-order conditions, then using the linear demand to obtain. The second order conditions and the stability conditions in two markets \( \phi_p = \pi^d_{pp} p^f_{p^*} - \pi^f_{p^*} \pi^d_{p^*} > 0 \) are assumed to be satisfied. It is easy to obtain

\[ p_E = p^*_E = \frac{-1}{\phi_p \Phi^2} \left[ 2 \left( \Pi^d_{xx} + \Pi^d_{xx,x^*} \right) - \left( -\Pi^d_{xy} - \Pi^d_{xx,x^*} \right) \right] = \frac{-7}{15} < 0, \] (10.1)

\[ p_{E^*} = p^*_E = \frac{1}{\phi_p \Phi^2} \left( \Pi^d_{xx} + \Pi^d_{xx,x^*} \right) \left( \Pi^d_{xy} + \Pi^d_{xx,x^*} \right) = \frac{2}{15} > 0, \] (10.2)

\[ p_T = p^*_T = \frac{-1}{\phi_p \Phi^2} \left[ 2 \left( -\Pi^d_{xy} + \Pi^d_{y,x^*} \right) \left( \Pi^d_{xx} + \Pi^d_{xx,x^*} \right) + \left( \Pi^d_{xx} - \Pi^d_{y,x^*} \right) \left( \Pi^d_{xy} + \Pi^d_{y,x^*} \right) \right] = \frac{-1}{6} < 0 \] (10.3)

In (10.1), higher emission tax in their own country means less production and the less derived demand to intermediate-good that comes along with these causes the input prices to decrease in their own country. Similarly, in (10.2), higher emission tax in their rival country means more production in home and thus causes the input prices to increase in their own country. The effect in (10.1) is higher than that in (10.2). Finally, the similar induction can be applied in (10.3).
**Optimal Environmental Policies and the Effect of Trade Liberalization**

This section will examine the conditions under which the policy is an eco-dumping strategy or a green strategy, analyzes the welfare effects of a pollution tax with a focus on the additional effects caused by the intermediate-good industry, and comparison with perfect competition in the intermediate-good industry is also studied.

Governments decide the environmental policies to maximize national welfare, defined as the sum of consumer surplus, $CS$, profits of upstream firm $\pi$, and downstream firm $\Pi$, pollution tax revenue, $ETR$; tariff revenues from downstream imports, $TR$; and the damage of pollution, $H$. The damage function is assumed to be a form in total output: home’s and foreign’s social damage function can be set $H = H(X, X^*)$, $H^* = H^*(Y, Y^*)$ respectively, with $H \neq 0$, $H^* \neq 0$. The welfare functions for the two countries can be defined respectively as

\[
Max_{\{E\}} W^d = \int_0^{X+Y} P(Q)dQ - P(Q)(X+Y) + p^d \left(p(E, E^*; T), p^* (\cdot)\right) + P \left(X(p(\cdot), p^*(\cdot), E, E^*; T), X^*(\cdot), Y^*(\cdot), p(\cdot), E; T\right)
+ E \left(X + X^*\right) - H \left(X, X^*\right) + TY,
\]

\[
Max_{\{E^*\}} W^f = \int_0^{X^*+Y^*} P^*(Q^*)dQ^* - P^*(Q^*)(X^*+Y^*) + p^f \left(p(E, E^*; T), p^* (\cdot)\right) + P^f \left(X(p(\cdot), p^*(\cdot), E, E^*; T), X^*(\cdot), Y^*(\cdot), p(\cdot), E^*; T\right)
+ E^* \left(Y + Y^*\right) - H^* \left(Y, Y^*\right) + TX^*.
\]

We will discuss the optimal environmental policy and examine the effects of trade liberalization on the optimal policy.

In the case, the first order conditions are:

\[
W^d_E = \frac{dCS}{dE} + \frac{d\pi^d}{dE} + \frac{d\Pi^d}{dE} + \frac{dETR}{dE} - \frac{dH}{dE} + \frac{dTR}{dE},
\]

\[
W^f_E = \frac{dCS^*}{dE^*} + \frac{d\pi^f}{dE^*} + \frac{d\Pi^f}{dE^*} + \frac{dETR^*}{dE^*} - \frac{dH^*}{dE^*} + \frac{dTR^*}{dE^*},
\]

where
\[
\frac{dCS}{dE} = -\frac{2}{9} (X + Y) < 0, \quad \frac{d\pi^d}{dE} = px_p^* p_E^* = \frac{4}{45b} p > 0, \quad \frac{d\Pi^d}{dE} = -\frac{28}{45} (X + X^*) < 0, \\
\frac{dETR}{dE} = (X + X^*) - \frac{28E}{45b}, \quad \frac{dH}{dE} = -\frac{28}{45b} H' < 0, \quad \frac{dTR}{dE} = \frac{4T}{45b} > 0,
\]

Using (13), (12.1) and (12.2) can be reduced into:

\[
W_E^d = -\left( X + X^* \right) p_E + px_p^* p_E^* + \left[ b(X + Y) + 2(E - H') \right] \left( X_p P_E + X_p P_E^* + X_E \right) \\
\quad + T\left( Y_p P_E + Y_p P_E^* + Y_E \right) = 0,
\]

(14.1)

\[
W_{E'}^d = -\left( Y + Y^* \right) p_{E'} + p_{p'}^* y_{p'}^* p_{E'}^* + \left[ b(X^* + Y^*) + 2(E^* - H'^{\prime}) \right] \left( Y_p^* P_{E'} + Y_p^* P_{E'}^* + Y_{E'}^* \right) \\
\quad + T\left( X_{p'}^* P_{E'} + X_{p'}^* P_{E'}^* + X_{E'}^* \right) = 0.
\]

(14.2)

On the other hand, the upstream firms are not acting strategically when the intermediate-good market is perfect competition. For notation convenience, \( E^F \) and \( E^p \) stand for the emission tax imposed by the domestic government on final polluting production in a competitive upstream market and in an imperfect competitive upstream market. We have a two-stage game in which the first order conditions for welfare maximization are

\[
W_E^d = \left[ b(X + Y) + 2(E - H') \right] X_E + TY_E = 0,
\]

(15.1)

\[
W_{E'}^d = \left[ b(X^* + Y^*) + 2(E^* - H'^{\prime}) \right] Y_{E'} + TX_{E'} = 0.
\]

(15.2)

Assuming the second order conditions are satisfied, substituting the comparative static results obtained in (5), (10) and (13) into (14) and (15), and integrating the symmetric assumption, \( E = E^* \). For a neater exhibition, the damage functions of domestic and foreign can be specified to be a quadratic form in total output as shown in literature commonly:

\[
H = h\left( X + X^* \right)^2 / 2, \quad H^* = h\left( Y + Y^* \right)^2 / 2, \quad H\Psi = H^* \Psi > 0, \quad H\Phi = H^* \Phi = h > 0.
\]

We obtain the optimal emission tax in terms of the marginal damage cost \( H^\prime \),

\[
E^p = E^{*p} = H\Phi - \frac{70ab - T(53b + 8h)}{56(b + h)},
\]

(16.1)
\[ E^c = E^c = H \hat{\xi} - \frac{4ab - T(5b + 2h)}{8(b + h)}. \]  

(16.2)

In a free trade world, \( T = 0 \), (16) shows that the emission taxes are smaller than Pigouvian tax (\( E = E^* = H' \); emission tax should be set equal to the marginal damage cost) no matter what the structure of intermediate-good market is. By examining (16.2), since there is no distortion in the perfect competitive intermediate-good market, the optimal emission tax is not the usual first-best tax rule (so called Pigouvian tax). The reason is that the downstream market is imperfect. The emission tax is a single instrument used to regulate two sorts of distortions, one negative externality, and one restriction in production, which can be found in (15).

Substituting the damage functions into (16), it can be rewritten as

\[ E^p = E^p = \frac{14a(4h - 5b) - T(28h - 53b)}{56(b + h)}, \quad E^c = E^c = \frac{4a(2h - b) - T(4h - 5b)}{8(h + b)}, \]  

(17)

Equation (17) shows that, under free trade, the higher increasing rate of marginal damage is, the more likely to be tax the optimal environmental policy is, see also (16). The optimal environmental policy is subsidy with imperfect intermediate-good market, whereas it is tax with perfect intermediate-good market when \( b/2 < h < 5b/4 \).

In the case of free trade, using \( E^p \) we obtain the optimal intermediate-good price in the second stage and thus yield the optimal final-good output in the third stage when the intermediate-good market is imperfect, so does the optimal final-good output when the intermediate-good market is perfect by using \( E^c \); that is \( \left( X^p + X^{p^p} \right)_{T=0} = \left( X^c + X^{c^c} \right)_{T=0} = a/(b + h) \). Summarize the result in proposition 1.

**Proposition 1.** Under free trade, the optimal final-good output with imperfect intermediate-good market will have the same output level as that with perfect intermediate-good market after imposing the optimal emission tax.

Regardless of upstream market structure, the government imposes the optimal emission tax will drive the final-good output level to be the same. This finding is interesting. To know why they all achieve the same output, we assume there is no social damage caused by the pollution first, \( H = 0 \). The emission tax can be seen as a production tax. By doing some simple mathematic exercise, we find out the optimal production tax moves the equilibrium price to what would, in
the absence of pollution and ignorance of input price, be the margin cost pricing position in output space. Without pollution damage, there is only one distortion in the market, which comes from the imperfect competition output market. Consequently, the production subsidy will move away the distortion and to be the social optimal. Next, we consider the pollution. If we can have one more tool, such as emission tax, then the optimal emission tax should be the Pigouvian tax. However, in our model, there is only one policy, which should be lower than Pigouvian tax.

Moreover, under free trade, if we compare the optimal emission tax when the intermediate-good market is imperfect to that when the intermediate-good market is perfect we see immediately that the discrepancy between the optimal emission tax and the Pigouvian tax with imperfect is \( E^P - H^E = -5ab/4(b + h) \), while it is \( E^C - H^E = -ab/2(b + h) \) with perfect; in other words, the discrepancy is bigger if the intermediate-good market is imperfect than if it is perfect. Combining this result and proposition 1 shows the optimal emission tax ranking in proposition 2.

**Proposition 2.** Under free trade, the ranking of the optimal emission tax with imperfect competitive intermediate-good market \( E^P \), the optimal emission tax with perfect competitive intermediate-good market \( E^C \) and the Pigouvian emission tax \( H^P \) is \( E^P < E^C < H^P = H^C \). The discrepancy between the optimal emission tax and the Pigouvian tax is bigger if the intermediate-good market is imperfect than if it is perfect.

The reason is that when the intermediate-good market is imperfect, the productions in downstream are less, the deadweight loss is bigger, and so the government will lower emission tax to stimulate outputs. Furthermore, the environmental policy to give consideration to reduce pollution and to improve export competency under free trade. Consequently, the optimal emission tax is lower marginal damage.

Next, we turn to the effect of a reduction of tariffs on the strength of environmental policies. From (17) the effects of trade liberalization on the optimal emission tax can be obtained,

\[
E^P_T = E^P_T^* = \begin{cases} 
\frac{53b - 28h}{56(b + h)} & if \ h \leq \frac{53}{28} \\
0 & if \ h > \frac{53}{28}
\end{cases}, \quad E^C_T = E^C_T^* = \begin{cases} 
\frac{5b - 4h}{8(h + b)} & if \ h \leq \frac{5}{4} \\
0 & if \ h > \frac{5}{4}
\end{cases}
\]  

(18)

The answer here depends on the increasing rate of marginal damage (or the convexity of damage function); that is, on \( h \). A reduction in tariffs causes two effects: an incentive for tougher environmental regulations because of an increase in output of domestic firm, and then an
increase in the marginal social cost; the other incentive for less strict regulations because of an increase in output of foreign firm selling to domestic market, and then cost advantage for domestic firm. Generally speaking, there is more stringent (looser) environment regulation, so called “green strategy” (“eco-dumping”) as a consequence of moves towards freer trade when the increasing rate of marginal damage is higher (smaller). More interestingly, by comparing $E_T^P$ to $E_T^C$, the optimal environmental policy is less likely to be a green strategy in the situation of bilateral reductions in tariffs if the intermediate-good market is imperfect than if that is perfect. Proposition 3 shows the problem some environmentalists concern, which is trade liberalization might damage the environment.

**Proposition 3.** The optimal environmental policy is less likely to be a green strategy under trade liberalization if the upstream firms act imperfectly than they act perfectly.

When h is smaller (higher), “eco-dumping” (“green strategy”) happens. Furthermore, $E_T^P - E_T^C = 9b/28(b + h) > 0$, shows it could be more green strategy as the intermediate-good market is perfect. The intuition can be explained as follows. A reduction in the tariff lowers the export cost of the downstream firms and will produce more. It can be proved easily that the effect of trade liberalization on the output of final good is bigger under perfect intermediate-good market than imperfect. Thus, the environmental tax should be higher due to more pollution with more output when the intermediate-good market acts perfectly.

**The Intermediate-good Markets: Choose Input Quantity**

In this section, we will set out the optimal environmental policy when the upstream firms’ choice variable is output. In our model, the upstream firms only sell the intermediate good to his own country’s downstream firm. They seem to be monopolists. However, the two upstream firms compete together through the downstream firm’s competition in the intra-industry trade model.

**Optimal Quantities of Intermediate Good**

Using $X + X^* = x$ and $Y + Y = y^*$, the inverse derived demand functions for intermediate-good are: $p = a - bx - \frac{1}{2}(by^* + T) - E$, $p^* = a - by^* - \frac{1}{2}(bx + T) - E^*$. The profit earned by the domestic firm is then given by

$$\max_{\{s\}} \pi^d = px,$$  \hspace{1cm} (19)
At the second-stage equilibrium in each market, upstream firm sets the input quantity to maximize profit. The first-order condition is

$$p^d_x = p_x x + p = 0. \quad (20)$$

Similarly, the profit for the foreign firm and the first-order condition:

$$\max_{\psi^*} \pi^f = p^* y^*, \quad (21)$$

$$\pi^f_{y^*} = p^* y^* + p^* = 0. \quad (22)$$

From (20) and (22), the quantity of the intermediate good for two countries depends on both the prices $p$ and $p^*$. Although the markets for the intermediate good are segmented, they are connected through the decisions of the downstream firms how much to supply. Solve the two equations together and yield the equilibrium $x = x(E, E^*, T)$ and $y^*(\bullet)$. The effects of pollution tax and import tariff on the input quantity can be found by totally differentiating the two first-order conditions, then using the linear demand to obtain. The second order conditions and the stability conditions in two markets $\phi_q = \pi^d_{xx} \pi^f_{y^*}, -\pi^d_{x^*} \pi^d_{y^*} > 0$ are assumed to be satisfied. It obtains

$$x_E = y_E^* = \frac{\pi^f_{y^*}}{\phi_q} = -\frac{8}{15b} < 0, x_T = y_T^* = \frac{2}{15b} > 0, x_T = y_T^* = \frac{-1}{5b} < 0, x_T = y_T^* = \frac{-1}{5b} < 0. \quad (23)$$

The intuition behind (23) is more direct than in (10). For example, in (23.1), higher emission tax in their own country means less production and then less derived demand to intermediate-good in their own country.

**Optimal Environmental Policy and the Effect of Trade Liberalization**

The welfare functions where the intermediate-good firms choose quantity show bellows.

$$\max_{\psi^*} W^d = x+y \quad P(Q)dQ - P(Q)(X+Y)+ p^d + P^d + E(X+X^*) - H + TY, \quad (24.1)$$

$$\max_{\psi^*} W^f = x^*+y^* \quad P(Q^*)dQ^* - P(Q^*)(X^*+Y^*)+ p^f + P^f + E^*(Y+Y^*) - H^* + TX^*, \quad (24.2)$$

We will discuss the optimal environmental policy and examine the effects of trade liberalization on the optimal policy.
The first order conditions are:

\[ W^d_E = \frac{dCS}{dE} + \frac{d\pi^d}{dE} + \frac{d\Pi^d}{dE} + \frac{dETR}{dE} - \frac{dH}{dE} + \frac{dTR}{dE}, \quad (25.1) \]

\[ W^{f*}_E = \frac{dCS^*}{dE^*} + \frac{d\pi^f}{dE^*} + \frac{d\Pi^f}{dE^*} + \frac{dETR^*}{dE^*} - \frac{dH^*}{dE^*} + \frac{dTR^*}{dE^*}. \quad (25.2) \]

Assume free trade \( T = 0 \), substituting the comparative-static results obtained before, and integrating the symmetric assumption; \( E = E^* \), and we are now in a position to compare the optimal emission tax setting by the government under the upstream firm taking output as a variable with that under the upstream firm taking price as a variable. To investigate this point, we can evaluate (25.1) at \( E^O = E^P \) and then use (14.1) to yield the following equation

\[ W^d_{E^O} \bigg|_{E^O=0, E^P=E^*} < 0. \]

It follows that \( E^O < E^P \). Proposition 4 summarizes the result.

**Proposition 4.** The optimal emission tax will be lower when the upstream firms take the output as a choice variable than they take the price as a choice variable.

The optimal emission tax with quadratic social damage function in total output and quantity as a decision variable is \( E^O = E^{*O} \). An increase in \( h \) tends to move the optimal emission taxes towards positive. In the area of \( 5b/4 < h < 3b/2 \), the optimal environmental policy is to tax (subsidy) when the upstream firms choose price (quantity) as a variable.

Moreover, the degree of diversification \( E^O \) and \( H^O \) is \( E^O = E^{*O} = H^O \) - 

\[ - [24ab - T(17b + 2h)]/[16(b + h)]. \]

In a free trade world, \( T = 0 \) in (29), the environmental tax is smaller than Pigouvian tax \( H^O \). Moreover, we can prove the optimal output in the downstream firm with quantity as a choice variable under the optimal emission tax is the same as that with price as a choice variable.

**Proposition 5.** With free trade, the Pigouvian tax with price as a choice variable for the upstream firm is the same as that with quantity as a choice variable.

In the case of free trade, using (20) we obtain the optimal intermediate-good output in the second stage and thus yield the optimal final-good output in the third stage with quantity as a choice variable, that is \( 0 \leq X^O + X^{O*} \leq \frac{a}{(b + h)} \). Combining this proposition with proposition
2 yields \( \left( X^Q + X'^Q \right) \bigg|_{T=0} = \left( X^P + X'^P \right) \bigg|_{T=0} = \left( X^C + X'^C \right) \bigg|_{T=0} \). This concludes to the result: under free trade, no matter what the choice variable is price or output for the upstream firm, when the intermediate-good market is imperfect the optimal emission tax maximizes domestic welfare by moving the upstream firm to what would have been the output in upstream with perfect competition. Similarly, an aim of the government imposes environmental policy is to make that the price equilibrium to be the margin cost pricing.

Finally, differentiating \( E^Q \) with respect to \( T \), the effects of trade liberalization are \( E^Q_T = E^*_Q > (\neq, <)0 \), \( \text{if } h < (\neq, >)17b/8 \). Comparing (18.1) and this result, proposition 6 shows the effect of trade liberalization on the optimal emission tax.

**Proposition 6.** The optimal environmental policy is less likely to be a green strategy under trade liberalization if the upstream firms choose quantity than price to maximize their profits.

The intuition behind proposition 6 is similar to proposition 3. The downstream firms produce more if the upstream firms choose price than quantity to maximize their profits. Thus, the environmental tax should be higher when the upstream firms choose price in intermediate-good market.

Burguet and Sempere (2003) analyze how trade liberalization affects environmental policies in the context of bilateral trade in downstream industry. They argued Kennedy’s (1994) statement may not hold in their model. We employ a vertical structure with downstream bilateral trade, the difference between ours and Burguet and Sempere (2003) can be seen in the above proposition.

**Concluding Remarks**

As the WTO tightens restrictions on international trade policies, environmental regulations have increasingly turned to be the potential instruments for strategic trade. This paper has established a symmetric two-country model with vertically related markets to examine the optimal environmental policy and how it is affected by the tariff on the final good. It is found that the optimal environmental tax is smaller and the optimal environmental policy is less likely to be a green strategy under trade liberalization if the market structure in the intermediate good market is imperfect than perfect competition. On the other hand, the optimal environmental tax is necessarily higher if the upstream firm chooses price than quantity. Furthermore, the optimal environmental policy is less likely to be a green strategy under trade liberalization if the
upstream firms choose quantity than price to maximize their profits. We attributed the foregoing result to the degree of competition of upstream market.
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Managing Innovation in View of the Uncertainties

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Abstract

Study of the problems of uncertainty in innovation is at present the most up to date. Approaches to its definition, arranged primarily on the assumption and include the known parameters, which essentially is a game approach to the assessment. Address specific issues of governance of innovation in accounting uncertainty still remains open and the most relevant, especially when the innovation represented by one of the drivers of growth of national economies. This paper presents a methodological approach to determining the degree of uncertainty and an approach to the management of innovation through a system of mathematical modeling on the criterion of gross errors.

Key words: Innovation, uncertainty, control, evaluation criteria of gross errors.
Introduction

Theory and practice of innovation has always been separately associated with the identification and risk analysis. Certainly, the risks as an economic category, characterized by absolutely everyone, without exception, the processes in business organizations, regions and states. However, there are varieties of risks, which are very difficult to predetermine, predict. Thus, these risks of innovation transformed into a state which is called uncertainty.

Another aggravating feature is the uncertainty of its continued growth. In part, this situation is associated with many factors, among which highlights the globalization, the complexity of schemes of interaction between agents of markets, the acceleration of technological progress and national innovation systems, the transition to the new technological order, etc. To date, no theory has gained little experience in working with the uncertainty, but, unfortunately, it is focused either on the technical areas of the economy, or reflect the issues of the economy as a whole.

Thus, the problem of evaluation and innovation management in the face of uncertainty remains unresolved and extremely topical in the intrinsic property of the global economy. This article provides an overview of the existing varieties of uncertainty in innovation, identifies approaches to clarify the results in the face of uncertainty, which have found wide opening in game theory, and presented a methodological approach, which allows a theoretical point of view closer to one of the problems of innovation management in consideration of their under conditions of uncertainty.

The research methodology is based on a three-tier approach, in which arrays of information collected on topical issues of innovation uncertainty, the analysis of this information in terms of its distribution and the account, after which it is possible to talk about simplifying the solution of such problems as the direction of innovation, determination of its trend assessment the development of reliable information needed to make informed management decisions.

Conditions of Uncertainty in Innovation

Formation and development of innovation at the state level, the region and the organization has many meanings. On the one hand, the question of development of economies and institutions and the state, creating new jobs, growing purchasing power, are filled with the budgets of different levels, and the other may be that the innovation will affect negatively to the economic system.
Typically, this occurs not because of the risks of a commercial nature or in efficient management, and for reasons trivial uncertainty, i.e. the absence of any information about future prospects. An innovative activity within an organization or region of the country has a number of properties of risk character. Calculated data showing effectiveness of the system under consideration of innovative measures in the commercial sector, based often on purely financial results. In addition, a risk factor in the calculation only applies to the proposed discount rate, which is a priori assumed to be the refinancing rate or the average market rate of the bank loans to businesses.

The problem of this property is that the modern economic system of any country has the properties of turbulence, namely, the planning horizon ends in one year. Reliably determine the state of the economy in the next few years it becomes impossible, and thus the deviation from the intended result will be significant.

Thus, it appears that the inclusion of risk factors in the development of innovation is extremely difficult and is already receiving properties of uncertainty, the management of which is not as obvious as in the presence of risk. Thus, after analyzing data on marginal interest rates in the period from 1 January 1999 to 9 November, 2011. According to the ECB were reliably produced the following results:

![Figure 1. Analysis of changes in interest rates](image-url)
The value of standard deviation is 1.046; the coefficient of determination resulting linear model has a very low value and indicates that the standard error of the registration in the next forecast period will be not less than 66%. Also in the picture clearly shows signs of heteroscedasticity at the inlet and outlet of the data being analyzed, it does not speak in favor of a reliable forecast for the next period. That's why rely solely approaches to the identification of risks through a series of financial and economic indicators are inappropriate. In the same way you can describe almost any single-factor evaluation methodology. It becomes obvious that the development of innovation through the evaluation of the effectiveness of risk associated with deviations from the planned courses, which in turn develop into uncertainties. The presence of uncertainties may affect the effects of innovation, because there are no reliable data on the future status of the innovative projects and programs that are currently being accepted for implementation.

**Uncertainty in the Innovation**

In theory and practice to date are the following types of uncertainties in the innovation activities of commercial organizations (Jalonen & Lehtonen 2011):

- Technology - is manifested in specific products and production processes (Harris & Woolley, 2009);
- The market - the most important aspect is the prospect of innovation in the market. Market uncertainty may arise at the stage of R & D, where no clear idea of the existence of further goals. In addition, innovation in consumer should have a positive response, and therefore, there are two launch it on the market, "ejection" where in parallel with the development and manufacture of innovative work going on to develop the necessary needs of potential consumers, "pull" - the production innovation in the light of those needs that are not implemented in real time or may be required in the future;
- Regulatory uncertainty - there are numerous gaps in the legal field of existence and development of innovations that could lead to its own rules of entrepreneurs, which does not necessarily mean support for social responsibility. In this case, are an issue of limitations and the availability of controllers for this type of uncertainty? Another point is the study of intellectual protection;
- Social and political uncertainty - as innovations emerges and develops under the influence of the market, which form a specific consumer, and reliance on social services
to be available. Political uncertainty arises as a consequence of social uncertainty, i.e. through the conflicts of interests of social groups;

- The uncertainty of approval and legitimacy - the entry into dissonance with public order innovation (Wilson 1997) gives rise to many questions related to their acceptance and approval;

- The uncertainty of management - the problem is selection of specific instruments of influence on the risks and uncertainties that would have the effect of innovation. The problem of innovation management is the lack of guidance on accounting for all components that are associated with innovation and evaluation. This and issues of resource provision and management of people, finances, relationships with suppliers and customers, etc.;

- Uncertainty of timing (timing) - is the presence of stochastic factors when entering into the market innovations that could significantly affect its profitability and viability in the foreseeable future. As well there is the possibility of innovation in favor of rejection of ideas, time-tested. The presence of such a factor leads to unnecessary barriers and consumer rejection of innovation simply because they are new (McKinney 2011);

- Uncertainty of the consequences - is the inability to anticipate future outcomes of innovation. The results at the output of the system are difficult to see;

- Uncertainty of the specific innovation - depends on two types of uncertainty (Nedosetkin 2002), associated with lack of knowledge and vision for innovation.

Thus, it appears that innovation is not only connected to various risks, but with many uncertainties, which are the result of undervalued and unrecorded risk situations.

So, rightly raises the question of how to estimate the uncertainties of innovation in the spectrum of their multiplicity and heterogeneity?

In the literature are the following uncertainties in the system of innovation (Day 1997):

1. Changes in macro factors;
2. Changes in government regulation;
3. Changes in competitive behavior;
4. Changes in consumer behavior;
5. Technological change.
Common Approaches to the Determination of Uncertainty

In the practice of innovation management, innovation has to constantly deal with the conditions of uncertainty, making decisions that determine the further existence of the chosen direction of development.

The most popular solution to the uncertainty of game theory was based on an antagonistic contradiction, namely, the innovation it is important that the entrepreneur - his work is not an innovator inflicted harm anyone, but rather his work was a kind of driver of growth and development of competition and demand.

Among the most popular management theories uncertainties are the following:

- Maximax criterion
  \[ M = \max_i \max_j \alpha_{ij} \]

Using this criterion is difficult, since it does not account laid adverse changes in the environment associated with innovation.

- Bayes criterion
  \[ BIC = -2\ln(l) + k \ln(n) \]

- Akaike criterion (Akaike 1974)
  \[ AIC = 2K - 2\log(L(\hat{\theta}|y)) \]

- Laplace criterion (Nikulin 1992)
  \[ W = \max_i \sum_{j=1}^{n} W_{ij} \]

- Wald criterion (Wald 1943)
  \[ W = \max_i \min_j r_{ij} \]

Using this criterion is difficult as you may unreasonably rejected the results, which have the potential effectiveness of innovations.

- Criterion Savage (Savage 1972)
  \[ S = \min_i \max_j r_{ij} \]

The calculation results obtained by this criterion are focus on those effects, omission of which the most impact on their missed sensed misunderstand the decision.
MANAGING INNOVATION IN VIEW OF THE UNCERTAINDIES

-Hurwitz criterion (Hurwicz 1951)

\[
W = \max_{i=1,...,n} \left[ \alpha \max_{j=1,...,m} W_{ij} + (1 - \alpha) \min_{j=1,...,m} W_{ij} \right]
\]

This criterion is only a combination of approaches and \(\max\min\) and \(\max\max\).

-Criterion Hodge - Lehmann (Lehmann 1996; Hodges & Lehmann 1956)

\[
\max e_{ir} = \max_i \left\{ n \sum_{j=1}^{n} e_{ij}q_j + (1-n) \min_j e_{ir} \right\}
\]

-Criterion Greymer (Greymer 1971)

\[
\max e_{ir} = \max_i \left[ \max_j \min q_j \right]
\]

- Criterion of BL (MM)

\[
e_{ir} = \max_i \max_j e_{ij}
\]

This criterion is a development criterion of Bayes and Laplace, but in practice its implementation is hampered by the definition of an array of information being processed and the duration of the study.

- Test works

\[
\max e_{ir} = \max_i \prod_j e_{ij}
\]

- Test works (Using this criterion in practice depends on finding a constant value, which in practice, innovation is almost impossible, especially when it comes to analyzing the innovation of the "first tier", i.e. having a radical.)

However, in practice the results of the decision designated games do not give a definitive answer on how to affect innovation in the overall efficiency in the commercial sector. For example, the unanswered questions of interaction with the elements of internal and external environment. In addition to the above approaches of determining the uncertainty shown separately as the theory of fuzzy sets. However, its use in the management of innovation is almost useless, because of its intermediate values. In this case, game theory provides insight into the selection of some of the solutions presented during the calculation of alternatives, i.e., range or the maximum gain or minimum loss.
From a mathematical point of view presented by the formula, no doubt, are the workers, but their use may be hindered by the input parameters, namely, what data may be included in the calculation and how to reliably identify and present and prospective period.

Among other proposals for the management of innovations in the uncertainty at the seminar to support risky research (Elsum 2008) proposed guidelines for the development of institutional and personal factors. Of interest is the management of innovation in the structure of the uncertainty over the classification of the following development factors: the unknown and the unknowable (Chernykh 2008). According to the author, innovation Uncertainty must be configured through the use of criteria of gross errors.

Proposals for the Development of Management Theory Uncertainties for Innovation Management

Thus, innovation is associated with many risks, which in turn smoothly into the region of uncertainty, prediction and evaluation are extremely difficult. Introduction to the consideration of this criterion would eliminate gross errors in a large number of issues associated with fitting a large set of data for analysis. The results of innovative activities may have the following properties:

1. The results of the outliers;
2. The possibility of processing through the existing econometric methods.

We now turn to the formation of an algorithm taking into account the uncertainties in innovation. Initially, the researcher must prepare a specific set of statistics for each of the types of uncertainty. Issues of obtaining them can be individual and be in a sociological survey, expert opinion, or (if you can get) real statistical data.

Since initially we turned to the use of criteria of gross errors, then we can confidently assert that the results of innovative activities are subject to the normal Gaussian distribution due to underestimation of their own set of parameters, which is given by the function:

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} \exp \left( -\frac{(x-m)^2}{2\sigma^2} \right)$$

Where $m$ - is the expectation that specifies the maximum density; $\sigma^2$ - dispersion.

In this case, the distribution function of the results will be as follows:
\[ \frac{1}{2} \left( 1 + \text{erf} \left( \frac{x-m}{\sqrt{2\sigma^2}} \right) \right) \]

Then the mass exponential distribution as \( x \to \infty \) takes the following form:

\[
\frac{1}{2}e^{-\frac{(x-m)^2}{2\sigma^2}} \left( \frac{1}{\sigma^2} \right)^{\frac{(x-m)^2}{2\sigma^2}} \left( \frac{1}{\sigma^2} \right) + \frac{2}{\sqrt{\pi}}\frac{\sigma^2}{x} - \frac{2m}{\sqrt{\pi}}\frac{\sigma^2}{x^2} + \frac{2}{\sqrt{\pi}}\frac{\sigma^2}{x^3} + \frac{1}{2} \left( \frac{(x-m)^2}{\sigma^2} \right) \]

Then the derivative will be the following:

\[ \frac{\partial}{\partial x} \left( \frac{1}{2} \left( 1 + \text{erf} \left( \frac{x-m}{\sqrt{2\sigma^2}} \right) \right) \right) = \frac{e^{-\frac{(m-x)^2}{2\sigma^2}}}{\sqrt{2\pi}\sigma^2} \]

Indefinite integral of the distribution of innovation, taking into account the error function, is as follows:

\[ \int \frac{1}{2} \left( 1 + \text{erf} \left( \frac{x-m}{\sqrt{2\sigma^2}} \right) \right) \, dx = \frac{1}{2} \left( x-m \right) \text{erf} \left( \frac{x-m}{\sqrt{2\sigma^2}} \right) + \frac{1}{\sqrt{\pi\sigma^2}}e^{-\frac{(m-x)^2}{2\sigma^2}} + x \text{const.} \]

The error function of \( x \) should be determined according to the tables of the error estimates given by the locations of errors. Thus, at this stage we have a certain set of values that can be called a "win" or "loss", depending on what subject to study.
2. Since the gross errors in the practice of research is not common (because they increase the variance of the result of the studies on the known parameters defined by interdependence, in our case, however, analyzed the flip side of such data), the most appropriate approach is to use exponential smoothing results using Holt-Winters (Winters 1960), which was slightly refined in order to eliminate all kinds of random factors, the occurrence of which is inevitable in innovation:

\[
\begin{align*}
\Omega_t &= \alpha \frac{Y_t}{S_{t-s}} + (1 - \sigma)(\Omega_{t-1} - T_{t-1}), \\
T_t &= \beta(\Omega_t - \Omega_{t-1}) + (1 - \beta)T_{t-1}, \\
S_t &= \gamma \frac{Y_t}{\Omega_t} + (1 - \gamma)S_{t-s}, \\
\hat{Y}_{t+p} &= (\Omega_t + pT_t)S_{t+s+p},
\end{align*}
\]

where \(\alpha, \beta, \gamma\) - constantly lying in the range \([0, 1]\), which should be selected by trial and error, which would achieve an optimal result, which would satisfy the requirements of the researcher.

Using this model will lead to the following problems:
- The probable exception of seasonal and structural vibrations;
- Identify indicators of \(T\) and \(S\) - values of the smoothed trend and seasonality, denoted by \(\Omega\).

3. Further work with the analysis of the data is reduced to a visual examination of the direction of the trend line in the Cartesian coordinate system, which allows you to select one of the possible forms of models, which can take one of the options: a linear or exponential, logarithmic, etc.

The choice of the model, as well as an overall assessment of its significance and each of its members, is checked by the general rules of econometric analysis.

Following the procedure in the resulting model can be entered values, which in the opinion of the researcher are crucial in the development of innovation, or which he wants to model the system state and defines a set of strategic actions that will address the following key tasks:

1. Get rid of the uncertainty;
2. Select the strategic steps in the development of innovation;
3. Establish a system design and implementation of management decisions to achieve their goals.

**Conclusions**

Thus, based on the analysis of literary sources and methodological approaches, proposed
a system of innovation management in the face of uncertainty. Based on the assumption that the results of a poll, statistics and expert assessment of the property will have a Gaussian distribution, we have derived the distribution of the domain of innovation, on which you can identify each of the necessary types of uncertainty.

To eliminate scatter and smoothing the overall results was proposed methodology Hold–Winter’s, enhanced inclusion of the operator to reduce the effects of the so-called seasonality. The results obtained in the second phase of the study will facilitate further research in the management of innovation through the assessment of the trend of its development, the definition of the model on which it will be evaluated, etc. Thus, presented a holistic approach, allowing us to reduce complex socio-economic and institutional factors to a minimum and build a system of governance in the face of uncertainty, which will be installed.
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Governance change in Facilities Management: An Institutional Perspectives

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Abstract

Governance of a specific field is shaped by not only the instrumental rationality but also the institutional rationality. In this research the instrumental rationality was manifested by the service providers and consultants who played a pivotal role in the construction of a new governance in the field of facilities services in the Netherlands. Further, the role of institutional rationality was investigated wherein it was found that the logic of rationalization shaped the governance in the field of facilities services. Moreover, the implication for the explanation of practice variation by institutional theory is discussed.

Key words: Governance; Institutional Theory; Institutional Entrepreneurship; Rationality
Introduction

This research is an attempt to understand the change in governance at the level of the field of facilities services. The supportive services and processes are called facilities services and the management of these processes and services is known as facilities management (FM). The field level analysis examines the changes in the governance at a wider level instead of a particular firm or an interfirm level. The field includes different organizations such as suppliers of facilities services, service providers, professional associations, consultants, researchers & educators, facilities managers and the clients (organizations) of the service providers or suppliers. At this level, it has been investigated why and how the governance is changing in the field of facilities services in the Netherlands. A new governance form labeled as Integrated Facilities Management (IFM) has emerged during the last 10 year or so. IFM is a governance arrangement in which both the execution and management of the facilities services are outsourced to a single service provider.

There are different definitions of governance. According to Williamson (2000) governance is an effort to craft order, thereby to mitigate conflict and realize mutual gains. Jones et al. (1997) state that organizational governance is about the mechanisms used by firms in coordinating economic activity. Governance has also been defined as the package of practices used to regulate lateral relations that extend organizational boundaries or that of organizational units. In this research, a package of practices like governance, which provides order and meaning to a set of activities, is conceptualized as an institution—practices that are fundamentally interpenetrated and shaped by broader cultural frameworks such as categories, classifications, frames, and other kinds of ordered belief systems (Bourdieu 1977; Mohr 2000; Lounsbury and Ventresca 2003; Lounsbury and Crumley 2007).

Research on organizational governance to a substantial extent focuses on understanding changes in organizational design, particularly on changes between markets, hierarchies, and networks (Thornton et al. 2005). However, institutional logics at wider societal levels shape the governance designs and strategies for organizations (Greenwood and Hinings 1993). The field1 level analysis focuses on these wider institutional logics, particularly on the role of some

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1The term field or field level or organizational field means the domains of organizations that in aggregate constitute a recognized area of institutional life, such as key suppliers, resource and product consumers, regulatory agencies and other organizations producing similar services and products (DiMaggio & Powell, 1983) or a community of organizations that interact frequently and fatefully with each other (Scott, 1995) or institutional logics or broad belief systems (Friedland and Alford, 1991). But more than just a collection of influential organizations, a field is the
institutional entrepreneurs in the process of the social construction and institutionalization of IFM.

A review of extant literature in accounting & control drawing upon ITS reveals that there has been much emphasis on the adoption and diffusion of ‘given’ organizational constructs\(^2\) with little attention being paid to the emergence and development of new constructs. An institutional perspective from ITS focuses on the adoption of ‘new’ institutions at the level of a specific organization or organizational relationship though such characterization of ITS has been criticized as a caricatured version of ITS (e.g; Lounsbury, 2008). Whereas a rational choice perspective emphasizes efficiency considerations and reveals conscious rational decision making at the level of the specific organization or organizational relationship, and ITS perspective emphasizes legitimacy considerations and views the adoption and diffusion as more or less isomorphic. Legitimacy is a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions (Suchman 1995; p.574). Our study, however, does not focus on the diffusion and adoption side of ‘new’ institutions (governance in this case), but on the construction side. It seeks to gain knowledge on how a package of practices in the area of governance is socially constructed at field level. Therefore, the focus of this part of the study is on construction at field level (e.g; O’ Dwyer et al. 2011) rather than on adoption at organizational level and thereby adding to a limited number of ITS based studies in accounting that focused on the field level (Examples inlcude Dillard et al. 2004; Ezzamel et al. 2007; Hopper and Major 2007; O’ Dwyer et al. 2011). Related to the research focus, special consideration will be given to the path creating and path changing individuals or organizations to whom this research refers as the institutional entrepreneurs (e.g; Garud et al. 2007). Instead of treating organizations as a-rational and passive entities (Lounsbury 2008) that have no potential to bring about institutional change (i.e. the creation or construction of new practices or the de-institutionalization of an existing institution of governance), organizations are assumed to inhabit agents with path breaking capabilities. In other words, the aim is to study how and why a ‘new’ governance gains acceptance in the field of FM.

\(^2\) The word ‘organizational construct’ means an organizational form as well as a governance / management control structure.
This research is unique in the sense that it focuses not only on the instrumental rationality (active agency of some powerful actors, in response to the institutional pressures) but also the institutional rationality (the influence of institutional logics, i.e. broader cultural beliefs and rules, that structure cognition and decision making of the actors) (c.f. Lounsbury 2008). By doing this, the research explains the how and why of the governance change in the field of FM in the Netherlands. The field research reveals that some actors transcend the organizational field boundaries and they are connected to other national and transnational fields. These actors bring changes in the governance in the field of FM in the Netherlands. These field-crossing actors are multinational organizations; they include client organizations, service providers, consultants and professional associations. Two of these field-crossing actors (service providers and consultants) got the identity of institutional entrepreneurs because they actively participated in the social construction of IFM in the field of FM in the Netherlands. The local service providers and consultants proved to follow the international ones. The professional associations provided the stage to disseminate the ideas inter alia through conferences and publications. Moreover, the initial adopters of IFM (international client organizations) were drawn upon to narrate their success stories to further reinforce the concept. So, the social construction of IFM can broadly be explained by instrumentally rational behaviour of institutional entrepreneurs i.e. service providers and consultants. But why are the actors behaving in such a way? The thesis seeks to answer this question by drawing on the concept of institutional rationality that emphasizes the role of institutional logics in guiding the cognition and decision making of the people and organizations. Through historical analysis of the academic and professional literature in the field of FM in the Netherlands in combination with interviews, the research reveals that the field of FM has been dominated by the ‘logic of rationalization’ (reduction of costs) that is in turn connected to broader logics of shareholders value (market) and profitability (corporation). This logic influences all the participants in the field of FM including the institutional entrepreneurs. It is analyzed that the ‘logic of rationalization’ has been reinforced over time by the ‘performativity’ of theories of the value chain, lean and mean production, emphasizing the legitimacy of outsourcing. It is suggested that the ‘logic of rationalization’ has further been reinforced by the competition and financial crisis over time.

The research also finds out that different forms of governance may survive and thrive because of their consistency with one dominant institutional logic in the organizational field.
This deviates from prior research (e.g.; Lounsbury and Crumley 2007) which attributes the emergence of new practices to change in institutional logics. This research shows that a new practice can emerge without change in the dominant institutional logics.

The paper is organized as follows. Section 2 discusses the facilities services, FM and developments in the field of FM in the Netherlands. Section 3 explains the research methodology and methods. Then section 5 describes and analyzes the field of IFM. The last section provides conclusions, limitations and suggestions for future research.

**Governance Developments in the Field of Facilities Services in the Netherlands**

**Facilities services.** Facilities services are all those services that support the core operations of any organization. Broadly speaking, services that belong to any discipline or function that are not directly related to the core operations of the organization are all facilities services. In this sense, human resource management or the accounting function are both facilities services. But in this thesis, the latter functions are excluded and the scope of this thesis is limited to a specific field and type of facilities services. The field is facilities management and some examples of facilities services are given in table 1.

**Table 1: The Facilities Services**

| Major type of Service | Description                                                                 |
|-----------------------|------------------------------------------------------------------------------|
| Office Services       | Cleaning, reprographics, reception, parking, planting, data management and office supplies |
| Projects              | Capital works, space management, relocations and change management           |
| Communications        | Multi client service desk, mail, telecom, courriers and signage              |
| Hospitality           | Catering, conference, audiovisual services, flowers and event management    |
| Building and Environment | Fire prevention system, heating ventilation and air-conditioning (HVAC), environment and safety, repairs and maintenance, water management, energy and utilities management |

**Facilities Management (FM)**

There is a debate on the definition of facilities management (FM) and its scope (De Bruijn et al. 2001). Generally speaking, FM includes managing and controlling some activities that support the primary processes of an organization. A comprehensive definition describes FM “as an integrated approach to operating, maintaining, improving and adapting the buildings and infrastructure of an organization in order to create an environment that strongly supports the primary objectives of that organization” (De Bruijn et al. 2001).
The European Committee for Standardization (CEN) gives a European (presuming Dutch also) definition of FM. According to CEN, FM “is the integration of processes within an organization to maintain and develop the agreed services which support and improve the effectiveness of its primary activities” (EN15221-1:2006 Facility Management-Part 1: Terms and definitions).

In a broad sense, FM is an integrated management approach that perceives its role as being a significant determinant of corporate goal alignment. It provides competitive advantage by a philosophy of focus on core and restructuring. The desired outcome is the saving of senior management time and improvement in effectiveness (Pathirage et al. 2008).

FM is a relatively a new profession (Gilleard et al. 1994; Tay and Ooi 2001) and it has achieved a foothold as a discipline since 1980s (Ventovuori et al. 2007). The idea of FM as a better way of dealing with facilities and services originated in the USA in the beginning of 1980s and then came to the Netherlands (and the rest of Europe) in the mid-1980s (Brat 1996; Wagenberg 1997). It does not mean that FM did not exist before 1980s. But in the 1980s the idea became popular as a new and better way of dealing with facilities services.

Facilities Management (FM) Market Size in the Netherlands

A professional association in the Netherlands called Facility Management Nederland (FMN) and a consultant firm jointly publish the statistics of the market of FM in the Netherlands biennially. According to such a market report of 2010, the FM market in the Netherlands was worth €33.6 billion in 2009 but the market has declined as compared to 2007 (€35.5 billion) and apparently, as per said report, the financial crisis had an impact on the market. However, the outsourcing percentage and index have grown over the last decade. Table 2 shows an overview of the FM market in the Netherlands from 2000 till 2009:

| Total Market Share               | 2009  | 2007  | 2005  | 2003  | 2000  |
|----------------------------------|-------|-------|-------|-------|-------|
| Market share (x €1,000,000)      | €33,623 | €35,489 | €33,372 | €34,625 | €34,074 |
| Market share outsourced (x €1,000,000) | €21,018 | €21,546 | €19,726 | €20,140 | €19,408 |
| Outsourcing percentage           | 63%   | 61%   | 59%   | 58%   | 57%   |
| Number of employees outsourced   | 314,684 | 300,796 | 287,085 | 303,653 | 313,878 |
| Number of suppliers              | 25,666 | 24,176 | 23,164 | 22,506 | 22,452 |
| Market growth index total market share | 99   | 104   | 98   | 102  | 100  |
| Market growth index outsourced market | 108 | 111   | 102  | 104  | 100  |
Developments in the governance of FM. The history of FM in the Netherlands is very old, but the focus of this research is specifically on the changes and developments surrounding the emergence and development of integrated facility management (IFM) as a concept. IFM seems to have emerged in the field of FM in the Netherlands during the last 10 years or so. The developments could be studied in different ways. In this study, the focus is on the developments related to different ways of organizing and controlling facilities services. To be more precise, the focus is on developments in the governance of facilities services. The term governance was discussed in detail in introduction. For the purpose of elaborating the presence of different forms of governance and control in the field of FM in the Netherlands, we draw upon Vosselman(2002). He (ibid) discusses different management control archetypes available to a Dutch organization. For the purpose of our investigation we summarize the options for executing and controlling FM as follows:

1. Some facilities services are executed and controlled by a centralized department and many facilities services are executed and controlled locally by several business units. (It is in-house-FM without tight centralized control of FM. Without tight control means the planning and control of FM is not the responsibility of one department).

2. All facilities services are executed and controlled in a central staff unit that may take the form of a cost center (an expense center). Some of the services may be outsourced by the department. This staff department is called a facility management organization. Management of such a department has the responsibility to plan and control the space and other facilities services. This is similar to a tight fit FM organization in which there is one central department close to the board of directors and the main objective is to cut facility costs by standardizing (Becker 1990).

3. Shared service centers in different forms (internal to the organization or external to the organization)

4. Facilities services organized and managed by each business unit separately (either in-house or outsourced) and there is no central department. This may also be called a loose fit FM organization (Becker 1990). The above classification (1 to 4) misses the emergence of a latest form of governance which is IFM. During the last 1 ½ decades there has been a development towards the institution of IFM.
IFM market trends during the last decade. Regarding IFM the statistics are shown by the following table 3, extracted from the Netherlands FM Market Report 2010.

**Table 3. IFM Market Statistics 2000-2009**

| Integrated Facility Management | 2009 | 2007 | 2005 | 2003 | 2000 |
|-------------------------------|------|------|------|------|------|
| Market share (x €1,000,000)   | €4,382 | €4,629 | €4,353 | €4,516 | €4,444 |
| Market shared outsourced (x €1,000,000) | €104 | €51 | €35 | €26 | €17 |
| Outsourcing percentage        | 2.4% | 1.1% | 0.7% | 0.5% | 0.3% |
| Number of employees outsourced | 1,484 | 1,000 | 700 | 420 | 290 |
| Number of suppliers           | 16 | 20 | 15 | 11 | 6 |
| Share of top three suppliers  | 62% | 67% | 48% | 73% | 65% |
| Market growth index total market share | 99 | 104 | 98 | 102 | 100 |
| Market growth index outsourcing market | 614 | 302 | 206 | 153 | 100 |

Source: De Nederlandse Facility Management Markt 2010
(Note: market share is based on estimated management fee of facilities. In the calculation of outsourcing market the amount charged by the integrated facility management providers includes only the fees for management. The income from the operational facilities services is not included in the (outsourced) market share.)

The market share of IFM has declined by 5% in 2009 when compared with 2007. This appears to be due to the financial crises. However, there is an enormous growth in the outsourcing percentage and index. Overall the outsourcing index is six times higher in 2009 as compared to 2000. De Nederlandse Facility Management Markt Report 2010 describes that the development towards a demand facility organization has been one of the five major trends since 2007 (Gijsbers et al. 2010, p.102). The demand facility organization (a part of the outsourcing organization) is connected to an organization format in which most operational tasks are performed and managed by external providers and only a few tasks are managed internally (Gijsbers et al. 2010). The next step could be the outsourcing of all operational tasks and may be even more tactical tasks to a single facility service provider, which is called IFM. According to the report, 65% of the facility managers indicate that they view the demand facility organization as an intermediary step towards IFM (Gijsbers and Van der Kluit 2008; Gijsbers et al. 2010). The tactical tasks could include the management of the services provided by the suppliers of facilities services. These survey results indicate that most organizations and facility managers are still at the stage of a demand facility organization and IFM is yet to develop in the future. In this regard, the service providers are more optimistic than facility managers About 76% (78% in 2008) of the service providers expect that facility managers will have more IFM while only 42% (50% in 2008) of the facility managers think so (Gijsbers et al. 2010). The report also reveals that 61% of the facility managers have to reduce cost in 2010 with an average cost reduction target of 10.5%, and 77% of the facility managers select facility service providers based on price. It appears that
most of the decisions regarding the service providers are driven by cost reduction pressures. If IFM can help in getting cost reductions then this IFM might be growing fast in the next 3 years. Moreover, 74% of the facility managers indicate that in three years they will be organized as a demand facility organization. So, the service providers have an opportunity to convince the facility managers and win the contracts of IFM if they could save costs and could create trusting examples before facility managers.

Some big organizations have already adopted IFM. The biggest companies having an IFM contract in 2009 and the beginning of 2010 were KPN, Centocour, Vopak and Dutch Railways (NederlandseSpoorwegen NS) and the biggest service providers of IFM in 2010 were ArcadisAqumen, SodexoAltyss and ISS facility services.

The following figure\(^3\) shows the IFM at different stages in different countries and the number of Dutch organizations that have already adopted IFM. The picture also gives an overview of the suppliers in Europe.

**Figure 1. IFM in the Netherlands and in the Europe**

### Research Methodology and Methods

\(^3\) Presentation at EuroFM 21-01-2010 by a consultant
A methodology refers to the choices we make regarding cases to study, methods of data gathering, forms of data analysis, etc., in planning and executing a research study (Silverman 2005; p.99). A method is a specific research technique (such as interviews). The research methodology is the general approach to studying research topics. Methodologies could be broadly classified as qualitative or quantitative. A distinctive feature of qualitative methodology is its assumption about social reality that is assumed to be “emergent, subjectively created and objectified through human interaction” (Chua 1986, p.615; Ahrens and Chapman 2006). This is different from positivistic research that makes the ontological assumption that “empirical reality is objective and external to the subject” (Chua 1986; p.611). Qualitative methodology stresses the understanding of the social world through an examination of the interpretation of that world by its participants (Bryman 2008).

The methodology adopted in this study is qualitative and the study is based on field research. This field research has the following characteristics (Ferreira and Merchant 1992; p.4):

1. Direct, in-depth contact with organizational participants, particularly in interviews. These contacts provide a primary source of research data.
2. The study focuses on real tasks or processes, not on a situation artificially created by the researcher.
3. The research design is not totally structured. It evolves along with the field observations.
4. The presentations of data include relatively rich (detailed) descriptions of company contexts and practices.
5. The resulting publication is meant for the academic community but some of the field research literature is also easily read and used by practitioners.

In other words this study collects data in the domain ‘field’ and employs ‘qualitative’ methodology” (Ahrens and Chapman 2006; p.821).

The reasons for the research design. The field research methodology was chosen for a number of reasons. Firstly, in a general sense in the scientific discipline of accounting and control there have been calls for more empirical studies that adopt a qualitative research methodology (c.f. Ahrens and Chapman, 2006). Governance happens in the field (Chapman 2007) and it calls for joining the fascinating organizational world (Cooper 2004). Secondly, the ‘why’ and ‘how’ nature of the research questions (Yin 2003) and the focus on the processes in the real life context made qualitative field research an appropriate research methodology (Silverman
2005). Thirdly, the adoption of qualitative field research was important because of its emphasis on the description and understanding of processes, in particular the meanings individuals give to processes in the real life organizational settings (Gephart 2004; Cooper and Morgan 2008).

The aim is to contribute to theory by positioning data against the theories through an ongoing reflection on data (Ahrens and Chapman 2006) while at the same time retaining the context specific information (authenticity) in drawing plausible conclusions (Lukka and Modell 2010). Theory is both an input for understanding practice, and an outcome. The researcher is part of the process of knowledge production and uses existing knowledge as well as field data to draw plausible conclusions. To a researcher the task is not simply to describe something as given but to analyze it in a specific context. Thus, the field study is not simply empirical but a profoundly theoretical activity which is shaped by the theoretical interests of the researcher (Ahrens and Chapman 2006). The data was collected through semi-structured interviews, academic research in FM and other field documents. Interview questions were developed from both the extant theoretical knowledge.

**Data collection.** For the purpose of getting access to potential interviewees the association manager of a professional association in the field of FM, called Facility Management Nederland (FMN), was contacted in October 2009. In order to introduce the research aims, the research process and potential interviewees a meeting was planned with her at the annual general meeting of FMN. A written description of the research (see appendix A) was also sent. This description outlined the aims of the research, the research topics and the questions for interviews. The plan was to arrange interviews with account managers of major service providers, FM managers of the client organizations of each of the service providers, consultants in the field of facilities management and representatives of professional associations in the field of FM in the Netherlands. The association manager of FMN sent the research description to the potential interviewees. But interviewees also had to be contacted through individual emails, arranging interviews with them. The sample letter (email) is shown in the appendix B. All the interviews were recorded on an MP3 player and were subsequently fully transcribed. A commitment to confidentiality was conveyed in the research description document, the emails and during the interview. In total 14 interviews were conducted. The interviewees were managers at 3 different service providers, 3 consultants, 6 facilities managers in different big organizations, 1
representative of FMN and 1 academic. The following table (4) summarizes the interview data collection:

**Table 4: Interviews with different actors in the field of facilities services**

| #  | Date       | Interviewee codes | Position                        | Duration (minutes) |
|----|------------|-------------------|---------------------------------|--------------------|
| 1  | February 2010 | LL                | Consultant                      | 103 (not recorded) |
| 2  | February 2010 | JB                | Facility manager                | 97                 |
| 3  | February 2010 | DvW               | Academic                        | 90                 |
| 4  | February 2010 | RL                | Consultant                      | 88                 |
| 5  | February 2010 | RV                | Service Provider                | 59                 |
| 6  | February 2010 | PK                | FMN                            | 47                 |
| 7  | February 2010 | JF & MvL          | Facility manager/Client Organization | 68               |
| 8  | March 2010   | GM                | Consultant                      | 75                 |
| 9  | March 2010   | DK                | Service Provider                | 83                 |
| 10 | April 2010   | LvL               | Facility manager / Client Organization | 81               |
| 11 | April 2010   | IL                | Facility manager                | 89                 |
| 12 | April 2010   | VvH               | Facility manager / Client Organization | 84               |
| 13 | April 2010   | DvV               | Facility manager / Client Organization | 72               |
| 14 | April 2010   | UG                | Service Provider                | 81                 |

Documents in different forms were the second source of data collected. In case of the field level research, the documents included the FM market reports in the Netherlands for the year 2006, 2008 & 2010, IFM Market report 2009, and academic literature in FM relating to the Netherlands, etcetera. (See appendix C for the complete listing of field documents). Furthermore the websites of different organizations, (professional associations, consultants and service providers) such as Facility Management Nederland (FMN), European Facility Management Network (EuroFM), the International Facility Management Association (IFMA), Facility Management Excellence and Experience (F-MEX) and TwynstraGudde, were browsed and data was used for the description and analysis.

**Data analysis.** The author of this paper transcribed all the interviews. Self-transcription was very useful in creating intimacy with the data and doing the analysis. The transcription of interviews was followed by a coding process which enables the recognizing of important issues in the transcript prior to the process of interpretation (Fereday and Muir-Cochrane 2006).
There were both deductive codes (derived from the theoretical frameworks) and inductive codes (themes emerging from the participant’s discussions) (Fereday and Muir-Cochrane 2006). The list of codes can be seen in appendix D.

The transcripts were coded and analysed by using the qualitative data analysis software ATLAS.ti. By coding all the material, the software allowed us to manage and organize data that helped in the understanding and analysis of the data. The analysis of the transcribed interviews was done in three sub-processes, that is, data reduction, data display and conclusion drawing/verification (Miles and Huberman 1994; O'Dwyer 2004). The careful reading and subsequent coding of all the transcripts gave way to the identification of key themes related to the issues of governance at both interfirm and field level. Then code-wise prints of all the transcripts were taken and read more than two times. During the careful reading themes, comments and memos were identified and written by hand on the printed codes and quotations. Then, an extensive comparison of themes across interviewees was done (Miles and Huberman 1994).

The field documents were not coded because of time constraints. Nevertheless, all the relevant documents were read (and themes/ideas were written manually) in order to identify contradictions or inconsistencies (or confirmation) with the interview themes. An effort was made to triangulate the documents and interview transcripts. The documents were also helpful in making tables, diagrams and extracting contextual information. After the reading of transcripts and emergence of different themes, a thick description of the findings was prepared. This process of thick written description involved an in-depth analysis characterised by an iterative back-and-forth movement between data and theory. Most important was to understand what the data meant in a theoretical sense. The credibility of research was enhanced through the use of quotes so that interviewees’ voices are heard (O'Dwyer 2004).

The interviews were conducted in only one round. Nevertheless, the historical analysis of field documents and academic research in FM, pertaining to the last two decades, particularly relating to the Netherlands, helped in understanding the development of governance in the field. The theoretical findings are the results of repeated drafting and analysis and continual referrals to theory and data. Frequent discussions of the results with co-researchers were also an important part of the analysis. Such meetings were formal as well as informal. These informal meetings, lengthy argumentations and reviews among research colleagues developed an intersubjective
consensus (Miles and Huberman 1994) and were important elements that resulted in refinements of the results of this study.

**Governance and Institutional Theory in Sociology (ITS)**

There is not one institutional theory. There are several branches. Extant research in accounting and control change has drawn upon different branches. Two important branches are New Institutional Economics (NIE) and Institutional Theory in Sociology (ITS). There are two distinct branches of institutional theory that offer different explanations for observed control structures. Institutional economics, particularly TCE (Coase 1937; Williamson 1979; Williamson 1985; Williamson 2002) offers explanations in terms of efficiency, which means that actors (organizations) are driven by efficiency maximizing behavior. Adoption of a new organizational construct takes place because the organizations want to attain efficiency. ITS, though not exclusively, offers explanations in terms of legitimacy.

**NIE.** Efficiency as a concept is paramount in NIE, particularly in transaction costs economics (TCE). Origins of TCE stem from Coase’s (1937) work on the determinants of the boundaries of the firm and prominent work has been done by Williamson (1979; 1985; 1996; 2000). This theory concerns the governance of transactions; it is oriented towards the governance structure as an institutional framework. TCE aims to answer the question why some transactions take place in firms and others in a market or in a hybrid arrangement. TCE responds to the assumption of zero transaction costs in neoclassical economic models (Hira and Hira 2000). It assumes that markets are efficient governance structures at the outset (Williamson 1975) and the existence of alternative governance arrangements is explained by transaction costs of markets as governance structures (Vosselman and Van der Meer-Kooistra 2006). Critical features of efficient governance include three dimensions of transactions and two behavioral assumptions. The dimensions of transactions are uncertainty, asset specificity and the frequency of transactions. These dimensions influence the transaction costs and, thus, the rationality of the governance structure. The behavioral assumptions are bounded rationality and opportunism. Bounded rationality is less than perfect rationality, as people experience limitations in their knowledge and their information processing capabilities, leading to the impossibility of making optimal decisions (cf. Simon 1978; Simon 1987; Chaserant 2003). The bounded rational actors may

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4 Here ITS includes both New Institutional Sociology and Old Institutional Sociology. As suggested by institutional scholars, (e.g; Hirsch & Lounsbury 1997) the dichotomy between the old and the new institutional theory is false and misleading one. The new institutional theory is more structure-oriented while old institutional theory is action-oriented. The reconciliation of the two theoretical currents provides a more balanced approach to action-structure duality (Hirsch & Lounsbury, 1997).
behave opportunistically: given the opportunity they are occasionally inclined to serve their own interests by using forms of trickery and deceit. In sum, the transaction costs of market transactions are not only caused by bounded rationality related to uncertainty, but also by potential opportunistic behavior of bounded rational actors. The degree of opportunism is related to asset specificity: the more asset specificity, the higher the risk of opportunistic behavior. High asset specificity (many transaction specific assets) weakens exit threats and increases interdependence. An individual party may take advantage of the relationship and transfer transaction cost to the other party (Vosselman and Van der Meer-Kooistra 2006). So, as per TCE, it is the nature of transactions and the associated transaction costs that are of prime importance. TCE takes transactions as the primary unit of analysis and argues that transactions would be governed and controlled in a firm or a market or a hybrid between a firm and a market, the choice is depending on the minimization of the sum of production costs and transaction costs. Transaction costs include costs of writing contracts, supervision costs, opportunity costs associated with opportunistic behavior and costs of investment in specific assets (Van der Steen 2006). In other words, from a TCE-perspective, efficiency (reduction of costs) is the driving force behind a change in governance. It assumes that decision makers in organizations consciously opt for a comparatively efficient form. The decision maker shows efficiency-seeking behavior (Vosselman and Van der Meer-Kooistra 2006). Although it is good to have the possibility of efficiency-seeking behavior in changing governance and management control in mind, TCE is not considered an appropriate theoretical lens for this research project because it underemphasizes the process of change (Mahnke 2001). It does not focus on the processes through which governance structures and management control structures develop, but its focus is on why observed governance structures exist (Vosselman and Van der Meer-Kooistra 2006). In other words, TCE would consider governance forms as already available the field level without shedding any light where those governance forms come from. TCE provides intentional explanations for such structures (Vromen 1995). Thus, TCE may not provide an adequate apparatus for understanding the processes of governance and control change. Moreover, the focus of this research project is also on developments at the level of the field of FM. As TCE’s unit of analysis is the transaction(s), its potential contribution would be restricted to the governance and control of the transactional relationship.
ITS. ITS premises that institutions and processes of institutionalization may exist at different levels namely a society, a state, an organizational field, a community, an organization, a group or an individual (Scott 2008; Suddaby and Greenwood 2009). The institutions are located in carriers such as cultures, social structures and routines (Scott 1995). Cultures are interpretive structures, patterns of meaning and rule systems; social structures are expectations attached to social networks, formal positions, and role systems; and routines are the habitualized behaviors, competencies and technologies stored in organizational memories (Scott 1995; Thornton 2002). Institutions are both supra-organizational patterns of activity through which humans conduct their material life in time and space, and symbolic systems through which they categorize that activity and infuse it with a meaning (Friedland and Alford 1991). In our research at the level of the field of FM in the Netherlands, governance is conceptualized as an institution because the deployment of governance entails material social relations or practices as well as communication of meanings. The change in the institution of governance, particularly the emergence and development of IFM in the field of facilities services, is the focus of this research. Each institution is governed by logics, which are a set of material practices and symbolic constructions (Friedland & Alford, 1991). The meanings and practices are co-constitutive of each other (Mohr 2000). The logic constitutes the organizing principles of an institution and is available to organizations and individuals to elaborate (Friedland and Alford 1991). Institutional logics are contradictory and may change over time. Thus a change in institutional logics entails a change in an institution i.e. both new social relationships and new symbolic orders / interpretations of reality. Institutional contradictions may serve as the bases for the most important political conflicts and institutional change. Individuals and organizations may politicize institutional contradictions and transform institutions. Actors who transform institutions are institutional entrepreneurs. This thesis is an attempt to understand and interpret the change of governance as an institution. It tries to inscribe processes of institutionalization (that are essentially processes of social construction) at the level of the FM-field.

ITS advances the argument that formal organizational structure reflects more than simple technological imperatives (Lawrence and Lorsch 1967; Thompson 1967) and resources dependencies (Pfeffer 1972; Pfeffer and Salancik 1978). This ‘more’ consists of institutional forces or rationalized myths (Scott 2008). As cited in Meyer & Rowan (1977, p.341) institutionalized rules are classifications built into society as reciprocated typifications or
interpretations (Berger and Luckman 1967) and such rules may be simply taken for granted or may be supported by the public opinion or the force of law (Starbuck 1976). Thus, institutions are ‘rules, norms and beliefs that describe reality for the organization, explaining what is and is not, what can be acted upon and what cannot’ (Hoffman 1999; p.351). ITS suggests that the organizations incorporate institutional rules in order to conform to societal or institutional requirements (external environment) and, thus, gaining legitimacy, resources, stability and enhanced survival prospects (Meyer and Rowan 1977). Legitimacy is ‘a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs, and definitions’ (Suchman 1995; p.574). The legitimacy brings support and acceptability in society. Since many organizations in a specific field or sector try to become legitimate, this results in isomorphism that is the similarity (of any type) in several organizations. Isomorphism may be due to coercive (dependency, legislative requirements or cultural expectations in society), mimetic (copying the successful companies in uncertainty) or normative (pressures from professionalism) mechanisms (DiMaggio and Powell 1983; Powell and DiMaggio 1991). These three types of isomorphism are associated with three pillars of ITS that may constrain behavior, namely, regulative, normative and cognitive pillars. The regulative pillar influences action through coercion and threat of formal sanction, the normative pillar directs action through norms of acceptability, morality and ethics and the cognitive pillar guides action through the different categories and frames by which actors know and interpret their world (Scott 1995). However, more than one isomorphic pressure may be operating simultaneously. The degree of institutional pressures may change over time as a result of constantly changing endogenous and exogenous factors (Carpenter and Feroz 2001).

**Developments in ITS**

**Bridging institutional economics and institutional sociology.** Critics have stated that TCE provides for an under-socialized account (it gives too little emphasis to social relations or embeddedness) whereas ITS provides for an over-socialized perspective (it pays too much attention to social relations or embeddedness) (Granovetter 1985). They argue that the models that combine both institutional perspectives might have the potential to provide more balanced explanations. Some scholars suggest that there is a tendency of early adoptions of organizational constructs to be driven by efficiency rather than legitimacy considerations (DiMaggio and Powell 1983; Tolbert and Zucker 1983). Such an institutional embeddedness of efficiency-
seeking behavior is also paramount in a framework designed by (Roberts and Greenwood 1997). They (ibid) incorporate both efficiency and legitimacy aspects in the development of a Constraint Efficiency Framework for organizational design adoption. They (ibid) have connected elements from TCE and ITS and argue that organizations are efficiency seeking under cognitive and institutional constraints, as opposed to efficiency optimizing. Efficiency-seeking behavior is thus institutionally embedded. At least to some extent, organizations are embedded in both relational and institutionalized contexts and have to manage the demands of internal and boundary spanning relations as well as ceremonial demands of highly institutionalized environments (Meyer and Rowan 1977).

Previous studies of management control change emphasize legitimacy along with traditional economic factors as the drivers of change (For instance Covaleski and Dirsmith 1988; Abernethy and Chua 1996; Granlund and Lukka 1998; Granlund 2001; Modell 2001) and relate the diffusion of control innovations to different reasons including efficiency and legitimacy (mimetic isomorphism), or a mix of these factors over a period of time (Malmi 1999). The institutional and market forces may not be dichotomous but rather complementary (Tsamenyi et al. 2006).

Latest accounting research (drawing upon ITS) indicates that both efficiency and legitimacy considerations might operate and that they need not be mutually exclusive (Hopper and Major 2007). In other words, legitimacy and efficiency may be intertwined (Hopper and Major 2007). Moreover, the social and institutional may create or construct the economic and actors may draw on efficiency considerations as a means for attaining social legitimacy (Hopper and Major 2007).

ITS scholars also suggest that a decision guided by legitimacy considerations is not irrational (or the mimicry is not without any logic) and isomorphism does not necessarily mean a-rational mimesis (Lounsbury 2008). It is based on institutional rationality (i.e. rationalized myths which refer to broader cultural beliefs and rules that structure cognition and guide decision making in the field (Meyer and Rowan 1977; Lounsbury 2008)), as opposed to individual rationality as it is proclaimed in economics. The dichotomy between efficiency and legitimacy, or between the technical and the institutional, has also been criticized by contemporary institutional scholars. For instance, Lounsbury (2008) argues that the technical considerations (efficiency considerations) are institutionally embedded. The two-stage diffusion model, which
saying that early adopters are interested in efficiency and later adopters in legitimacy, has also been challenged (ibid). Some scholars argue that efficiency is a social construct and what is perceived to be efficient might also be a product of socially constructed categories and institutionalized assumptions about the world (Dobbin 1994; Suddaby and Greenwood 2009).

**The progression of institutional theory.** An analysis of the literature reveals that there has been much emphasis on *adoption* and *diffusion* of organizational constructs\(^5\) rather than on the *construction* of new institutional arrangements. This tendency makes an ITS–perspective similar to a rational choice perspective (See also Quattrone and Hopper 2001) because both show the response of an organization or an actor to something that is already available at an organization field level. Viewing in this way, in the rational choice perspective the modes or institutions of governance are just ‘given’ as ontologies that exist ‘out there’. From an ITS perspective the governance institutions are also considered to be ‘out there’, albeit socially constructed. Extant accounting and control research drawing upon ITS paid much attention to an understanding of the conformity individual organizations show in adopting new governance institutions, with hardly any attention for the path creating and path changing individuals or organizations to whom we refer as institutional entrepreneurs (See a special issue on institutional entrepreneurship reviewed by Garud et al. 2007). We suggest that both sides of the coin (adoption and construction) have to be taken into account. Therefore, there is a need for a more comprehensive model on the institutionalization of governance. There is need for emphasis on the study of non-isomorphic change preceding the usual adoption or adaptation and diffusion i.e. the isomorphic change at field level.

To a large extent the development of a new governance institution takes place through the interplay between the level of the (inter)firm relationship and the level of the organizational field, where networks of organizations and professionals emerge and develop. Therefore, a multi-level focus is required, that is, both the (inter)firm level and the field level. This is an important extension of extant institutional frameworks that focus on the level of the individual organization, without much explicit attention to the field of organizations to which an individual organization belongs (Exceptions include Dillard et al. 2004; Hopper and Major 2007). However, an important additional extension concerning the significance of agency and institutional entrepreneurship is required.

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\(^5\)The word ‘organizational construct’ means an organizational form as well as a governance / management control structure.
Institutional entrepreneurs are skilled actors who use existing cultural and linguistic materials to narrate and theorize change so that other social groups in the field agree to cooperate in the change process (Greenwood et al. 2002; Maguire et al. 2004) and try to connect the new practices to stakeholders’ routines and values (Maguire et al. 2004). By exploring the concept of institutional entrepreneurship we extend the analysis from the adoption of ‘new’ governance institutions by individual organizations (and, from a field level perspective, the related diffusion across organizations) towards the construction of new governance institutions.

**Incorporating the concept of institutional entrepreneurship on governance / control change.** Established institutions are stable and persistent. They create path dependencies. However, institutions do change with the passage of time. The institutions change as a result of functional, political or social pressures (Dacin et al. 2002). The concept of institutional entrepreneurship is helpful in exploring how actors shape emerging institutions and transform existing ones despite the complexities and path dependencies that are involved (Garud et al. 2007). These institutional entrepreneurs can be individuals or organizations. Institutional entrepreneurs are the actors who have an interest in a particular institutional arrangement; they leverage resources to create new institutions or to transform existing ones (Maguire et al. 2004). Institutional entrepreneurs break with existing rules and practices associated with the dominant institutional logics and institutionalize alternative rules, practices or logics in which they are interested (Garud and Karnoe 2001; Battilana 2006). The alternative rule, practice or logic (in our case, the alternative governance) becomes institutionalized when it is shared and taken for granted across a wider field and the deviation from it is sanctioned or requires appropriate justification. Institutional entrepreneurs may explore legitimacy and they may create institutions which are appropriate for them and which foster their interests. These agents, having resources, bring institutional change and they change the character of the institutions (Dacin et al. 2002). They are powerful actors who shape the change in a process that may be highly political. Sometimes, even less powerful actors may shape the institutional change, especially in emerging fields. This is, for instance, demonstrated by a study into HIV/AIDS treatment advocacy in Canada (Maguire et al. 2004). The concept of ‘institutional entrepreneurship’ provides a ground for understanding how certain new organizational governance forms emerge and become established over time. It reintroduces the concepts of agency, interests and power into the institutional analysis of organizations (Garud et al. 2007). Institutions are not only constraints,
but also a platform for entrepreneurial activities. Change is embedded in institutions, but is also the result of human and/or organizational agency.

**Instrumental rationality and institutional rationality.**

This sub-section discusses the two different concepts of rationality i.e. instrumental rationality and institutional rationality (cf. Lounsbury, 2008). The organizations can strategically act in their own interests and react to institutional pressures in different forms such as defiance, manipulation, compromise, etc. (Oliver, 1991). Lounsbury (2008) labels this kind of rationality as instrumental rationality. The above section explains the instrumental rationality of how a new governance form can emerge and develop in a specific field. Instrumental rationality emphasizes the autonomy of individuals to take decisions in ways that strategically serve their material interests (Lounsbury 2008) and assumes an institution-free conception of interest and power in which actors have objective interests independent of their understandings (Friedland and Alford 1991). But there is more to this in order to understand the construction which is the influence of existing institutions or institutional rationality. The instrumental rationality does not allow a deeper understanding of why a field changes. In order to understand why the governance changes in the field, we need to look at the institutional rationality that guides the cognition and decisions of field participants or actors. Institutional rationality is a collective rationality that guides individual behavior and is beyond the discretion of an individual or an organization. It emphasizes the role of broader structures of meaning without being deterministic (Lounsbury 2008). It brings attention to the institutional logics that prevail in the field and how these logics are connected to the broader societal logics and orders. Institutional logics are, “the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality” (Thornton and Ocasio 1999; p.804). Institutional logics define the content and meaning of institutions. A focus on institutional rationality calls for an approach that focuses on the effects of differentiated institutional logics (instead of isomorphism) on individuals and organizations in a larger variety of contexts, including markets, industries, and populations of organizational forms (Thornton and Ocasio 2008). Institutional logics shape rational, mindful behavior, and at the same time individual and organizational actors shape and change the institutional logics (Thornton 2004). Thus, the institutional logics provide a link between institutions and action, that is, situated forms of organizing (actions taken at local
level) are linked with beliefs and practices in wider institutional environments (Thornton and Ocasio 2008). Each institution has a central logic which is a set of material practices and symbolic constructions. The logic constitutes the organizing principles of an institution and is available to organizations and individuals to elaborate (Friedland and Alford 1991). The institutional logics are contradictory and may change over time. The core meta-institutions of western society are the capitalist market, the bureaucratic state, family, democracy and religion, and each of these institutions has a central logic (Friedland and Alford 1991). The typology of the core meta-institutions is further developed by Thornton (2004), who states that the western societies are composed of six societal sectors- the market, the corporation, the professions, the family, the religions, and the state (Thornton et al. 2005). Because the institutional logics of the aforementioned meta-institutions are inherently contradictory, such institutional contradictions may serve as the bases for the most important political conflicts and for institutional change. Individuals, groups and organizations may exploit these institutional contradictions to transform institutions. The institutional logics approach emphasizes that individual and organizational behavior can be understood when such a behavior is located in a social and institutional context that both regularizes behavior and provides opportunity for agency and change (Thornton and Ocasio 2008).

**IFM Field Description and Analysis**

This section will explore and analyze the field data by drawing upon both concepts of rationality.

*How is the field changing?—Instrumental Rationality.*

*Depicting the field.* As the aim of this research is to gain a richer understanding of the process of social construction of IFM in the field of facilities services in the Netherlands, it is necessary to describe what precisely the field is. A field is not formed around common technologies or common industries, but around issues that bring together various field constituents with disparate purposes (Hoffman, 1999, p.352). Therefore, in this research the organizational field comprises all the organizations that are in some way or another connected to IFM (a governance form). Figure 2 below depicts the field as it is the focus of this research. We will discuss IFM and all the field participants one by one along with their role in the social construction of IFM.
The following sub-section goes deeper to find out why the field has changed in such a way and what the influence of the institutional logics regarding IFM is.

**Why is the field changing?—Institutional Rationality**

In order to understand why the governance has been changing in such a way, we need to look at the institutional rationality that has influenced the cognition and decisions of the field participants or actors. For this purpose we did a historical review of the developments in FM field in general and FM governance in particular.

In order to study the institutional change in governance (in this case the emergence of IFM), we studied the history (academic articles, field documents and reports) of the last two decades. The research articles (from 1995 till 2010) in the academic field of FM and field documents were important in reflecting on the historical development in the field of FM in the Netherlands. The historical analysis helped in identifying the institutional logics prevailing in the field of FM. The research was further supported by interviews with different actors in the field. The focus was on the institutional entrepreneurs and the change in both form and thought (rationalized meanings and myths) of governance over time. Besides, it was examined how different forms of governance (FM staff department, SSC or IFM) relate to the dominant logics in the field of FM and how the wider societal level institutional logics influence the FM field logics and the organizational governance decisions.

This research revealed that there are two prominent logics in the field of FM namely, the logic of rationalization (cost reduction) and the logic of professionalism. The logic of rationalization has been dominant in the field. This logic is connected to wider societal logics of market and corporations. This logic has influenced the governance decisions in the field of FM
since the arrival of the concept of FM in the 1980s and during the period under investigation. For the purpose of identifying the logics of the field we used various documents from the field of FM, particularly the academic research in the Dutch field of FM. Studying the historical developments, different forms of governance were found. The following table (6) gives the history of developments in the Dutch field of FM and the emergence of different forms of governance:

Table 6. An overview of historical developments and related governance forms

| Time period | Developments / Events | Forms of governance |
|-------------|-----------------------|---------------------|
| Pre-1980s   | Real estate and facilities management departments were founded because of expansion in the business activities (mass-production & growth) in the first few decades of the twentieth century (Krumm 2001). Continuous growth, internationalization and transformation of traditional functional structures into structures based on geographical distinctions (Krumm 2001). | Centralized control of activities (Krumm 2001). Consistent with structural changes there were corporate (central) as well as local branches. Such a separation also resulted in a division between ‘operational’ and ‘strategic’ activities’ (Krumm 2001). |
| 1980s-1990s | The recession in 1970s contributed to the breakthrough of FM because it forced companies to manage costs more precisely (Barnhoorn 1995). Management had lost control by pushing down services (Barnhoorn 1995). In the beginning of the 1970s, rising competition and the increasing cost of doing business forced corporations to rethink their existing structures and strategies (Krumm 2001). Theories of value chain and distinction between primary and support functions (Porter 1985) and concept of core competence (Hamel and Prahalad 1994), have been driving the companies to focus on their core business and outsource support functions like FM (Brat 1996; Jensen 2008). Financial control as one of the objectives of FM (Grimshaw 2003). Trends such as back-to-the core, downsizing, outsourcing and right sizing (Krumm 2001). Economic history of USA and UK and influence on FM, where the 1980s was the time of intermittent recession and consistently vigorous cost-cutting in FM and 1990s was the time of, for economic reasons, the rapid rise of outsourcing of FM functions (Duffy 2000). Formation of IFMA and FMN (by the merger of ISM, FMZ and NEFMA). Dutch market knew only single service suppliers and no suppliers of integral facility packages (Brat 1996). | FM Department as ‘traditionele beheerorganisatie’ (without outsourcing or some outsourcing) or ‘Regieorganisatie’ (with responsibility for FM and control of operational outsourcing in the hands of a FM department). For instance, Dutch Municipalities (Wagenberg 2003) and DSM- a medium sized international chemical corporation in the Netherlands (Brat 1996). SSCs (internal or external outsourcing). For instance, Shell Services International (SSI) in 1995 and Ahold’s worldwide centres of excellence (Krumm 2001). IFM / TFM (One example in the mid-1990s where a multinational company (IBM) in the Netherlands had an IFM contract with an international service provider (Johnson Controls)). |
| 2000-2009  | The outsourcing grew in this decade. The outsourced market size was 63% in 2009 as compared to 57% in 2000 and the outsourced market growth index shows a growth of 8% during the last 9 years (Gijsbers et al. 2010). The FM market grew first but after the financial crisis it declined. So the overall decrease (from 2000 till 2009) is 1% (Gijsbers et al. 2010). Growth in the number of local and international service providers and suppliers. The number of service providers grew from 22, 452 to 25,666 during this decade (Gijsbers et al. 2010). Financial crisis increases the cost reduction pressures. 61% facilities managers had to reduce cost in 2010 and the average cost reduction was 10.5% of the budget. Similarly, 77% facilities managers selected facility service providers based on price (Gijsbers et al. 2010). | FM Department / Regieorganisatie (with responsibility for FM and control of operational outsourcing in the FM department) and demand management organization. For instance, Tata Steel (Corus). SSCs (internal or external outsourcing). For instance DSM’s Facility Management Internal-FMI (Brat 1996). IFM / TFM (more organizations adopting the concept such as NS, KPN, Philips, KLM, etc. |
outsourcing of the non-core. Similarly, the idea of having an FM department with a responsible manager implied imposing financial control. Many authors consider cost control to be an important task of facilities managers and some define FM as an economic function concerned with ensuring an efficient use of physical resources by controlling cost (Duffy 2000; Grimshaw 2003). History shows that a business environment that is focused on an adequate return on capital has impacted the practice of FM towards cost control and outsourcing over time (Duffy 2000). For instance, a Dutch study (cited in Van Wagenberg, 1997) on outsourcing (Groeneweg 1996) indicates that cost reduction was the main motive for outsourcing. Similarly, one of the objectives of FM is to facilitate work in an efficient way and contain cost (Wagenberg and Vogel 1993). The benchmark studies also reinforce the logic of rationalization because one of the major purposes of benchmarking is to compare costs and take appropriate actions to reduce cost and to become efficient. The latest cost reduction pressures and financial crises has strengthened the logic of rationalization. For instance, in 2010, 61% of the facilities managers got cost reduction targets of (average) 10.5% from their managements.

The dominance of a logic of rationalization is consistent with the observation that the organizations themselves are the main drivers behind the development of FM (Wagenberg 1997). The big organizations are also, in most cases, multinational and come in contact with different fields and logics (Greenwood and Suddaby 2006). Moreover, the logic of rationalization is acceptable to, and is compatible with the market and corporate logics. That’s why such organizations are often looking for ways to rationalize the non-core and enhance shareholders’ value. This is because the logic of rationalization is connected to the broader societal logics of market (shareholders’ value) and corporation (profitability). The pressure to enhance profitability has included pressure to reduce costs (Krumm 2001). One interviewee (a facilities manager) explains how the rationalization logic guided the IFM decision of the first (or one of few initial organizations) international organization (IBM) in the Netherlands.

Contrasting a logic of rationalization with a logic of professionalism. Unlike other professions, FM is a non-core, relatively young and developing profession. The FM profession has developed although rationalization has been the dominant logic in the field. The trend towards outsourcing multiple services to a single service providers is growing (Lehtonen and Salonen 2006). The following table (7) gives a summary of the broad characteristics of these two logics:
Table 7. Field Logics

| Logic of Rationalization                                                                 | Logic of Professionalism                                                                 |
|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Efficiency and economies of scale                                                       | Professionalism is the ethical use of knowledge in the context of action- Francis Duffy    |
| Financial control and cost containment                                                   | cited in- (Alexander 2003)                                                                |
| Benchmarking                                                                             | FM is a value addition process to the whole supply chain (Alexander 1999) and value      |
| Transparency                                                                             | addition is about optimization rather than only cost cutting (Roberts 2001).              |
| Standardized solutions (Duffy 2000)                                                     | Managers overlook the strategic potential of FM in overall competitiveness because they    |
| FM as a business                                                                          | perceive it to be an outsourcing non-core (Murarak et al. 2005).                         |
| Increasing profits                                                                       | Professionalism is about a specific knowledge base and skills, high self-control via code |
| Building a competitive position                                                          | of ethics and recognized social responsibility to address the legitimate needs of all the  |
| Capital committed to market return                                                       | stakeholders in the workplace (Grimshaw 2003) instead of shareholders only.              |
| Market as a control mechanism                                                           | Users interests and needs be put first and cost cutting to be put in the context of greater|
| Reduction in headcount                                                                  | effectiveness (Duffy 2000).                                                              |
| Shareholders’ value                                                                     | Lack of professionalism creates a rigidly cost controlled workplace (Grimshaw 2003).     |
| Profitability                                                                            | Balance to be struck between traditional profession and new business environment which    |
| Facilities managers speak the language of suppliers (Duffy 2000)                         | is shaped by global forces (Grimshaw 2003).                                              |
|                                                                                         | An integral approach to FM which means a better understanding of total costs, of the      |
|                                                                                         | complexity of facility process and emphasis on the contribution of FM to working and      |
|                                                                                         | living conditions (Brat 1996). In outsourcing the working regime becomes more severe      |
|                                                                                         | (ibid).                                                                                  |
|                                                                                         | Performance issues and service providers don’t understand the needs of customers.        |
|                                                                                         | Focus of service providers is on short term earnings.                                     |

All the actors in the field subscribe to the logic of rationalization, but facilities managers and academics also view social and ethical responsibility (logic of professionalism) as an important factor. The institutional logics embodied in the professions are antithetical to the goals and means of corporations, but the institutional logics of markets are complementary to the goals of corporations (Thornton 2002). There is some tension between the logic of rationalization and the logic of professionalism. But this tension has also helped the FM profession to grow and innovate. The pressures to rationalize and reduce cost and become flexible have led to innovative approaches to managing the facilities that support the business (Alexander 2003). The severe commercial and competitive pressures on business have in a way increased the practical relevance and significance of FM to the organizations because the organizations have to realize cost savings and have to focus on the core to be competitive (Pathirage et al. 2008; Sullivan et al. 2010). While at the one hand the focus is on core and reducing cost, at the other hand the facilities are no longer of marginal significance (Pathirage et al. 2008). Thus, the logic of rationalization dictated by the economic environment has also helped the professionalization of FM. Therefore, the tension between the logics (rationalization and professionalism) has somehow facilitated the development of the profession. Yet, the logic of rationalization remains to be dominant. The latest FM market report suggests that the criteria for selecting the service providers have become tougher in terms of more focus on price (cost savings) (Gijsbers et al. 2010, p.68,74,100). This is further enhanced by financial crisis pressures.
Professionalism has been voiced over time but it remains frail. There have been suggestions that corporations should go beyond sheer operational efficiency and that decisions regarding an in-house department or external service providers should be made on the basis of best services delivered. It is about effectiveness, user’s interests, social and ethical responsibility and better living and working conditions. A rigidly controlled work place displays a lack of professionalism.

So there is a conflict between these logics though the logic of rationalization has been dominant since 1980s. The facilities managers speak the language of suppliers rather than users and the profession has not invented and delivered the emerging needs (Duffy 2000). FM claims to be strategic but most practitioners work at operational levels; FM wants to be at the heart of the organizational development but many FM services are delivered either by external consultants or in-house teams set up as internal consultants; FM claims to be proactive in managing change but it is reactive in most cases (Ventovuori et al. 2007). The main body of the existing market research focuses on the supply side of the market especially on the main FM suppliers’ market. There is a big gap of knowledge about the demand side of the FM market across the whole Europe (Moss 2008). FM is under-researched and is at an early stage of its development (Nutt 1999; Ventovuori et al. 2007). In academic terms, FM is a comparatively new subject area or a field that has grown out of diverse interests from different subjects. It is not an academic discipline in a conventional sense (De Bruijn et al. 2001). The greater difficulty with FM is that the core subjects of FM were less clearly defined and remain to be so, and much emphasis is placed on multidisciplinary and vocational relevance of FM to the industry (De Bruijn et al. 2001). The growing dominance of cost control (rationalization) as a major function of FM has been seen as problematic for the practice of FM (Grimshaw 2003).

The presence of different governance forms and the logic of rationalization. The logic of rationalization is expressed in different forms of practice. In the Dutch field of FM, the logic of rationalization legitimizes all the current popular forms of governance, i.e. an FM department (Facility Management Organization), an SSC or IFM. All the proponents of these governance forms claim efficiency or cost savings to be the major objectives. The multinational and big national organizations are more inclined towards IFM. Small companies, government and non-profit organizations don’t consider IFM to be an appropriate choice at the moment. A consultant explains it as follows:
“For the last couple of years (3 to 4 years) most of the large corporate companies are interested in this way of organizing FM. So they all do studies, they all outsource; they all are looking for parties. It’s not popular for the smaller ones and for the government, educational facilities. It’s only the private sector.”

**Problems with IFM.** Another consultant tries to explain why IFM might not be the solution for all the companies, “Well IFM is not the best solution and is not always the best solution. I have many examples where all options are good.”

IFM may result in loss of synergies if the service provider does not utilize all its competences and/or the in-house unit does not possess the best competence in the market (Ventovuori 2007). This drawback of IFM is theorized by both service providers and the client organizations when they blame each other for not being professional enough or being too much focused on control. The service providers and consultants relate the problems of governance to the in-house facilities managers. In-house facility mangers do the opposite.

The service providers and consultants connect the problems to the clients and they think the client organizations do not want to lose control and they are not professional. For instance, a consultant describes it as follows:

“The clients want to sit on the chair of the service delivery company. They want to control how the service should be delivered and their focus should be on translating business needs into what should be delivered. So they must be professionally translating the business needs instead of telling how they should do the service.”

But some facilities managers think that the IFM service providers are not professional enough and the average performance is disappointing. The field insights can be summed up in the forms of figure 3 below:

**Figure 3: Field Insights and Analysis**
The figure 3 depicts instrumental rationality of service providers and consultants as well the institutional rationality of why they are behaving in such a way. It highlights the institutional rationality (institutional logics) and their effects on the cognition of different actors in the field. The dominant logic of rationalization is connected to broader logics of markets and corporations and this logic has been very influential in the emergence and further spread of IFM in the field of FM. The institutional entrepreneurs, as commonly discussed in the extant literature, exist at field level but this research reveals that some actors (institutional entrepreneurs) cross the boundaries of different fields and that they are connected to national and international fields and wider logics. Such boundary or field-crossing capacity enables them to disseminate new ideas and broader logics in different organizational fields. In this research, these field-crossing actors are the consultants, professional associations, international service providers and international client organizations. They are influenced by the global economic environment (competition, financial crisis) and the logics of markets and corporations, and they shape the logics of the local organizational field. For instance, the logic of the field of FM in the Netherlands is rationalization, which is compatible with the broader logics of market and corporations. The boundary-crossing actors, particularly service providers and consultants theorized the benefits of a new governance form (IFM), legitimated it with the success stories of renowned international client organizations, and participated in benchmarking, publications, seminars and conferences. The professional associations were used as platforms in addition to their own networks. Further, in order to cope with the economic environment different theories emerged during the last three decades. These theories also shaped the field. For instance, in this case the theories of the value chain, concepts of core competence and theories on outsourcing
have been influential in shaping the understanding of the people and organizations towards rationalization. Moreover, explicit attention was paid to the influence of the economic environment such as the financial crisis and competition that also shape the organizational fields.

Lastly, it is noted that prior research (e.g., Lounsbury and Crumley, 2007) on institutional logics explains practice variation as the result of a change in institutional logics. But this research shows that new practices (such as new governance i.e. IFM) may emerge without any change in the corresponding institutional logics because the rationalization logic has been dominant in the field over the last 2 or 3 decades, yet different governance forms and practices (FM staff department concept, SSC and IFM / TFM) emerged over time. Different practices may co-exist in the organizational field at a particular moment in time because they are all connected to the dominant institutional logics. Their appropriateness may be dependent on other factors such as size or ownership (private vs. public companies). For instance, in this research the big organizations find the IFM or demand management organization to be an appropriate governance choice, while governmental and non-profit organizations consider having a FM department to be an appropriate governance choice. As the research has shown that historically the logic of rationalization has been dominant, the variety of governance may not necessarily be because of different institutional logics. This finding has an implication for ITS, because the practices change though only one logic remains dominant.

**Conclusions, Limitations and Suggestions for Future Research**

ITS was the theoretical lens for this study. ITS is suitable for the investigation of field level institutional change in governance. So, it was considered the best choice for the field level analysis unlike TCE which would consider the governance forms as already available at the field level without shedding any light where those governance forms come from. Governance (as a package of practices) is an institution because it provides order and meaning to a set of activities.

This field level research is a first and distinct study that has paid attention to two different concepts of rationalities in ITS, that is, instrumental and institutional rationality (cf. Lounsbury 2008). The instrumental rationality approach was adopted by different institutional scholars (e.g; Oliver 1991; Kraatz and Zajac 1996). In this approach some actors in the field called institutional entrepreneurs bring about institutional change by responding to institutional pressures. For instance, in this study two field level actors (consultants and service providers) get the character of institutional entrepreneurs because of their active participation in the social construction of
IFM in the field of FM in the Netherlands. The idea of IFM came into the Netherlands through a multinational client organization and a multinational service provider. We label these actors as field-crossing actors because they are connected to the national and global fields of organizations instead of only local organization field. This field crossing ability enables these actors to bring new ideas, concepts and governance to specific fields. Though the idea was brought in the field of FM in the Netherlands by an international client organization and a Foreign Service provider, the local service providers and consultants pursued the governance concept very actively. IFM has been explained as a rational response to the existing conditions, characterized by cost reduction pressures in different forms and legal constraints regarding lay off employees, by the institutional entrepreneurs. They state that the employees get better career prospects when they move to the service providers due to IFM because FM is the core business of the service providers. They have been illustrating the success stories of the initial renowned organizations and later adopters to underline the importance of IFM. There are different professional associations that are connected to other professional associations and the field actors. Some organizations are local like FMN, F-MEX, some are transnational such as IFMA and EuroFM. The professional associations have mainly been interested in the dissemination of knowledge, best practices and new ideas. The professional associations are a kind of professional network as described in the theoretical framework developed in chapter 4. The professional associations have been helpful to the institutional entrepreneurs in the construction of IFM because institutional entrepreneurs participate in and contribute to the publications and conferences organized by the professional associations.

The institutional rationality explains the influence of the (broader) institutional logics or institutional orders on the actions and understandings of all the field actors including institutional entrepreneurs. IFM gains acceptance in the field and guides the cognition of the field participants because it resonates with the logics prevailing (logic of rationalization) in the field of FM in the Netherlands and also the broader logics of (market and corporations). The historical analysis of the academic and professional literature in the field of FM in the Netherlands in combination with interviews revealed the dominance of the ‘logic of rationalization’ (reduction of costs) in the field of FM. The ‘logic of rationalization’ has been reinforced over time by the theoretical developments which emphasize focus on the core, cost savings, and outsourcing the non-core. It
is added that the ‘logic of rationalization’ has become commanding by competition and the financial crisis over time.

Secondly, the focus was on construction of governance at field level (O’Dwyer et al., 2011) rather than adoption at the organizational level. By doing this we add to the scarce number of ITS based studies in accounting that focused on the field level (e.g. Dillard et al. 2004, and Hopper and Major, 2007; Ezzamel et al., 2007; O’Dwyer et al., 2011). Besides, this research also reacts to the calls for more studies on institutional entrepreneurship (e.g; Garud et al. 2007).

Thirdly, this thesis demonstrates that different governance forms and practices emerged over time without change in the dominant logics or emergence of alternative institutional logics. A theoretical contribution to the FM domain was not the main focus of this research. Nonetheless, this research reflects on FM and the governance of FM, particularly in the Netherlands. The field level study adds an alternative (social and institutional) perspective to the field of FM. The extant FM research is, to a large extent, focused on technical aspects of FM.

The reflections could direct the attention of the practitioners that the ‘logic of professionalism’ requires attention so that the profession could develop holistically. Though some research in FM generates waves of professionalism (Duffy 2000; Roberts 2001; Grimshaw 2003), the field would be better off with more FM research. It is stated that we only explain how IFM has been constructed. The purpose of this research is not to give a specific opinion on the functionality of IFM.

Regarding limitations, the analysis and conclusions could have been more rigorous by doing a longitudinal research. One of the major reasons why a longitudinal study was not doable is the lack of time; a lot of time had to be spent in getting access to the organizations. However, the field documents and international academic research in FM spanning over the last two decades were collected and analyzed to overcome this shortcoming.

It is suggested that a future research spanning over a number of years and with the involvement of Dutch native speakers be conducted to gain better insights into the developments in the field of FM. A similar research could also be conducted in some other countries.
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Problematic Internet Use: Deficient Self-Regulation or Pathology?
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Abstract
Increasing research on problematic internet use (PIU) makes it necessary to distinguish between the generalized use of internet and its specific applications. This study explores the relationships amongst psychosocial vulnerabilities, specific PIU (SPIU), generalized PIU (GPIU), time spent online (general and specific), and negative outcomes in a sample of British young adults. The results indicate that both SPIU and GPIU are caused by psychosocial vulnerabilities. However, in the case of specific internet applications, these vulnerabilities foster deficient self-regulation (SPIU), leading to excessive time spent online, which produces negative outcomes. Conversely, in the case of generalized use of internet, it is GPIU as a pathology, rather than excessive time spent online on general activities, which leads to negative outcomes.
Introduction

In the 21st century, with over 2 billion users worldwide, the internet has emerged as a vital medium for communications, research, entertainment, and information exchange and has become an integral part of our economic, social, and political life. As the beneficial aspects of internet have been recognized, unease continues to increase about its problematic use. Problematic internet use (PIU) (Caplan, 2002; Davis et al., 2002), often termed as internet addiction (Hall, 2001; Young, 1999), internet dependence (Yuen and Lavin; 2004), pathological internet use (Davis, 2001), compulsive internet use (Meerkerk et al., 2006), unregulated internet use (LaRose et al., 2003), or excessive internet use (Suhail and Barges, 2006), is a multidimensional concept that refers to an unhealthy attachment to internet-based technologies and consists of emotional, cognitive and behavioral symptoms resulting in difficulties with managing life outside the internet domain. Research on PIU, starting from the mid-1990s, has become a critical topic for both scholars and policy makers alike and has shown a clear link with psychological, social, academic, and professional impairment. Calls have been made for researchers to focus on what actually is that people are addicted to. Is it the social interaction, unlimited access to information, anonymity, or the activity with which the individual is occupied? (Beard and Wolf, 2001). The precise distinction between the problematic use of internet and its various applications is an under-researched area. In order to advance research and theory and to develop a wider characterization of different types of PIU, the present study contributes to the existing literature by specifically examining the relationships amongst psychosocial vulnerabilities, specific and generalized types of PIU, time spent online on specific and general activities, and negative outcomes in a sample of British young adults.

Specific vs generalized PIU

As the field of PIU research matures, it is becoming increasingly crucial to understand that individuals might not develop problems with the medium of internet itself, but rather with the various activities enabled by the internet (Hall et al., 2001; Van Rooij et al., 2011). Defining PIU as a single category and overlooking the important role played by specific internet-related technologies in the development of PIU, can restrict researchers and misguide clinicians by implying that the medium (i.e., internet) is the primary source of PIU (Shaffer et al., 2000). Young (1999) suggested that certain users may develop five specific types of problematic internet behaviors: cyber-sexual addiction, cyber-relationship addiction, obsessive online
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shopping, trading or gambling, compulsive web surfing or database searches, and obsessive computer game playing. Griffith (1999) supported this contention but argued that excessive internet users can not always be branded as ‘internet addicts’, as the internet might just be used by them as a medium to engage in a specific activity, in which they might not engage in except on the internet itself. This emphasizes on the need to distinguish between addiction to the internet and addiction on the internet. Davis (2001) refers to this distinction as Specific PIU (SPIU) and Generalized PIU (GPIU). SPIU is dependence on internet content-specific functions (e.g., online gaming, cybersex, cyberstalking), whilst GPIU is a general, multidimensional overuse of the internet without a clear objective (e.g., chatting, surfing, downloading). Caplan (2002) expands on this classification by suggesting SPIU as one of many possible manifestation of a broader behavioral disorder and GPIU as a pathology associated with the unique social context available on internet. Previous research suggests specific internet activities which are immersive and interactive in nature and provide a mental or emotional escape, make the experience more rewarding and addictive (Whang et al., 2003; Leung, 2004; Meerkerk et al., 2006).

PIU: deficient self-regulation model Vs pathology model

In their meta-analysis of 100 PIU studies, Tokunga and Rains tested two models of PIU: the deficient self-regulation model and the pathology model (Tokunga and Rains, 2010). Although both models study the relationship between psychosocial vulnerabilities, PIU and time spent online, they are different. In the deficient self-regulation model, PIU is termed as a “benign problem... that compensates for a lack of satisfaction in other areas of life and PIU lie within the scope of the ordinary person to correct”, implying that these individuals do not require professional treatment (Hall et al., 2001; LaRose et al., 2003). This approach is based on Bandura’s social cognitive theory of self-regulation and suggests that PIU is something that may periodically arise and that may, with time, be self-remedied (Bandra, 1991). Under this approach, the amount of time spent online is viewed as an outcome of PIU, which in turn is developed by psychosocial vulnerabilities fostering deficient self-regulation and hindering an individual’s capacity to closely regulate his involvement in internet-related behaviours (LaRose et al., 2003). In other words, an individual’s failure to control the time spent online is caused by his inability to successfully regulate his internet use (Caplan, 2002; Davis, 2002; LaRose et al., 2003). Previous research supports the claim that psychosocial vulnerabilities are associated with PIU (Caplan,
2002, 2003; Amichai-Hamburger and Ben-Artzi, 2003; LaRose et al., 2003). On the other hand, although not currently included in the Diagnostic and Statistical Manual of Mental Disorders (DSM), under the pathology model, PIU is characterized as a clinical pathology or psychological dependence (Young, 1999). It is caused by psychosocial vulnerabilities of individuals who presumably seek comforting communications by spending excessive amounts of time online, in order to relieve dysphoric moods (Young, 1998; Morahan-Martin, 1999; Hurr, 2006). This cognitive association between internet use and need fulfilment becomes self-perpetuating and leads to the development of PIU (Tokunga and Rains, 2010). These two models are summarized in Figure 1a and 1b.

![Figure 1a. Deficient self-regulation model of PIU](image1)

![Figure 1b. Pathology Model of PIU](image2)

The path analyses results of Tokunga and Rains (2010) provided support for the deficient self-regulation model but did not validate the pathology model, suggesting that the deficient self-regulation characterization provides a tenable explanation for the relationship between psychosocial vulnerabilities, PIU, and time spent using the internet. They further suggested two directions to inform future research and theorizing about PIU. First, time spent online should not be confounded with PIU as an individual might spend a substantial amount of time online without experiencing PIU. It is important to distinguish between problematic and excessive use of internet as they are closely related but conceptually distinct behavioral patterns. Excessive use of internet, which refers to the frequency or degree of online activity that exceeds the normal, usual or planned amount of time, might not necessarily indicate a problem. For example, academics may spend what many would consider to be an excessive time online, but that might be a necessary requirement to successfully complete their research work. Caplan (2003) found...
that although both excessive and problematic internet use were significant predictors of negative outcomes associated with internet use, excessive use was a weaker predictor. Second, PIU should not be theorized as a general, multi-dimensional overuse of the internet. Rather, PIU involves either using a specific internet application (e.g., online gaming) or general use of internet (e.g., online chatting).

**Focus of the Present Study**

Following the two latest research directions pointed out by Tokunga and Rains, the aim of the present study is to clarify the conceptual and empirical ambiguities surrounding the associations amongst psychosocial vulnerabilities, SPIU, GPIU, time spent online (specific and general), and negative outcomes (Caplan, 2003). Thus the following research questions are proposed:

**RQ1a:** Which model (deficient self-regulation or pathology) can better explain the relationships underlying SPIU?

**RQ1b:** Is SPIU a stronger predictor of negative outcomes than time spent online (specific)?

**RQ2a:** Which model (deficient self-regulation or pathology) can better explain the relationships underlying GPIU?

**RQ2b:** Is GPIU a stronger predictor of negative outcomes than time spent online (general)?

**Methods**

**Participants**

Participants were 212 undergraduate students (83 females and 129 males). Sixty percent of the participants were between 18-20 years, 37% between 21-30 years, and only 3% were aged 31 and above. To follow the ethics guideline of keeping the anonymity of the students, a professional research firm collected the data from the overall UK undergraduate student population.

**Measures**

Psychosocial vulnerabilities. Kessler et al.’s sixteen-item scale was used to assess the level of psychosocial vulnerabilities ($\alpha = 0.90; M = 14.53; SD = 5.14$). All items were measured on a 5-point Likert scale (1 = none of the time, 5 = all of the time). Negative outcomes. Caplan’s three-item scale, related to social, academic and professional aspects of life, was used to measure the negative outcomes associated with internet use ($\alpha = 0.91; M = 9.45; SD = 6.95$). All items were measured on a dichotomous (1 = Yes; 2 = No) scale.
Generalized problematic internet use (GPIU). Young’s eight-item scale was used to assess the level of GPIU ($\alpha = 0.79; M = 2.70; SD = 2.20$). All items were measured on a dichotomous scale (1 = Yes; 0 = No).

Specific problematic internet use (SPIU). Charlton’s ten-item online gaming addiction scale was used to assess SPIU ($\alpha = 0.82; M = 27.4; SD = 6.00$). Items were measured on a five-point Likert scale (1 = strongly agree to 5 = strongly disagree).

Time spent online (specific and general). To estimate the amount of time spent online, participants were asked to answer two questions about the number of hours they spent on the internet in a typical day, not counting when they used it for work or studies (general internet use) and on playing online games (specific internet use). The participants reported spending 1-7 hours per day ($M = 2.50; SD = 1.10$) on general and between 1-10 hours per day ($M = 3.67; SD = 2.53$) on specific internet activities.

**Results**

Hierarchical regression analysis for specific internet use. A hierarchical regression test was conducted to test whether the deficient self-regulation model or the pathology model better explains the nature of relationships amongst psychosocial vulnerabilities, SPIU, time spent online (specific), and negative outcomes in the context of specific internet use.

Deficient self-regulation model. In the first regression analysis, SPIU was entered into the equation at Step 1. Results indicate that SPIU accounts for 15% of the variance in negative outcomes, $R^2 = 0.15, F(1,208) = 38.30, p < 0.001$. Next, time spent online (specific) was entered at Step 2, which increased the predictive power of the model significantly, $R^2$ change = 0.16, $F(1,207) = 44.62, p < 0.001$ and eliminated the previously significant SPIU effect on negative outcomes. Next, psychosocial vulnerabilities was entered into the equation at Step 3. The addition of psychosocial vulnerabilities increased the percentage of explained variance by another 16%, $R^2$ change = 0.16, $F(1,206) = 62.03, p < 0.001$.

Pathology model. In the second regression analysis, the order of entry of SPIU and time spent online (specific) was reversed. In Step 1, time spent online (specific) was entered into the equation. Results indicate that time spent online (specific) accounts for 30% of the variance in negative outcomes, $R^2 = 0.30, F(1,208) = 87.27, p < 0.001$. Next, SPIU was entered at Step 2, which did not significantly increase the predictive power of the model, $R^2$ change = 0.01, $F(1,207) = 2.88, p = 0.091$. Next, psychosocial vulnerabilities was entered into the equation at
Step 3. The addition of psychosocial vulnerabilities increased the percentage of explained variance by another 16%, $R^2$ change = 0.16, $F (1,206) = 62.03$, $p < 0.001$.

These results indicate that the relationship between SPIU and negative outcomes is spurious, and that time spent online (specific) confounds that relationship. These results support the use of the deficient self-regulation model for a specific internet activity to the extent that time spent online (specific), and not SPIU, is the actual predictor of negative outcomes.

Table 1.
Hierarchical Regression Equations Predicting Negative Outcomes For Specific Internet Use (Online Gaming)

| Step | Variables entered | Std. $\beta$ | t | $R^2$ change | $F$ change (df) | Total $R^2$ | F total (df) |
|------|-------------------|--------------|---|-------------|----------------|-------------|-------------|
| **Deficient Self-Regulation Model** | | | | | | | |
| 1    | SPIU              | 0.39         | 6.19** | 0.15        | 38.30 (1,208)** | 0.15        | 38.30 (1,208)** |
| 2    | SPIU, Time Spent Online (Specific) | 0.12 | 1.70 | 0.16 | 44.62 (1,207)** | 0.31 | 45.47 (2,207)** |
| 3    | SPIU, Time Spent Online (Specific), Psychosocial Vulnerabilities | 0.10 | 1.60 | 0.16 | 62.03 (1,206)** | 0.46 | 59.93 (3,206)** |
| **Pathology Model** | | | | | | | |
| 1    | Time Spent Online (Specific) | 0.54 | 9.34** | 0.29 | 87.27 (1,208)** | 0.29 | 87.27 (1,208)** |
| 2    | Time Spent Online (Specific), SPIU | 0.47 | 6.68** | 0.01 | 2.88 (1,207) | 0.30 | 45.47 (2,207)** |
| 3    | Time Spent Online (Specific), SPIU, Psychosocial Vulnerabilities | 0.29 | 4.28** | 0.16 | 62.03 (1,206)** | 0.46 | 59.93 (3,206)** |

* $p<0.01$; **$p<0.001$

Hierarchical regression analysis for generalized internet use. A hierarchical regression test was conducted to test whether the deficient self-regulation model or the pathology model better explains the nature of relationships amongst psychosocial vulnerabilities, GPIU, time spent online (general) and negative outcomes, in the context of generalized internet use.

Deficient self-regulation model. In the first regression analysis, GPIU was entered into the equation at Step 1. Results indicate that GPIU accounts for 37% of the variance in negative
outcomes, $R^2 = 0.37$, $F (1,209) = 125.69$, $p < 0.001$. Next, time spent online (general) was entered at Step 2, which did not increase the predictive power of the model significantly, $R^2$ change = 0.002, $F (1,208) = 0.63$, $p < 0.001$. Next, psychosocial vulnerabilities was entered into the equation at Step 3. The addition of psychosocial vulnerabilities increased the percentage of explained variance by another 15%, $R^2$ change = 0.15, $F (1,207) = 63.65$, $p < 0.001$.

Pathology model. In the second regression analysis, the order of entry of GPIU and time spent online (specific) was reversed. In Step 1, time spent online (general) was entered into the equation. Results indicate that time spent online (general) accounts for 3% of the variance in negative outcomes, $R^2 = 0.03$, $F (1,209) = 7.70$, $p < 0.05$. Next, GPIU was entered at Step 2, which increased the predictive power of the model significantly, $R^2$ change = 0.34, $F (1,208) = 114.22$, $p < 0.001$ and eliminated the previously significant time spent online (general) effect on negative outcomes. Next, psychosocial vulnerabilities was entered into the equation at Step 3. The addition of psychosocial vulnerabilities increased the percentage of explained variance by another 15%, $R^2$ change = 0.15, $F (1,207) = 63.65$, $p < 0.001$.

These results indicate that the relationship between time spent online (general) and negative outcomes is spurious, and that GPIU confounds that relationship. These results support the use of the pathology model for general internet activities to the extent that GPIU, and not time spent online (general), is the actual predictor of negative outcome.

Table 2.
HIERARCHICAL REGRESSION EQUATIONS PREDICTING NEGATIVE OUTCOMES FOR GENERAL INTERNET USE

| Step | Variables entered | Std. β | t | $R^2$ change | F change (df) | Total $R^2$ | F total (df) |
|------|-------------------|--------|---|--------------|---------------|-------------|--------------|
| **Deficient Self-Regulation Model** | | | | | | | |
| 1    | GPIU              | 0.61   | 11.21** | 0.37 | 125.69 (1,209)** | 0.37 | 125.69 (1,209)** |
| 2    | GPIU, Time Spent Online (General) | 0.63, -0.79 | 10.69**, 0.05 | 0.002, 0.05 | 0.63 (1,208), 0.42 (1,208) | 0.37, 0.52 | 63.05 (2,208)**, 75.91 (3,207)** |
| 3    | GPIU, Time Spent Online (General), Psychosocial Vulnerabilities | 0.45, -0.93, 7.98** | 8.06**, 0.05, 0.42 | 0.15, 0.05, 0.42 | 63.65 (1,207)**, 7.98**, (1,207)** | 0.52, 0.42 | 75.91 (3,207)**, 7.98** |
| **Pathology Model** | | | | | | | |
| 1    | Time Spent Online (General) | 0.19, 7.98** | 2.78**, 0.42 | 0.03, 0.42 | 7.70 (1,209)*, 7.98** | 0.03, 0.42 | 7.70 (1,209)*, 7.98** |
Structural Equation Modelling (SEM Analysis)

Although the hierarchical regression analysis reported above was useful for clarifying whether the deficient self-regulation model or the pathology model is the best framework for explaining the relationships involved in general and specific internet use, SEM analysis was employed to test the underlying structure of these models using MPlus software. SEM allows for the simultaneous assessment of multiple hypothesized direct and indirect effects.

Specific internet use. Figure 2 summarizes the SEM results of the deficient self-regulation model for specific internet use. Overall, the deficient self-regulation model fits the data very well for specific internet use, $\chi^2(\text{df}) = 823.06$ (41); CFI = 0.90; TLI = 0.94; RMSEA = 0.07. The model accounted for 59% of the variance in negative outcomes. The results support the model confirming that due to existing psychosocial vulnerabilities, an individual fails to regulate his specific use of internet (online gaming) and this loss of control results in the formation of habitual and compulsive behavior i.e. SPIU ($\beta = 0.32$, $p < 0.001$). This SPIU eventually lead to excessive time playing online games ($\beta = 0.39$, $p < 0.001$), which finally results in negative outcomes ($\beta = 0.77$, $p < 0.001$). Psychosocial vulnerabilities was included as an exogenous predictor of both SPIU and time spent online (specific) ($\beta = 0.69$, $p < 0.001$). Additionally, time spent online (specific) was included as a direct predictor of negative outcomes.

Deficient Self-Regulation Model for specific internet use

![Deficient Self-Regulation Model for specific internet use](image-url)
Figure 2. Structural equation model results for specific internet use under the deficient self-regulation model. Note: Values in parentheses are indirect effects; *p < 0.01; **p < 0.001

Generalized internet use. Figure 3 summarizes the SEM results of the pathology model for general internet use. Overall, the pathology model fits the data very well for general internet use $\chi^2$(df) = 930.43 (39); CFI = 0.90; TLI = 0.96; RMSEA = 0.06. The model accounted for 76% of the variance in negative outcomes. The results support the model confirming that existing psychosocial vulnerabilities lead an individual to spend excessive time online on general internet activities ($\beta = 0.19$, $p < 0.01$), which ultimately develops into GPIU ($\beta = 0.17$, $p < 0.01$) ultimately causing negative outcomes ($\beta = 0.87$, $p < 0.001$). Psychosocial vulnerabilities was included as an exogenous predictor of both GPIU ($\beta = 0.66$, $p < 0.001$) and time spent online (general). Additionally, GPIU was included as direct predictor of negative outcomes.

Discussion and Conclusions

The aim of this study was to shed light on the conceptual and empirical ambiguities surrounding the relationships amongst psychosocial vulnerabilities, problematic internet use (SPIU and GPIU)), excessive time spent online (specific and general), and negative outcomes. The conceptual framework developed in this research employs Davis’ (2001) cognitive behavioural model of PIU, suggesting that the first stage in the development of both types of PIU is the presence of psychosocial vulnerabilities. This implies that cognitive symptoms are the main source of PIU and they precede and cause the affective or behavioral symptoms of PIU rather than vice versa. Furthermore, the framework assumes that excessive time spent on the internet should not be confounded with PIU (specific or general) and that both result in negative outcomes for the individual. Hierarchical regression results supported these assumptions and
SEM results provided good fit for both the deficient self-regulation model and the pathology model.

On the one hand, the deficient self-regulation model showed that excessive time spent online is the actual predictor of negative outcomes suggesting that this model is more useful and should be employed when studying SPIU. Although previous research theorizes PIU as a generalized multidimensional overuse of internet, PIU involves a specific use of a technology supported by the internet (e.g., in this case, online gaming). The results suggest that in the case of specific use of internet, it is not the SPIU which results in negative outcomes, but the actual harm is caused by the excessive amount of time spent on that specific activity. Therefore, an individual might experience compulsive behavioral symptoms toward online gaming, but these would only result in negative outcomes when conscious self-control is relatively reduced and the individual is unable to regulate his overuse of the specific application and starts spending excessive amounts of time on this activity (LaRose et al., 2003). This process can be described as lapses in effective self-regulation and not a pattern of consumption consistent with a psychological disease or an addiction to chemical substances (Tokunga and Rains, 2010). The findings are consistent with La Rose et al., who found that depression predicted deficient self-regulation (SPIU), which, in turn, predicted the amount of time spent online (LaRose et al., 2003).

On the other hand, the pathology model showed that GPIU is the actual predictor of negative outcomes, suggesting that this model is more useful and should be employed when studying GPIU. In the case of generalized internet use, it is not the amount of time spent online which results in negative outcomes, but the actual harm is caused by the compulsive behavioral aspects of GPIU. Therefore an individual might spend which might seem abnormal amounts of time online without actually experiencing negative outcomes. The findings are consistent with Caplan (2007), who argued that behavioral aspects of PIU are better predictors of negative outcomes than those which are simply defined as use exceeding a certain amount of time (i.e, frequency of use).
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Working Capital Management and Corporate Performance of Textile Sector in Pakistan

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Abstract

Textile sector is considered as the backbone of Pakistani economy. The profitability and sustainability of the textile sector is very important for the economic growth of Pakistan. Working capital has a major role in the performance of any business entity. In this article the authors have tried to find out the impact of working capital management on the performance of textile sector companies. For the above said purpose, the data of 30 textile sector companies listed at Karachi Stock Exchange having maximum market share were analyzed. All the manufacturing firms generally face problems with their collection and payments schedule. The results have indicated that sales growth, receivables turnover, payables turnover, inventory turnover, gross working capital turnover, current assets turnover, and financial debt ratio have a significant impact on the profitability of the textile companies of Pakistan. The study also concludes that firms in Pakistan are following conservative working capital management policy due to shortage of funds; thus, the firms need to concentrate on the collection policies. There is a great need for the efficient policies for the management of working capital. Furthermore, the efficient management and least cost financing can increase the profitability of textile companies.
Introduction

Textile sector is largest sector of Pakistan’s economy. The share of textile sector in the exports and GDP has remained between 50% to 60% in the last years. Considering the importance of the sector, in depth analysis at industrial level as well as firm level is required. In this article, working capital management of textile sector has been analyzed. Working capital management plays a very important role in the profitability, risk, creation of shareholder value, as well as value of the firm (Smith, 1980).

Working capital management is simply the management of firm’s current assets and current liabilities to maintain the current assets and current liabilities at a most favorable level. Because higher level of working capital leads to under utilization of resources and lower level creates problems in the production and running processes, therefore, an optimal level is required. Major time of the financial managers is consumed in identification of optimal level of current assets and liabilities in accordance with operations (Lamberson, 1995, pp. 45-50). Fixed assets are used in production while current assets are utilized in production, thus, working capital is considered as lifeblood and life giving force for the business entity (Eljelly, 2004). A firm can reduce its investment in fixed assets by leasing or renting, but it cannot adopt the same policy in case of working capital (Filbeck & Krueger, 2005). The greater the relative proportion of liquid assets, lesser the risk of running out of cash or stock (Shin & Soenen.L, 1998).

The main purpose of any firm is to maximize profit along with maintaining liquidity. Increasing profits at the cost of liquidity can create serious issues for the firm. Thus, there should be a balance between the two, liquidity and profitability. A firm cannot ignore profits for a longer period of time and likewise cannot ignore the issue of liquidity (Raheman & M.Nasr, 2007). The tradeoff between profitability and liquidity is very important because if a company do not pay proper attention towards its working capital management then the firm is likely to fail or to face bankruptcy (Kargar & Blumenthal, 1994). It requires continuous monitoring to maintain the optimal level between the components of working capital. Cash, marketable securities, accounts receivables, accounts payable, and inventory management are the major components of working capital management and play a very important role in the performance of a firm. The major challenge to manage working capital is to create and retain a balance between each component of working capital. Efficient working capital management is essential for value creation of firms. The success of a business heavily depends on the ability of the executives to efficiently mange
receivables, inventory, and payables (Filbeck & Krueger, An Analysis of Working Capital Management results across Industries., 2005).

Efficient working capital management is planning and controlling current assets and current liabilities in a manner that eliminates the risk of inability to meet the obligations and also reduces excessive investment in the current assets that will hinder the profitability. Working capital management has become the most important issues where many executives are finding it difficult to identify the important drivers of working capital and the optimal level of working capital.

A firm may adopt an aggressive policy by reducing current assets in the total assets or by increasing current liabilities in total liabilities. Higher level of current assets may result in decline of profit; on the other hand lower level of current assets may result in liquidity issues and stock outs (Horne & Wachowicz, 2004).

The literature has shown number of variables that are responsible for the profitability of the firm. In this study, explanatory variables have been chosen on the basis of alternative theories of capital management and profitability. The accrual method of accounting has been criticized due to its discretionary nature of choosing alternative accounting techniques to manage profits which usually mislead the shareholders (Schipper, 1989).

There is a significant role of cost free capital sources. In liabilities the proportion of cost free capital sources, which usually have zero cost associated with them is significant. Theses sources help to support the utility’s investment frequently. Cost free capital sources like customer supplies that contain deferred tax and tax credits which are without cost. Then advances from customers and miscellaneous current and accrued liabilities are also without any cost. Typically, the rate of return is based only upon certain specific capital sources like debt and equity. Thus, the benefits of cost free capital sources should be recognized while ratemaking. The best way is to determine the revenue requirements. Another very popular measure of working capital management is cash conversion cycle. Cash conversion cycle is the time span between the receivables turnover and the payables turnover. A long cash conversion cycle might increase profitability but it should not be at the cost of image of the firm.

The high level of current assets may reduce the liquidity risk associated with opportunity cost of funds that a normal amount may have invested in non current assets. Thus, the impact of working capital on profitability is significant, but very few studies have been conducted to
examine the relationship. The financial management of small textile companies in the developing countries like Pakistan is an ignored area of research. There are very few studies that have been conducted on the impact of working capital management over the performance of firms. Lack of evidences and researches on the relationship between working capital management and the firm performance with reference to Pakistan provide a strong motivation for evaluating textile sector of Pakistan because it is one of the largest sector of the economy.

**Objectives of the study.** The study objectives are to examine the working capital management of the textile sector companies, and in particular:

- To identify significant components of working capital that have significant impact on returns of shareholders; and
- To find the level of influence of each of components of working capital management on profitability.

**Literature Review**

Literature on corporate finance traditionally focused on long term financial decisions. Where as, short term financial decisions are ignored which are also a very important component of corporate financial decisions. Management of working capital is vital for the smooth running of a business without risk and maximum profits, which requires a balance between the tow approaches i.e. conservative and aggressive (Smith, 1980). Uyar (2009) examined the relationship between cash conversion cycle and profitability using ANOVA and correlation analysis. The results showed that retail and wholesale industry use shorter cash conversion cycle as compared to manufacturing industries. They also examined that there is a negative correlation that exists between cash conversion cycle and profitability. Most of the studies in the field support the traditional belief of working capital management which states that reducing the working capital increases the profitability. Efficient working capital management helps to maximize the value of firm and increases the returns of share holders (Deloof, 2003); (Wang, 2002). Contrary to the traditional belief, more investment in working capital may also increase the returns because huge investment in current assets reduces the interruption of production process and helps the firms to enjoy the economies of large scale (Blinder & L.Macinni, 1991). However, the studies conducted in Pakistan concluded that the return of shareholders can be maximized by effectively managing the working capital (Afza & S.Nazir, 2008). Lack of evidence of working capital management and its impact on the firm performance in case of
textile sector of Pakistan is the main reason behind this article. This is an attempt to fill the gap in the literature.

Current ratio, liquidity ratio, receivables turnover ratio, and working capital to total assets ratio had a significant impact over the profitability (Singh & Pandey, 2008). Profitability measured through gross operating profit and the cash conversion cycle is also correlated. The authors used a sample of 131 companies listed at Athens stock exchange and applied regression analysis. They argued that by proper handling the cash conversion cycle and other components of working capital managers can maximize the returns of shareholders. Rehman and Nasr (2007) have concluded that there exists a negative relation between receivables turnover, inventory turnover, and collection period and the profitability. They have selected a sample of 94 Pakistani companies.

Working capital management is vital for all the companies regardless of their size but the small firms should be more conscious about that (Kargar & Blumenthal, 1994). Usually businesses have huge proportion of working capital as compared to total assets, thus, this proportion should be handled efficiently and effectively. Small businesses are not good in managing their working capital. Small businesses usually suffer from under capitalization and they cannot afford to starve of cash (Peel, Wilson, & Howorth, 2000).

Working capital meets short term requirements of a business during the course of business. Working capital keeps on changing its shapes. The business need to maintain adequate working capital, it acts as blood in the life of a business. In case of weak management of the working capital the growth and smooth running of the business is affected. The success of a business is dependent on generating cash in excess of disbursements. A firm may be very profitable, but if that profit is not translated into cash the firm may face severe cash problems, keeping in view the dual objective of profitability and liquidity must be synchronized and one should not intercept the other for a long period of time. Managers can enhance the earnings potential of a company by reducing the number of days of receivables turnover and inventories. This is highly significant for small growing companies who need finance (Deloof, 2003). The standard measure for working capital management is cash cycle and there exists a strong relationship between working capital management and return (Shin & Soenen.L, 1998).

In short, the literature review in general indicated that a strong relationship exist between working capital management and profitability, but after having a condensed literature review an
ambiguity arises that which variable or ratio of working capital management is more influential than the other. It varies from industry to industry. The current research investigates the relationship between a set of such variables and the profitability of a sample of Pakistani textile companies that are listed at Karachi Stock Exchange. This study will contribute to the literature by developing the relationship between working capital management and the returns of shareholders in two different ways. First, it focuses only on textile industry of Pakistan and highlights the variables that have a significant influence on the profitability of the textile companies of Pakistan. Secondly, this study will also try to correlate the findings of pre conducted studies on the working capital management in Pakistan and the profitability of firms. Thus, this study adds substance to the existing theories that have been developed by previous researchers.

**Theoretical Framework**

Working capital management can be defined as management of current assets and current liabilities. Value creation of shareholders is not possible without proper management of working capital. In this research following variables have been taken on the basis of prior studies.

**Net operating profitability.** Net operating profitability ratio represents the net operating profit percentage out of total sales. Net operating profitability ratio represents the efficiency of management in growing profits and reducing costs. Net operating profits does not include the expenses of interest and taxes, therefore, represent the true profit making capacity of the firm (Correia, Flynn, Uliana, & Wormald, 2007). Thus, net operating profit is a key metrics that is used in the evaluation of a company.

**Receivables turnover.** Receivables turnover ratio is a measure that is used to quantify a firm’s effectiveness in collecting its proceeds from sales. This ratio is also considered as a part of activity ratios. It can be calculated by dividing sales with average receivables. By extending the time of receivables turnover the firms are indirectly extending interest free loans to the clients. A high ration depicts that either the company is working on cash basis or it is very efficient in collection policy. On the other hand, a low ratio depicts that company should reassess its collection policy (Horne & Wachowicz, 2008).

**Inventory turnover.** Inventory Turn Over show the number of time the company converts its raw material into finished goods. Inventory is usually the largest component of the working capital. The management of inventory turnover is very important for the efficient performance as
it is the largest item of the working capital. A low inventory turnover as compared to the industry shows that either the company is ineffective in inventory management or the company has obsolete inventory and the company is not writing off to avoid losses against its income. It is desired to have high inventory turnover ratio (Shim & Siegel, 2008).

**Payables turnover.** Payables turn over shows that how often the company pays off its suppliers. This ratio is calculated by dividing total purchases with average accounts payables. This ratio also tells the paying capacity of the company and also depicts the efficient management of cash by the company. This ratio is opposite to receivables turnover ratio, the lower the ratio better for the company it is. The inverse situation is acceptable only when the inventory turn over ratio is high.

**Gross working capital turnover.** This ratio shows the velocity of utilization of net working capital of the company. This ratio tells the efficiency of the company in using its working capital. High value of this ratio is considered good for the company. A low working capital ratio also shows lack of funds with the company. This ratio is calculated by dividing gross working capital with turnover of the company (Adair, 2011).

**Current assets to total assets.** This ratio is helpful in finding the proportion of current assets out of total assets in the company. This ratio also indicates the portion of resources that are circulated again and again. This ratio is calculated by dividing current assets with total assets (Horne & Wachowicz, 2004).

**Current liabilities to total assets.** This ratio is helpful in finding that up to what extent the resources are financed through current liabilities. This ratio can be found by dividing current liabilities with total assets. This ratio shows that how much resources are financed through short term liabilities.

**Financial debt.** Debt ratio is a very important ratio which shows that out of total assets how much assets are financed through debt. A debt ratio is also important for a bank to identify the risk in extending the debt to a company. It is a ratio of proportion of debt a company has as compared to its assets. It also gives general idea about the leverage of the company. This ratio is calculated by dividing total debt with total assets (Horne & Wachowicz, 2008).

**Sales growth.** This ratio represents the growth in sales in terms of percentage. This ratio can be calculated by dividing the changes in sales with the last year’s sales. Sales growth is helpful in identifying the growth of young companies that have fewer profits or no profits.
**Current ratio.** Current ratio is the most common ratio to find the liquidity of the company. This ratio represents the financial performance of the company. If this ratio is more than one then it shows that the current assets of the company exceed its current liabilities. This ratio can be calculated by dividing the current assets with current liabilities. Most of the times this ratio is calculated in conjunction with quick ratio which excludes inventories from the total current assets to find the actual capacity of the company to meet its current obligations (Shim & Siegel, 2008).

**Hypothesis**

The basic objective of this study is to identify the significant ratios that influence the performance of the textile sector companies in Pakistan. The operational hypothesis of the study is as follows:

\[ H_0: \text{Working capital management has no impact on performance of textile sector companies in Pakistan.} \]

\[ H_1: \text{Working capital management has a significant impact on performance of textile sector companies in Pakistan.} \]

**Research Methodology**

The purpose of the study is to evaluate the relationship between working capital management and earnings of textile sector of Pakistan. The aim of the study is to identify the significant factors that have major impact on the earnings per share or the earnings of the textile companies listed at Karachi stock exchange. In this study a comprehensive literature has been reviewed that was conducted on other sectors. The literature reviewed has helped in the identification of the significant variables that may have an impact on the earnings of the company.

The empirical evidences are based on the collection of financial statements of Pakistani textile companies. The reports were gathered from the stock market and websites of the companies. Earnings per share have been chosen as dependent variable and other ratios related to working capital management are taken as independent variables. The data of 30 textile companies of Pakistan has been gathered and ratios were calculated. The regression analysis has been run using SPSS 16. Regression analysis was chosen to find the impact of independent variables over the dependent variable. The correlation values have also been calculated.
### Pearson Correlation coefficients between Variables of 30 Textile Companies

|                  | EPS          | Net operating profitability | Receivables turnover | Inventory turnover | Payables turnover | Working capital turnover | Current assets to total assets | Current liabilities to total assets | Financial Debt ratio | Sales growth | Current Ratio |
|------------------|--------------|-----------------------------|----------------------|-------------------|------------------|-------------------------|-----------------------------|-----------------------------------|---------------------|--------------|---------------|
| Pearson Correlation | 1.000        |                             |                      |                   |                  |                         |                             |                                   |                     |              |               |
| EPS              | 1.000        |                             |                      |                   |                  |                         |                             |                                   |                     |              |               |
| Net operating profitability | .251         | 1.000                       |                      |                   |                  |                         |                             |                                   |                     |              |               |
| Receivables turnover | .459         | .023                        | 1.000                |                   |                  |                         |                             |                                   |                     |              |               |
| Inventory turnover | .293         | .072                        | .671                 | 1.000             |                  |                         |                             |                                   |                     |              |               |
| Payables turnover | -.203        | -.402                       | .462                 | .511              | 1.000            |                         |                             |                                   |                     |              |               |
| Working capital turnover | .626         | .314                        | -.657                | -.647             | -.746            | 1.000                  |                             |                                   |                     |              |               |
| Current assets to total assets | -.474        | -.161                       | .758                 | .283              | .555             | -.697                  | 1.000                       |                                   |                     |              |               |
| Current liabilities to total assets | -.578        | -.495                       | .749                 | .489              | .770             | -.759                  | .798                         | 1.000                            |                     |              |               |
| Financial Debt ratio | .196         | .300                        | -.595                | -.583             | -.562            | .709                   | -.336                        | -.459                            | 1.000                |              |               |
| Sales growth      | .693         | .648                        | -.561                | -.270             | -.416            | .562                   | -.514                        | -.826                            | .394                | 1.000        |               |
| Current Ratio     | .566         | .752                        | -.253                | -.387             | -.536            | .569                   | -.132                        | -.615                            | .487                | .736         | 1.000         |

Correlation matrix of all variables included in the analysis is presented in the above mentioned table which is calculated based on data of 30 textile sector companies of Pakistan. The table shows that earnings per share are negatively associated with majority of the measures of working capital management. These results are consistent with the view that making payment to suppliers, collecting payments from customers earlier and keeping product or inventory in the stock for lesser time are associated with increase in profitability. It implies that if a firm is able to reduce the Net Trade Cycle period, it can enhance the profitability for the firm and will ultimately create value for the shareholders.
Model Summary

| Model | R   | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|-------|-----|----------|------------------|---------------------------|---------------|
| 1     | .961<sup>a</sup> | .923     | .888             | 2.235615352              | 1.973         |

a. Predictors: (Constant), Current Ratio, Current assets to total assets ratio, Inventory turnover, Financial Debt ratio, Payables turnover, Net operating profitability, Sales growth, Gross working capital turnover ratio, Receivables turnover

b. Dependent Variable: EPS

The model mentioned above shows that the relation between the independent and dependant variables is 96% and independent variables are 92% explaining the variation in dependent variables. It means that 92% of the change in dependent variable is because of independent variables.

ANOVA

| Model | Sum of Squares | Df | Mean Square | F      | Sig.   |
|-------|----------------|----|-------------|--------|--------|
| 1     | Regression     | 15 | 132.638     | 26.538 | .000<sup>a</sup> |
|       | Residual       | 15 | 4.998       |        |        |
|       | Total          | 15 | 1293.698    |        |        |

a. Predictors: (Constant), Current Ratio, Current assets to total assets ratio, Inventory turnover, Financial Debt ratio, Payables turnover, Net operating profitability, Sales growth, Gross working capital turnover ratio, Receivables turnover

b. Dependent Variable: EPS

The above mentioned ANOVA table is calculated to find the F value which is 26.53 which shows that the overall fitness of the model is good. The significance level is also 0.000 which is very good.
| Model                                      | Un-standardized Coefficients |            |     |     |
|-------------------------------------------|-----------------------------|------------|-----|-----|
|                                           | B              | Std. Error | t   | Sig.|
| 1 (Constant)                              | -30.533        | 5.713      | -5.344 | .000 |
| Net operating profitability               | 12.540         | 43.174     | 2.902 | .042 |
| Receivables turnover                      | 82.777         | 52.965     | 3.563 | .013 |
| Inventory turnover                        | 40.568         | 18.874     | 2.149 | .044 |
| Payables turnover                         | 24.179         | 10.397     | 2.325 | .031 |
| Gross working capital turnover ratio      | 6.986          | 2.508      | 2.786 | .011 |
| Current assets to total assets ratio      | 50.440         | 37.163     | 1.357 | .190 |
| Financial Debt ratio                      | -79.019        | 33.299     | -2.373| .028 |
| Sales growth                              | 2.780          | 16.940     | 2.164 | .001 |
| Current Ratio                             | 6.556          | 8.052      | 3.566 | .050 |

a. Dependent Variable: EPS

Research Equation

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 - \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 \]

\[ Y \quad = \quad \text{Earnings per share} \]

\[ X_1 \quad = \quad \text{Net operating profitability} \]

\[ X_2 \quad = \quad \text{Receivables turnover} \]

\[ X_3 \quad = \quad \text{Inventory turnover} \]

\[ X_4 \quad = \quad \text{Payables turnover} \]

\[ X_5 \quad = \quad \text{Working Capital Turnover} \]

\[ X_6 \quad = \quad \text{Financial debt ratio} \]

\[ X_7 \quad = \quad \text{Sales growth} \]
$X_8 = \text{Current ratio}$

The model has been drawn using regression analysis. All variables were regressed to the level of significance to find their influence on the earnings per share. It was found that out of nine variables eight variables that are net operating profitability, receivables turnover, inventory turnover, payables turnover, working capital turnover, financial debt ratio, sales growth, and current ratio have a significant impact over the earnings per share on the textile companies of Pakistan. Among all of these statistically significant variables only one has negative affect over the earnings per share.

**Conclusions**

The main aim of the study was to identify the major components of working capital that affect the earnings per share of the company. The study empirically analyzed the impact of working capital over the performance of textile companies of Pakistan.

The results shows that for textile sector, the earnings per share are dependant on net operating profitability, receivables turnover, inventory turnover, payables turnover, working capital turnover, financial debt, sales growth and current ratio. For value creation the management of textile companies must try to keep receivables turnover maximum and payable turnover at minimum. The inventory turnover should also be maximized. The positive association between receivables turnover and profitability has been validated. Likewise, the payables turnover has shown a negative association with profitability. Gross working capital turnover and current assets to total assets ratio has also shown a very positive relation with profitability of the company. The negative relation of current liabilities to total assets shows higher degree of aggressiveness in working capital financing policy. The research also shows that leverage is negatively associated with profitability. Sales growth has shown a positive relationship.

Several policy implications can be drawn from the above mentioned findings of the study. The companies should stress on delaying payables without loosing their credibility. The companies should encourage the aggressive collection policy without loosing their marketshare due to squeezing the time period of receivables.
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